Indigenous Knowledge, Belief and Practice of Wild Plants among the Meru of Kenya:

Past and Present Human-Plant Relations in East Africa

Proefschrift

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van de Rector Magnificus prof.mr. P.F. van der Heijden,
volgens besluit van het College voor Promoties
te verdedigen op 14 november 2007
klokke 15.00 uur

door

Alfreda Kajira Ibui

geboren te Meru, Kenia
in 1955

Promotiecommissie

Promotoren:	Prof. Dr. L. J. Slikkerveer Prof. Dr. R.E. Leakey (Stony Brook University, N.Y., USA)
Referent:	Dr. G.A. Persoon
Overige leden:	Prof. Dr. V.H. Heywood (University of Reading, UK) Prof. Dr. K.R. Libbenga Prof. Dr. P. Baas Prof. Dr. R.A.M. Bedaux Dr. C. Lionis (University of Crete, GREECE)

Indigenous Knowledge, Belief and Practice of Wild Plants among the Meru of Kenya:

Past and Present Human-Plant Relations in East Africa

Alfreda Kajira Ibui

Faculty of Mathematics and Natural Sciences
Leiden Ethnosystems and Development Program (LEAD)
Leiden University, Leiden, The Netherlands

'*A Plant Ecologist who restricts his studies to a single working life deals with a very short span in the total million years since the earliest land plants in the Devonian'.*

David A. Livingstone (1969).

Cover photograph: Meru girl demonstrates the use of a *mukuma* (*Hibiscus fuscus*) toothbrush.
Photograph: A. K Ibui (2007).
Printed: C.D.P., Leiden University, The Netherlands
Copyright ©:Alfreda Kajira Ibui, November 2007
All rights reserved. No part of this book may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage system, without the written permission from the copyright owner.

Preface

Born and raised in Meru in Kenya, right on the Equator, since my early childhood I have been fascinated by the notion that my country represents the place of origin of humankind. Since the great scientific theories of the nineteenth-century evolutionist Charles Darwin, the pioneering work of Kenyan anthropologists who include the Leakey family (Louis and Mary Leakey, and their son Richard Leakey) have confirmed Kenya as a major part of East Africa to be indeed the *Cradle of Humankind*, where the unique fossil remains of our earliest ancestors and their artefacts have been discovered. Although only a relatively very few have yet been unearthed during the few past decades, in their contexts these fossils have enabled us to interpret their significance and further reconstruct human evolution within its ecological context.

Although numerous studies on these remains have been conducted by scholars from several disciplines, still many questions need to be answered: 'What did they look like? How did they live and survive? What were they eating?' I have always wondered if their life-style or their environment could have caused their disappearance and eventual extinction. I became intrigued by the concept used to refer to these early, pre-agriculturalists as 'hunter-gatherers'. While most research has been conducted on the 'hunter' aspect of these early humans, relatively few studies have sought to document what exactly they were 'gathering'. Although it seems obvious and rather easy to refer to general forest products such as leaves, roots, fruits, nuts and seeds, the actual material evidence of such use of macro-plant remains by our early ancestors is still poor, particularly in comparison to the growing collection of early human skeletal remains in this part of Sub-Saharan Africa. Unlike bones, plant parts are made of very soft tissue, which after death cannot withstand the harsh environmental stress caused by wind, rain and sunlight, generally denying sufficient time for preservation. In addition to the primary focus of scientists on retrieving human fossils, the ecological circumstances explain the paucity in evidence of macro-plant remains from the past.

Already during my childhood in Meru where I grew up so close to nature looking after my parents' cattle, goats and sheep, the many aspects of our relations with plants and trees attracted my special interest. The peaceful rural environment, rich in trees, shrubs, lianas, plants and grass used to provide me with food, toothbrushes, shade, and the shelter that I miss today in the urban area of Nairobi. I wondered if that situation had existed since prehistory, and if our understanding of our present relations with the vegetation could help us to unravel the evolution of human-plant relations since the dawn of humankind in Africa.

Later, during my scientific work at the Department of Palaeontology of the National Museums of Kenya in Nairobi and my challenging research at various sites, my interest in the relations between our early ancestors and their environment, specifically their plant resources, deepened. Fortunately, my education and profession also enabled me to follow my ambition and find out if such a historical (diachronic) approach had been used anywhere before. Although sporadic and still in its infancy, I learned that some scholars from different disciplines have indeed sought to relate the present to the past in order to unravel the process of human-plant relations, not only for theoretical-historical purposes, but also for applied-oriented objectives for the future development of sustainable use and conservation of plants in Kenya and elsewhere around the globe. Specifically, the recent study on *Origins an Development of Agriculture in Kenya, East Africa* by Leakey and Slikkerveer (1992), provided me with an impetus to venture into such a new approach in Kenya, where our documentation, study and analysis of human-

plants relations of the present would not only be of relevance to the past, but also for the present and the future.

As I was most privileged to have the opportunity to use and implement the newly developed diachronic model of the ethnobotanical knowledge systems approach within the context of the ongoing bilateral co-operation programme between the National Museums of Kenya and Leiden University in The Netherlands, which also provided me with generous support and encouragement, I believe that the volume of this dissertation speaks for itself.

Acknowledgements

Several people and institutions have contributed generously to the completion of this dissertation, and I wish to take the opportunity here to acknowledge their support.

I am grateful to the Government of Kenya for allowing me the time to be out of the country for several months over the past years to complete my studies abroad. At the same time, I am grateful to the Government of The Netherlands for allowing me to come and study in its country. The two main institutions in these two countries which contributed substantially from their resources include the National Museums of Kenya (NMK) and Leiden University (UL). The National Museums of Kenya provided all the funding for field projects for which I am grateful. Indeed, I am grateful to Dr. George Abungu, former Director of the National Museums of Kenya, who was my inspiration and encouragement in the initial stages of my research. In addition, I am grateful to Dr. Idle Omar Farah, who as the present Director-General continued to provide me with the same kind support and encouragement. In addition, I received tremendous inspiration from my workmates in the Department of Palaeontology for which I am grateful to all of them. I am also grateful to Mr. Michael Mungai from the National Herbarium of the National Museums of Kenya for identifying my collection of wild plants from Meru, and to Dr. Maside for checking the identifications and final edits.

I am grateful for the kind financial support I received from Leiden University under the NMK-UL Bilateral Agreement during the times that I was invited to work as a Visiting Staff Member of the Leiden Ethnosystems and Development Program (LEAD). I also thank the staff of the Faculty of Mathematics and Natural Sciences at the Leiden University Branch of the National Herbarium of The Netherlands, and that of the Faculty of Social Sciences who made my working visits so successful. I am grateful to Mrs. Neduvoto Piniel Mollel for further checking and re-editing the names of on the list of useful plants from Meru which I constructed.

My special thanks go to the Leiden Ethnosystems and Development Program (LEAD) which provided me with office space and convenient communication and computer facilities. Here I would like to express my gratitude to the members of the LEAD programme encompassing Mrs. Drs. Mady Slikkerveer MA, Mrs. Drs. Diana Bosch MA, Mrs. Dra. Wina Erwina MA, Mrs. Drs. Liesbeth Leurs MA, MSc, Mkes, Dr. Henk van Wilgenburg, Mr. Musuto Chirangi MA, Dr. Yeshanew Gheneti, Dr. H.W.A Voorhoerve, Mrs. Dra. Poppy Djen Amar MA and Mrs. Dra. Nanet Ambaretnani MA. My special thanks go to Mrs. Drs. Liesbeth Leurs MA. MSc. for all the hours she put into helping me with the data analysis in consultation with the Department of Psychology of the Faculty of Social Sciences. The *mores* of Leiden University prohibit me to express my gratitude to certain individuals from this famous institution, to whom I owe so much.

I cannot fail to thank my key informants from Meru who not only provided me with invaluable information about their indigenous plant knowledge, but who introduced me to the local Meru Wild Plants experts, including Mr. George Murerwa Kirigia, Mr. Onesmus Mwiathi Mwirichia and Mr. Gitonga Micheu. Also, all those experts who shared their enormous knowledge on useful wild plants of Meru cannot pass unappreciated. These include: Andrew Kilemi Mugucia, Bretah Ciangai, Charles Kanampiu Mutirithia, M'Imathiu M'Imari, Eric Njue Nkiria, Evangeline Mwarania, Geoffrey M'Mugwika Mbogori, Godfrey Bariu, Henry Muriuki Muketha, Imathiu M'Rukwaru, Irene Ciankuru Nyaga, Jacob M'Kaibi, John Murithi, Joseph Kaaria, Justus Karuga, Kanampiu Rimunya, Kibara Francis Mwiandi, Kinankau Igweta, Martin Mwitu, Mathiu M'Rukwaru, M'Imunya M'Ibui, M'Rukaria M'Ikirima, Onesmus Mwiathi Mwirichia, Rebecca M'Ikunyua, Teratisio Mwenda Mwirabua, Winifred Kanyua Jaban and also

my field assistants who included; Caroline Ntinyari Arimi, Daniel Mugaa Ibui, Fredrick Maingi Imanene, Irene Waithera Maina, Martha Karari, Onesmus Mwiathi Mwirichia, Samuel Murangiri Ibui, Timothy Gichunge Ibui and Thomas Mboya Mwenda.

I have gained immensely from friends from various Churches in Holland, especially those from St. James Church in Voorschoten and the International Church in Leiden (ICL). I thank members of these Churches for making my life bearable and reducing the loneliness with their kind and friendly words. I wish to thank the Reverend Canon Dr. Philip Bourne and the pastors of ICL who have made many people from all continents of the Earth feel at home in their Congregation, from which I gained immense spiritual support. Here, in addition to the warm friendships, I have had kind support through lifts to and from the Church and several escort trips to the Airport when travelling home to Kenya. Those who provided such support included: Mrs. Marijke Moens, Dr. Yeshanew Gheneti, Mrs. Vera Atlas, Mr. and Mrs. Frans Nedersigt, Mr. and Mrs. Alex Schippers (Partricia) and the Zoo family that include David, Molly and Grace. I thank you David and Molly for the many times that they have escorted me and carried my luggage to the airport and for the special lunches we had had together. I thank Molly for her motherly care. I will miss the kind family.

My gratitude goes also to all those who provided me with a home away from home during my many trips to The Netherlands. These include Mrs. Marijke Moens, Mrs. Drs. Diana Bosch and Mr. Haile Gebrekirstos, Mrs. Korbi Dirkse and her daughter Kolvika, Mrs. Leny Lagerwerf, Mrs. Anneke Landheer and Mrs. Abrehet Bart. I am also grateful to Mrs. Ineke Buma who offered her house and her time to act as my family contact in The Netherlands, whom I could visit and talk to as often as I needed.

Similarly, I would like to express my sincere gratitude to Mrs. Rosemary Robson-McKillop B.A. (Hons.) for editing the final version of the manuscript.

I am grateful to my mother, my greatest support and inspiration in education, who unfortunately passed away during my study period and to my brothers and sister who kept my spirits up. Especially, I thank my sister for all those weekly short text messages.

Last but not least, I thank my husband Justus Benjamin Ibui for supporting me and kindly agreeing to be left alone for long periods of time, filling his place and mine. I am similarly grateful to our children Agnes, Kennedy, Samuel, Timothy, Daniel and Karen, who patiently provided me with support and encouragement through electronic emails and short text messages during my numerous travels abroad. Thank you all for being so patient, bearing and supportive, as I could not have completed my study without you. You are the best family one could possibly have.

This dissertation is dedicated to my husband
Justus B. Ibui,
an expert on the uses of Meru's wild plants
and a great supporter of this study

Contents

Preface ix

Acknowledgements xi

List of Figures xix

List of Maps xxii

List of Tables xxiii

Chapter I Introduction 1
1.1 Background to the Study in Meru, Kenya 1
1.1.1 Meru: It's People and their Wild Plant Resources 1
1.1.2 Human-Plant Relations in a New Perspective 3
1.2 Wild Plant Knowledge and Use among the Meru 6
1.2.1 The Meru Concept of Useful Plants 6
1.2.2 Medicinal Plants for Health and Healing 10
1.2.3 Conservation of Bio-Cultural Diversity 13
1.3 Reconstruction of the Historical Interaction Process 17
1.3.1 Limited Traces from Pre-history 17
1.3.2 Pre-contemporary Evidence 19
1.3.3 Indigenous Plant Knowledge Systems 20
1.4 Aim, Objectives and Structure of the Study 22

Chapter II Theoretical Framework 27
2.1 The Advanced Study of Human-Plant Relations 27
2.1.1 Ethnobotany: Evolution of an Multidisciplinary Approach 27
2.1.2 The Emic Perspective on Indigenous Plant Knowledge 29
2.1.3 Plant Use, Conservation and Community Development 31
2.2 The Reconstruction of (Pre-)Historical Associations 34
2.2.1 Palaeoethnobotany: The Evidence from Prehistory 34
2.2.2 Historical Ethnobotany: Oral and Written Records 40
2.2.3 The Challenge of the 'Ethnographic Analogy' 41
2.3 Recent Approaches to Human-Plant Relations 44
2.3.1 Ethnoecology: 'Traditional Ecological Knowledge' (TEK) 44
2.3.2 The Leiden 'Ethnobotanical Knowledge Systems' Approach 46
2.3.3 The Advance of Quantitative Ethnobotany 48
2.4 The Study of Traditional Plant Use Behaviour 49
2.4.1 Conceptualisation of Human-Plant Use Behaviour 49
2.4.2 The Integrated Approach Selected for the Study in Meru 51

Chapter	**III**	**Methodology and Analytical Model**	53
	3.1	**The Ethnosystems Approach to the Study in Meru**	53
	3.1.1	The Participants View (PV)	53
	3.1.2	The 'Field of Ethnological Study' (FES)	55
	3.1.3	The 'Historical Dimension' (HD)	55
	3.2	**Qualitative Study**	56
	3.2.1	Botanical Survey: Collection of Useful Wild Plants	56
	3.2.2	Ethnobotanical Survey: Meru Knowledge and Practice	60
	3.3	**Quantitative Study**	63
	3.3.1	The Selection of the Sample Surveys	63
	3.3.2	Composition of the Questionnaire	65
	3.4	**The Construction of the Conceptual Model**	66
	3.4.1	The Interactive Model of Wild Plants Use Behaviour	66
	3.4.2	Blocks, Factors, Variables, and Indicators	69
Chapter	**IV**	**Research Setting: Kenya and Meru**	81
	4.1	**The Republic of Kenya**	81
	4.1.1	Geography and Climate of Kenya	81
	4.1.2	The History of Kenya before Independence	81
	4.1.3	Kenya after Independence	83
	4.2	**Greater Meru Region: Its Origins and Populations**	87
	4.2.1	Geography, Climate, Landscape and Natural Resources	87
	4.2.2	The History and Culture of the Pre-Meru (*Ngaa*)	89
	4.2.3	Administrative Structure of the Three Districts	91
Chapter	**V**	**Life in the Three Meru Villages**	97
	5.1	**Study Population and the Sample Surveys**	97
	5.1.1	Population Data of Greater Meru Region	97
	5.1.2	Selection of the Three Sample Survey Villages	102
	5.2	**Geography, Landscape and Location**	103
	5.2.1	Rural, Semi-Urban and Urban Locations	103
	5.2.2	Housing, Farms and Forests	105
	5.3	**Socio-Demographic and Economic Structure**	105
	5.3.1	Household Size and Composition, Gender and Age	105
	5.3.2	Socio-Economic Status (SES): Profession and Wealth	112
	5.4	**Meru Culture, Wild Plants and Conservation**	124
	5.4.1	Traditional Plant Knowledge and Use	124
	5.4.2	Local Management and Conservation of Wild Plants	127
	5.5	**Traditional Institutions: Continuity and Change**	131
	5.5.1	Meru Administration, Marriage and Land Inheritance	131
	5.5.2	Religious Believes and Practices	134
Chapter	**VI**	**The Evolution of Human-Plant Relations in Kenya**	139
	6.1	**Hominines of the Palaeolithic: Early Dependence on Plants**	139
	6.1.1	Kenya: A Growing Record of Fossil Plants	139
	6.1.2	*Australopithecine Heritage*: Early Use of Plants	146

	6.1.3	*Homo erectus Heritage*: The Quest for Plant-Based Food	148
	6.2	**Modern Humans of the Neolithic: Agricultural Revolution**	151
	6.2.1	Archaic *Homo sapiens* Heritage: Brains and Strategies	151
	6.2.2	*Homo sapiens sapiens*: Early Wild Plant Use in Gogo Falls	153
	6.3	**Pre-Contemporary Cultures in Meru: Use of Wild Plants**	156
	6.3.1	*Ngaa*: Pre-Meru Hunter/Gatherers and their Wild Plant	156
	6.3.2	The Development of Modern Agricultural Production	159
	6.4	**The Meru Heritage**	161
	6.4.1	Ecological Adaptation to Changing Habitats	161
	6.4.2	Ethnographic Analogy *versus* the EKS Approach	164
Chapter	**VII**	**Meru Knowledge and Use of Medicinal Plants**	171
	7.1	**The Useful Wild Plants of the Meru**	171
	7.1.1	Collection and Documentation of Wild Plant Specimens	171
	7.1.2	Classification of Uses of Wild Plants	176
	7.2	**Indigenous Medicinal Plants**	179
	7.2.1	Indigenous Classification of Medicinal Plants	179
	7.2.2	Indigenous Classification of Diseases	184
	7.2.3	Indigenous Conservation of Medicinal Plants	187
	7.3	**Wild Plant Use in Herbal Medicine**	189
	7.3.1	Wild Medicinal Plant Use	189
	7.3.2	Preparation and Application of Herbal Medicine	191
	7.4	**Traditional Healers and Community Plants Experts**	192
	7.4.1	Meru Traditional Healers and Plant Experts	192
	7.4.2	Integration of Traditional and Modern Medicine	197
Chapter	**VIII**	**Meru Knowledge and Use of Non-Medicinal Wild Plants**	199
	8.1	**Wild Food Plants**	199
	8.1.1	Classification and Use of Wild Food Plants	199
	8.1.2	Plant Parts used for Food Preparation	203
	8.1.3	Food Preparation Practices of Wild Plants	204
	8.2	**Wild Material, and Social Plants**	204
	8.2.1	Wild Material Plants	204
	8.2.2	Wild Social Plants	206
	8.3	**Wild Fuel and Environmental Plants**	211
	8.3.1	Wild Fuel Plants	211
	8.3.2	Wild Environmental Plants	214
	8.4	**Wild Non-vertebrate Poisons and Bee Plants**	215
	8.4.1	Wild Non-Vertebrate Poisons Plants	215
	8.4.2	Wild Bee Plants	217
Chapter	**IX**	**Bi- and Multivariate Analysis of Medicinal and Non-Medicinal Plants Use**	219
	9.1	**Bivariate Analysis**	219
	9.1.1	Preparation of Analysis: Data Sets and Variables	219
	9.1.2	Dependent Variables	225

	9.1.3	Predisposing Factors	228
	9.1.4	Enabling Factors (SES)	236
	9.1.5	Environmental Factors	237
	9.1.6	Intervening and Policies Factors	237
	9.2	**Multivariate Analysis: OVERALS**	240
	9.2.1	OVERALS Canonical Correlation Analysis	240
	9.2.2	Projection of Variables and Objects in the Canonical Space	249
	9.3	**Analytical Model: Multiple Regression Analysis**	252
	9.3.1	Correlation of Coefficients of Correlations	252
	9.3.2	The Final Model of Medicinal and Non-Medicinal Wild Plants Use Behaviour	254
	9.4	**Interpretation of the Results of the Analyses**	256
Chapter	**X**	**Conclusions and Implications**	261
	10.1	**Conclusions**	261
	10.2	**Implications**	268
	10.2.1	Theoretical Implications	268
	10.2.2	Practical Implications	271
	10.3	**Recommendations**	273
Bibliography			277
Appendix			293
Glossary			299
Abbreviations			303
Summary			305
Samenvatting			315
Curriculum Vitae			327

List of Figures

Figure 1.1	View of the Nyambene Hills which extend to Mount Kenya in Meru North District. *Photograph:* A.K.Ibui (2002).	0
Figure 1.2	*Kagera* woman showing a wild plant collected from the field for preparation of herbal medicine. *Photograph:* A.K. Ibui (2002).	7
Figure 1.3	Plant-based medicines produced in the Biohorma, Elburg, The Netherlands. (*Source:* Source: www.loba.be, contacted in April (2006).	11
Figure 2.1	The famous fossil skull 'Omo I', being the earliest fossil evidence of anatomically modern humans in Africa, named the 'Pathfinder', was discovered by Richard Leakey in the Omo-Kibish Valley in 1967. (*Source:* Stringer & McKie 1996).	35
Figure 2.2	Reconstruction of the 'Site 50', east of Lake Turkana, showing a camp site near a river used about 1.5 million years ago by a *Homo erectus* group. (*Source:* Lewin (1993).	37
Figure 2.3	Cave painting from the Chora I site of the Chora Valley in Tanzania, probably representing three stylized wild date palm trees shown in silhouette with dead leaves hanging down over the upper part of the trunk. (*Source*: M. Leakey 1978).	38
Figure 3.1	The Conceptual model of relationships between independent and dependent variables of wild plant use behaviour in Meru, Kenya. (*Source:* Adapted from Kohn & White 1976; Slikkerveer 1990; Agung 2005).	68
Figure 3.2	Links in the measurement process of wild plants use behaviour in Meru, Kenya. (*Source*: Kohn & White 1976: 25).	70
Figure 4.1	Ecological zones of Mount Kenya region. (*Source:* Adapted from Fadiman 1982).	90
Figure 5.1	A sheep seeks the shade under a 70 year old respondents' grass-thatched, mud-walled hut. *Photograph*: A.K Ibui, *KK Lumbi* (2005). *Photograph:* A.K Ibui, KK Lumbi (2005).	117
Figure 5.2	A 78 year old respondent standing in front of her cemented-floored, wooden-walled, corrugated sheets roofed house. *Photograph:* A.K.Ibui, *Kinoru* (2003).	118
Figure 5.3	A respondent poses for a photograph with his grandchildren in front of his brick-walled, tile-roofed, several bed-roomed house. *Photograph*: A.K. Ibui, *Kinoru* (2005).	119
Figure 5.4	Figure 5.4 A Meru girl demonstrates the use of a *mukuma* (*Hibiscus fuscus*) toothbrush. *Muthaara* (*Indigofera erecta*), *muoru* (*Plectranthus sp*.), *mwatha* (*Vernonia lasiopus*) and are commonly used for this purpose. *Photograph:* A.K Ibui (2007).	125
Figure 5.5	Age-sets of the traditional Meru at the time of the British invasion (1906). (*Source:* Oral traditions of the Meru according to Fadiman 1982).	132
Figure 5.6	Sacred Tree *mugumo* (*Ficus thonningii)* of the Meru with some members of the field team standing under it. *Photograph:* A.K. Ibui (2002).	135

Figure 6.1	The geological time scale of Planet Earth (*Source*: Lewin 1992).	138
Figure 6.2	Fossil seeds recovered from Rusinga Island in Kenya (18 Myr). (*Source*: Palaeontology photograph collection at the NMK).	142
Figure 6.3	Fossil wood recovered from Rusinga Island in Kenya (14 Myr). (*Source:* Palaeontology photograph collection at the NMK).	142
Figure 6.4	Fossil leaves recovered from Tugen Hills in Kenya (12.6 Myr). (*Source:* Palaeontology photograph collection at the NMK).	143
Figure 6.5	Well-preserved coalified stems showing plant barks and the detailed internal structures still intact (14 Myr). (*Source:* Ibui *et al.* 2003).	144
Figure 6.6	Leaf imprints on rock recovered from the Meru, Mutonga site (14 Myr). (*Source:* Ibui *et al.* 2003).	145
Figure 6.7	Fossil skull of *Australopithecus boisei* dating back to 1.7 Myr discovered by Richard Leakey and Harrison Mutua in Koobi Fora in 1969. (*Source:* Palaeontology Photograph collection at the NMK).	147
Figure 6.8	The fossil skull '1470' (KNM-ER 1470) of *Homo habilis* (Handy Man). (*Source:* Palaeontology photograph collection at the NMK, Nairobi).	148
Figure 6.9	Illustration of the most complete skeleton of the of the 'Turkana boy'. (*Source:* Palaeontology photo Collection at the NMK, Nairobi).	149
Figure 6.10	A researcher shows an archaeological excavation site in Olorgesailie Olorgesailie is a site where an abundance of hand axes have been collected in Kenya. *Photograph:* A.K Ibui (2006).	150
Figure 6.11	The Bodo cranium and face, representing an example of *Archaic Homo sapiens* from East Africa, found in Ethiopia, dating back between 600,000 – 200,000 BP. (*Source:* McKee *et al.* 2005: 262).	152
Figure 6.12	Electron microscope photograph of *Eleusine indica spp. africana*, a progenitor of millet, retrieved from the archaeological site at Gogo Falls. (*Source:* Leakey & Slikkerveer 1991).	155
Figure 6.13	Grinding stone from the Pastoral Neolithic Period (2,500-3,000 years BP). (*Source:* Archaeology collection at the NMK – *Photograph:* A.K Ibui 2006).	165
Figure 6.14	Grinding stone from the Pastoral Neolithic Period (1,000 - 2,500 BP). (*Source:* Archaeology photograph collection at the NMK).	165
Figure 6.15	Stone bows from the Pastoral Neolithic (1,000 - 3,000 years BP). (*Source:* Archaeology photograph collection at the NMK).	166
Figure 6.16	Grinders from the Pastoral Neolithic Period (1,000 and 3,000 years BP). (*Source:* Archaeology photograph collection at NMK).	166
Figure 6.17	Wooden drinking vessel from Tsavo Kenya (1,000-2,000 BP). (*Source:* Archaeology collection at the NMK – *Photograph*: A.K Ibui 2006).	167
Figure 6.18	Grinding stone and grinder used a century ago by Meru Central inhabitants. *Photograph:* A.K. Ibui, *Kinoru* (2006).	167
Figure 6.19	Present grinding stone, grinder, gourd and port in use by a *KK Lumbi* Woman. *Photograph:* A.K. Ibui, *KK Lumbi* (2006).	168

Figure 7.1	Collected wild useful plant specimens in presses put out in the sunlight in Meru District to dry. *Photograph:* A.K. Ibui (2002).	173
Figure 7.2	Bar Chart showing the number of plants collected in each District in Meru *Source: Fieldwork (2002).*	174
Figure 7.3	Pie chart showing the distribution of different wild plants according to their local use in Meru. *Source: Fieldwork (2002)*.	177
Figure 7.4	Complex uses of the 271 species of wild plants collected, total number of species of plants with at least one use = 271, 2 uses = 150, 3 uses = 30, 4 uses = 3. *Source: Fieldwork (2002)*.	178
Figure 7.5	Venn diagram showing interaction of uses among medicinal, food and material wild plants in Meru (medicinal (Med.) = 422, Food = 140, material (Mat.) = 79.	179
Figure 7.6	Line Chart showing most used plant parts in the preparation of medicine. number of times reported: roots = 132, leaves = 129, bark = 57, stem = 20, seeds = 12, branches = 11, fruits = 10. *Source: Fieldwork (2002).*	191
Figure 8.1	*Matuja* picked from *mutuja* (*Myrianthus holstii*), a traditional favourite fruit among the Meru. *Photograph:* A.K Ibui (2002).	203
Figure 8.2	Leaves and seeds of *muuru* (*Vitex doniana*) whose stem provides excellent wood for furniture. *Photograph:*http://www.rsrg.unibonn.de/Projekte/kenya/dfg_rep/botanic_ gallery/meru_oak/meru_oak1.html. Contacted 2nd November (2007).	206
Figure 8.3	*Miraa (Catha edulis) harvested for export* in Meru North District: a newspaper report. *Source:* http://nationmedia.com/dailynation: 17th January 2006).	209
Figure 8.4	*Miraa* chewing in Meru, a newspaper report. (*Source*: http://nationmedia.com/dailynation: 17 January 2006).	210
Figure 8.5	A young man tries to place a *sufuria* with edible tubers on the fire to cook. *Photograph:* AK. Ibui, *Kinoru* (2006).	212
Figure 8.6	A Meru girl carrying firewood. *Photograph:* A.K. Ibui *Kinoru* (2006).	212
Figure 8.7	A Meru girl using dry branches of a non-vertebrate poisons plant to sweep the dusty compound. *Photograph:* A.K.Ibui (2007).	216
Figure 9.1	Projection of the 26 optimally scaled variables of sets 1 and 2 of wild medicinal and none medicinal plant use behaviour onto the canonical space.	250
Figure 9.2	Projection of household heads in the sample survey as objects onto canonical space.	251
Figure 9.3	The Final Analytical Model showing the calculated Multiple Correlation Coefficients on wild medicinal and non-medicinal plant use in Meru.	255

List of Maps

Map 4.1	Kenya and the central location of Meru. *Source*: © www.Maps.com.	80
Map 4.2	Administrative Divisions in Meru North District. (*Source:* Meru North District Development Plan 2002-2008).	94
Map 4.3	Administrative Divisions in Meru Central District. (*Source:* Meru Central District Development Plan 2002-2008).	95
Map 4.4	Administrative Divisions in Meru South District. (*Source:* Meru South District Development Plan 2002-2008).	96
Map 6.1	Geographical locations of some of the major human fossil sites in Kenya to-date, where also some fossil plant remains have been found. (*Source:* Reconstructed from Palaeontology Records at NMK).	141

List of Tables

Table 3.1	Checklist of the equipment for collecting, pressing and drying useful wild plants in Meru. (*Source:* Adapted from Martin 1995).	59
Table 3.2	Example of a Collection Slip of the East African Herbarium of the National Museums of Kenya, Nairobi. (*Source:* East African Herbarium at the National Museums of Kenya).	60
Table 3.3	Block 1: Predisposing factors: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	71
Table 3.4	Block 2: Predisposing factors: Concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	74
Table 3.5	Block 3: Enabling factors: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	75
Table 3.6	Block 4: Environmental factors: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	76
Table 3.7	Block 5: Conservation factors: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	77
Table 3.8	Block 6: Intervening factors: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	77
Table 3.9	Block 7: Dependent factors of wild medicinal plant use behaviour: concepts, variables, and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	78
Table 3.10	Block 8: Dependent factors of wild non-medicinal plant use behaviour: concepts, variables, indicators and categories. (*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).	78

Table 4.1	Meru North District Areas, number of Locations and sub-Locations (*Source:* District Statistics Office, Maua in DDP - 2002-2008).	92
Table 4.2	Meru Central District administrative Divisions, Area, Locations and sub-Locations. (*Source:* District Statistics Office, Meru Central District 2001).	93
Table 4.3	Meru South District administrative Divisions and Area. (*Source:* District Statistical Office, Chuka, 2001, in DDP - 2002-2008).	93
Table 5.1	Meru North Divisions and projected population density (1999 – 2008). (*Source:* District Statistics Office, Maua – 2001: in DDP 2002-2008).	98
Table 5.2	Population Density by Division in Meru Central District (1999 – 2008). (*Source:* District Statistics Office, Meru Central District – 2001: in DDP 2002-2008).	99
Table 5.3	Population density distributed over the Divisions in Meru South District (1999-2008). (*Source:* District Statistics Office, Chuka 2001, in DDP, 2002-2008).	100
Table 5.4	Projection of age and gender composition in Meru North District (2004-2008). (*Source:* District Planning Unit, Maua, 2001 in: Meru North District DDP, 2002-2008 (Note: AgeNS = Age Not shown).	100
Table 5.5	Projection of age and gender composition in Meru Central District (2004-2008). (*Source:* District Statistics Office, 2001 in: Meru Central District DDP, 2002-2008).	101
Table 5.6	Population composition in the three divisions of Akithi, Mirigamieru and Igambang'ombe. (*Source:* District Statistical Office, Chuka 2001 in: DDP Meru North District 2002-2008).	103
Table 5.7	Distribution of household size, gender and age of household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003).*	106
Table 5.8	Household composition of 429 members of the 75. sample households (N=429). *Source: Household Survey (2003)*.	107
Table 5.9	Distribution of formal education and marital status of household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	110
Table 5.10	Distribution of the main profession of the household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	113
Table 5.11	Distribution of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	116
Table 5.12	Distribution of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages as assessed by the research team (N=75). *Source: Household survey (2003)*.	123

Table 5.13	Distribution of the overall assessment of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	123
Table 5.14	Distribution of the level of wild plant knowledge of household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	126
Table 5.15	Distribution of conservation efforts reported by the household heads in the sample survey over the 3 selected villages (N=75). *Source: Household survey (2003)*.	130
Table 5.16	Meru Age-sets since the early Seventeenth Century. (*Source:* Oral Traditions according to Fadiman 1982; Maitai 1988; and Ng'unyura 2000).	133
Table 7.1	Indigenous grouping of Meru vegetation in local and English Names (N=567). *Source: Fieldwork (2002)*.	175
Table 7.2	Descriptions of Plant Parts Used. *Source: Fieldwork (2002)*.	175
Table 7.3	Various Uses of Wild Plants Reported as 1St, 2nd, 3rd or 4th Uses *Source: Fieldwork (2002)*.	178
Table 7.4	Classification of major Meru medicinal plants, medicinal uses and parts used. *Source: Fieldwork (2002).*	181
Table 7.5	Indigenous classification of diseases as reported by community local experts in Meru both in Vernacular and English languages *Source: Fieldwork (2002)*.	185
Table 7.6	Distribution of the respondents' use of wild plants for medicine in the previous year. *Source: Household survey (2003).*	190
Table 8.1	Distribution of the reported use of non-medicinal plants by the respondents in the Previous Year according to the Sample Survey Villages (N=75). *Source: Household survey (2003)*.	200
Table 8.2	List of wild food plants and plant parts used as reported by the Meru Plant experts. *Source: Fieldwork (2002)*.	201
Table 8.3	List of wild material plants and plants parts used as reported by Meru plant experts. *Source: Fieldwork (2002).*	205
Table 8.4	List of wild social plants and plant parts used as reported by the Meru plant experts. *Source: Fieldwork (2002)*.	207
Table 8.5	List of wild fuel plants and plant parts used as reported by the Meru plant experts. *Source: Fieldwork (2002)*.	213

Table 8.6	List of wild environmental plants and plant parts used as reported by the Meru plant experts. *Source: Fieldwork (2002)*.	214
Table 8.7	List of wild non-vertebrate poisons plants and plant parts used as reported by the plant experts in Meru. *Source: Fieldwork (2002)*.	215
Table 9.1	Distribution of pre-disposing variables in medicinal (usemd) and non-medicinal (usenm) uses of wild plants in the three villages of the greater Meru region (N=75).	232
Table 9.2	Distribution of socio-economic status variables over medicinal (usemd) and non-medicinal (usenmp) use of wild plants in three villages of the greater Meru region (N=75).	234
Table 9.3	Distribution of environmental variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru Region (N=75).	234
Table 9.4	Distribution of conservation variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75).	234
Table 9.5	Distribution of intervening variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75).	234
Table 9.6	List of variables showing significant associations with medicinal plant use behaviour according to the values of the *Pearson Chi-Squares* as reported by the respondents of the sample surveys.	238
Table 9.7	List of variables showing significant associations with non-medicinal plant use behaviour according to the values of the *Pearson Chi-Squares* as reported by the respondents of the sample surveys.	239
Table 9.8	Distribution of the component loadings © for both dimensions between sets 1 and 2 of the 26 variables in the survey (N=75).	242
Table 9.9	Distribution of the Component Loadings on wild food, material, social and fuel plant uses for sets 1 and 2 in Dimension 1 of the 25 variables (N=75).	245
Table 9.10	Distribution of the Component Loadings on wild environmental, non-vertebrate poisons and bee plant uses for sets 1 and 2 in Dimension 1 of the 25 variables (N=75).	246
Table 9.11	Calculated multiple correlation coefficients (r) between the 8 blocks of the model.	254



Figure 1.1 View of the Nyambene Hills which extend to Mount Kenya in Meru North District. *Photograph:* A.K.Ibui (2002).

I Introduction

1.1 Background to the Study in Meru, Kenya

1.1.1 Meru: Its People and their Wild Plant Resources

The Meru people who are also referred as the *Amiiru* and speak the *Kimiiru* language live on the eastern slopes of Mount Kenya where they settled after their immigration from an island at the coast of the Indian Ocean. The island is thought to have been *Manda*, of which the history can only be traced through oral stories passed down from parent to child during the last three hundred years. Although these people are generally referred to as *Amiiru*, the name *Meru* is used equally to mean the *people*, *language* and the *geographical location.* The word 'Meru' will therefore be used to represent all three concepts, while the reader is invited to interpret the context in which the name is applied in order to understand its implications. In the whole of this dissertation, non English names are written in italics, except where there are quotations and where extra emphasis is being placed on certain terms.

During their migratory period, the Meru depended heavily on the wild for their sources of food, medicine and fodder for their domestic animals. Their rich cultural ceremonies including marriage, birth, initiation and death were also performed using particular wild plants which were imbued with a special meaning for the people. These practices were continued by the people until they reached the eastern part of Mount Kenya where they eventually settled. Although the initial settlements seem to have been made without any distinct boundaries - except riverine ridges - later developments, especially in the political and social spheres, prompted the Government to subdivide the region into three distinct Districts in order to 'bring' services closer to the people. At present, the community is found in the centre of a country which has been named the 'Cradle of Humankind', largely as a result of the abundance of prehistoric discoveries there. Traces of human-plant relations in prehistory have also been found in this region, albeit with glaring 'missing' links. Contemporary evidence in particular, provided by oral tradition, lends support to relations in the recent past similar to those which are still found in Meru today.

The enormous knowledge on oral traditions and belief systems of the Meru have been documented extensively by Fadiman (1982), Rimita (1988) and Ng'unyura (2000), while additional information concerning the same has been passed down to the author of this dissertation by parents and grandparents, who received it from their parents and grandparents before them, and who also got it from their parents and grandparents before them and so on. Before the settlement of the Meru in their present location, the region was the territory of the Masai and the Ogiek peoples, who originally combed these regions searching for pasture for their livestock. The Meru today tend to reveal a very interesting life-style, especially in their use of wild plants, revealing typical behaviour which they have acquired over many generations. This indigenous management system has prompted them to use, manage and conserve their wild resources in a fairly sustainable mode, particularly in the use of both medicinal and non-medicinal plants which are the theme of this study.

The Meru, who today are distributed over the three Districts of the greater Meru region, take great pride in their local knowledge and use of wild plants for a number of purposes, although the tradition seems to be on the decline. Urgent documentation of both plants and of the knowledge and practices which are related to the use and conservation of these resources is therefore of great significance. The Meru region itself is unique as it enjoys favourable temperatures, altitudes and equatorial seasonal rains, factors which combine to provide the appropriate environment for its

biodiversity consisting of genes, species and ecosystems. Variable ecological zones range from the arid plains which rise some 2,000 feet to moor land extending to over 12,000 feet above sea level. This geographical situation is an unquestionable factor in contributing to the wide variety of plant and animal species in the region

Before the arrival of the Europeans in the early nineteenth century, the Meru people had their own political structures and ranks which defined the role of each member of the community; from a *mwana* (little child) to *mzee* (the most aged or wise). These local institutions - described in detail in chapter V - provided an appropriate local system of governance, behaviour and conduct for the society. Every male and female knew their role which was respected by everyone. Unfortunately, these local institutions were ruthlessly dismantled by colonial rule leaving behind a people who had grown disoriented about where they belonged. The members of the community most affected were the men who formed the traditional government at the time. These men were bereft of properly defined roles in the society, creating a vacuum in their cultural identity which soon led them to immorality and drunkenness born of frustration and disappointment, a kind of behaviour completely foreign to the area previously.

At that time all the past way of life which the people had observed from the early days of their immigration was cast into disarray as they tried to grasp the 'new' behaviour of the *muchunku* (white man) and their religion, since their own was stigmatised as 'backward' and 'heathen', inexorably leading to hell and damnation. During this time of turmoil, most Meru people stopped turning to the wild for their resources, as Western crops had to be planted on cultivated land, eventually forcing many to adopt a settled life-style which replaced their earlier nomadic existence. The Meru today live in settled homes, cultivating their land which often becomes too expensive to manage in the face of such increasing inputs demanded by agribusiness as expensive fertilizers, pesticides and fungicides robbing most members of the community of the chance to earn a decent livelihood. Currently, the greater Meru region - the Meru North, Meru Central and Meru South Districts - contribute over 5 per cent to national poverty in Kenya (*cf.* District Development Plan 2002-2008).

The change to a sedentary life encouraged most Meru to concentrate more on family life, a practice to which they were not able to adhere fully before. Their socio-demographic life changed in terms of family size and resulted in larger households as more children were born into each family. With little knowledge of Western family planning methods, compounded by the loss of their natural and cultural ways, these families eventually found themselves with more mouths to feed than they could afford, causing a lack of food for daily requirements, over-exploitation of resources and increased encroachment on the ancestral lands. Household composition in Meru today ranges from one to over ten members; one-child families are found only among the very young couples who are still of reproductive age. The largest population in Meru - and in Kenya in general - is found among those aged between zero and forty-five years as the Report on DDP 2002-2008 reveals. Most families tend to earn less than one dollar a day, which exerts greater demand on such resources as collectable fuels, since most cannot afford gas or electricity. Ineluctably, this threatens the local trees and shrubs as they are used for firewood and charcoal.

In the field of formal education, every child in Kenya can attend free primary education, which has resulted in more children leaving their traditional homes and life-styles in order to enter the formal education system, either in day schools or boarding schools. The system is currently referred to as 8.4.4: 8 years of primary, 4 years of secondary and 4 years of university education. Graduates from the university or colleges are generally able to find employment in Government service, albeit that this has recently become a problem because of the upsurge in population growth. In cases where both the educated and the less educated youngsters cannot find such jobs, most of them try to earn a

living by turning to entrepreneurship, cattle-herding and farming. The senior members of the community tend to leave employment in order to build houses to rent to provide for the presaged hard times in their lives, since pensions are generally too low. Some members of the community who find it impossible to enter the education system often opt for domestic jobs as house servants. All these factors have affected traditional community life in one way or another. This is clearly illustrated by examining the use of natural resources including wild plants. In earlier times, community members were able to wander through the forests in search of fruits, nuts and tubers; nowadays they are becoming so restricted to their demarcated pieces of land which are also under threat because of the decline in proper management skills and knowledge of conservation of their resources. Consequently, much of the wild vegetation is menaced by depredation and imminent extinction.

Besides these socio-demographic factors, there are other factors which have affected the Meru people's life-style, including their use of wild plants. These factors arise in the psycho-social sphere and are linked to the peoples' indigenous knowledge of the local environment and its resources. Recently, some community members seem to have lost interest in taking care of nature. They no longer educate their children in the virtues of nature and the environment, not because they are uninterested, but because their children are hardly ever at home. These recent changes are contributing to a general decrease in indigenous knowledge and wisdom. Although the local people's beliefs in and attitudes to their environment have been changing since it was inculcated in the community that most activities to do with wild plants and trees were heathen and evil, indigenous plant knowledge and practice have stubbornly managed to survive in the rural areas, where in some cases, a reorientation towards indigenous peoples and their knowledge systems has been observed.

There has also been a shift in local perceptions and practices in conservation. The people of the greater Meru region have turned to using exotic trees for fuel. These form the bulk of the newly planted forests currently seen in Meru, and include *Mikima* (*Grevillea robusta*) and *Mibaumauta* (*Eucalyptus sp.*). These two species of trees have won increasing popularity among the residents. None the less, the people are still forced to cut down the indigenous trees for fuel (charcoal) resources, sometimes without bothering to replace them with seedlings.

At present there are no Government policies or regulations prohibiting people from using wild plants and trees in any way - with the exception of use for material and commercial purposes. Concomitantly, there are also no Government institutions to promote sustainable use and conservation, leaving the community to decide for itself on how to use and manage their wild resources. The problem of the lack of recognition at the Government level of the role of indigenous herbal medicine in health care is serious, pushing traditional medicine underground, as most healers and patients fear prosecution. Such ignorance might easily lead to illegal collection and over-use of traditional medicinal plants and herbs, and as such threaten indigenous practices of sustainable management and conservation of important plant resources.

1.1.2 Human-Plant Relations in a New Perspective

While most indigenous peoples throughout the world today rely on a combination of subsistence strategies including hunting, gathering, fishing, herding and small-scale cultivation, only few societies depend on wild resources for more than half of their total subsistence requirements. As Cotton (1996) notes, the emerging famine in many parts of the world during the past decades has increased the interest in the wild plant resources used by indigenous and traditional peoples. Not only could the documentation of indigenous knowledge systems related to wild food plants lead to

the development of high-quality foods in areas not well suited for cultivation, but also new insight could be provided in the role of local collection of firewood in environmental degradation. The process of the important transition from hunter/gatherer to settled agriculture which took place during the Neolithic period rather independently in several parts of the world, has largely been studied from the perspective of domestication and cultivation of plants. However, research on the use and conservation of wild plants, not only preceding the Agricultural Revolution but also continuing up until today, has received relatively less attention in areas around the globe, especially in East Africa. As Brower Stahl (1984) already rightly noted at the time, *'...research into the origins of African agriculture lags ten to fifteen years behind studies of early agriculture elsewhere.'*

Meanwhile, in recent times, there has been a marked increase in the debate on Indigenous Knowledge Systems (IKS) and Traditional Ecological Knowledge (TEK) in developing countries, including Sub-Saharan Africa, most clearly apparent in the international debate on development cooperation between Western and non-Western countries, in particular in the reorientation towards indigenous people and their knowledge systems. This interest has triggered a different approach to the study of human-plant relations as a process, which embarks on the analysis of present-day configurations, and focuses, from there on the pre-contemporary and prehistorical developments in a retrospective mode. This approach allows also for a problem-oriented research strategy, in which the theoretical and methodological considerations are complemented with practical implications of results for sustainable community development.

As Slikkerveer(1999) noted: *Almost parallel to Western 'scientific', 'cosmopolitan' or 'global' knowledge, 'the indigenous', 'traditional' or 'local', knowledge has developed over many generations to encompass the holistic, interdisciplinary wisdom, practices and experiences of local communities and ethnic groups,* which had eventually culminated in the official *Year of the Indigenous Peoples* of the United Nations in 1994. It is significant that, in this context, similar renewed interest has arisen in 'Traditional Ecological Knowledge', which encompasses a whole range of disciplines as a special field of human ecology in developing countries. Today, many aspects of Indigenous Knowledge Systems are studied, documented and made universally available in order to link up with and enrich global knowledge which is easily accessible through print and electronic databases.

Cogently, many studies are documenting not only that such local knowledge has been ignored and marginalized in the past for many generations - especially during the colonial era - leading in some cases to loss and disappearance, but, on a more positive note, that they are forming the key to truly sustainable community development around the globe. As this study will document, this development in Meru is not just about the loss of important local plant species; it also reveals the related diminution in indigenous peoples' knowledge, beliefs and practices, recently referred to as the threat of loss of bio-cultural diversity.

Despite the fact that indigenous knowledge in Kenya and elsewhere in the developing world has previously been looked upon as 'primitive' and 'backward' by many Western settlers, 'experts' and 'administrators', recent scientific evidence underscores its crucial role in the prolonged management and conservation of local environments and resources where its local application in wild plant use and conservation have sustained humans for centuries. Since these studies of indigenous knowledge and practice in many sectors of society have made these local systems crucially important to attaining sustainable community development, policies and measures need to be put in place promptly to ensure their preservation and simultaneously to encourage the local people in their use so as to protect them from extinction. Therefore, the critical question asked by Posey (1999): *'How can humanity benefit without further undermining the health and well being of the traditional and indigenous people'* requires an urgent answer. Today, the indigenous peoples around the globe - and

especially in Africa - suffer from a great number of illnesses, even though their environment still abounds in medicinal plants and herbs which have the potential to provide new medicines for many ailments - the same potential they have shown in the past in the development of 'modern' drugs. In spite of the undervaluation of the efficacy of medicinal plants and the spurning of people's knowledge and empirical experience of the past, the revitalization of indigenous knowledge and the growing disappointment in 'modern' medicines especially in the cure of diseases such as HIV/Aids have stimulated renewed efforts to study and analyse traditional medicine in Kenya in order to develop new drugs, awakening a new interest in medicinal plants and herbs among various population groups in the country.

Indeed, as Slikkerveer (1991) notes: *...'for a long time, indigenous knowledge was ridiculed as 'primitive', 'native', 'old fashioned' or even 'magic'- and as such was ignored, marginalised and in some cases even wiped out'*. However, during the 1950s and 1960s, when a growing academic interest emerged in the study of local ideas, taxonomies and classifications from the participant's point of view - commonly referred to as the emic point of view - a whole new dimension took shape looking at research which was viewed as a domain for scholars from the West. Although the rich African flora and fauna have been studied by scientists from all four corners of the earth, the indigenous people themselves have just been used as porters and workers in the field, without any official recognition of the substantial contribution they could have made and still could make to this kind of research. More seriously, their Intellectual Property Rights (IPR) have also been ignored, especially those of local experts and healers who possess and safeguard this knowledge and wisdom. Apart from a few 'proper' cases, the knowledge so gathered is often documented in Western publications and read all over the world, but the indigenous peoples involved are relegated to the background, sometimes shrugged off as illiterate and backward. Yet these are the people who are the repositories of this knowledge. Without any books or manuals, they have been able to preserve and adapt it throughout the ages in oral traditions and the informal education of their children. In this process, indigenous institutions such as the age-grade systems among the Meru have played an important role in the preservation of indigenous knowledge and practice, despite the oppression and marginalization during the period of colonization of the country.

Although it now seems incomprehensible that such locally important knowledge and wisdom should have been overlooked in the past, with the growing threat of loss and extinction of environments and their resources in the wake of the influx of external forces, the role of these peoples and their knowledge systems in the sustainable management, use and conservation of the rich bio-cultural diversity of Africa is now finally being recognized, albeit it is now virtually teetering on the brink of extinction. Such a reorientation towards Indigenous Knowledge Systems is also revealed in this study of the knowledge, perceptions, beliefs and practices related to the wild plants of the indigenous Meru people, documented and respected as local stewards and experts who have shared their knowledge with a scientist - this time not a foreigner but indigenous herself – and as such finally raising the peoples' spirits and inculcating the belief that formal, modern education can after all deliver children who they always had wanted to have: children as those of the younger generation who are eager to learn about their own nature and environment and their usefulness, in the hope that, as part of the Meru cultural heritage, this kind of knowledge can one day enter into the very classrooms which took their children away, and be imparted to them. Then, they can finally rest in peace in the knowledge that they have left behind a responsible new generation.

As indicated above, until recently, the use of plants for both medicinal and non-medicinal purposes in Kenya has not been viewed very positively. This is especially true of medicine and other products which have been part and parcel of life throughout the centuries, including those used in social practices and as insecticides. At the same time, local nutritious herbs have been abandoned in

favour of more refined Western foods. Fortunately, this tradition is changing as more people in Kenya are returning to nature, although not necessarily to the forests, but just to their own gardens where medicinal plants and herbs are being cultivated to be used to augment family health and nutrition (Maundu *et al.* 1999).

1.2 Wild Plant Knowledge and Use among the Meru

1.2.1 The Meru Concept of Useful Wild Plants

The Meru concept of useful wild plants encompasses two dimensions: medicinal and non-medicinal, and is related to the diverse functions of these plants as enshrined in the oral tradition of many generations as well as in the current traditional practices. At the time in which they once lived on the island of Manda, the Meru had ample food resources from the surrounding ocean, in which they could fish to supplement their grain diet. The local stories document that they did already cultivate their land in these early times. Later, when they left the island - as will be described in Chapter IV - land resources were not easily available in the new areas as they could not stop long enough to cultivate their land for fear of pursuit by the same enemy who had forced them to leave the island. In the course of their journeys through the new lands, the Meru developed their specialization as hunter/gatherers in combination with minimal cultivation of land which enabled them to manage their livelihood.

In this way, the group known as the *Athi* (hunters) became largely dependent on wild resources for their food, hunting such small animals as rabbit, duiker, gazelle and bush pig. They also searched the forest caves for honey from natural hives to supplement their meat diet. At this period, they would exchange their products with local groups practising land cultivation and livestock-keeping and with the *Aturi* (blacksmiths) whose profession declined as they had to move further land inwards into regions with fewer supplies of iron ore resources. On their historical journey into the hinterland, the Meru encountered deep rivers which were difficult to cross, forcing them to collect wood the local material which would serve to build strong bridges. In this work, they preferred to use the branches of known shrubs, since they were reluctant to fell the large trees. For such purposes, they would look for branches or shrubs to be intertwined in order to form long crossing boards. These could be strengthened with ropes made from lianas. Such activities helped the Meru to accumulate their fund of local knowledge and wisdom which became vital to their survival after their settlement in the current Meru region.

Among the Meru, the utilitarian aspects of indigenous use, management and conservation of their wild plants basically determines their concept of *useful wild plants*. In other words, the Meru people conceptualise their relations with wild plants within the context of their indigenous plant knowledge system *a priori* as useful, in which 'usefulness' forms the guiding principle in their local classification of wild plants as *useful wild plants*. The utilitarian orientation of the Meru is reflected in the various types of wild plant use, indicated below. By consequence, utilisation of wild plants is locally categorised first and foremost in use for medicine, then followed by non-medicinal purposes such as for food, material, fuel, social and cultural events, environmental practices, non-vertebrate poisons and bee keeping. As this study seeks to embark on the participant's view of the indigenous people themselves, the local categorisation will also provide the guideline for the documentation and analysis of wild plant use in the research area. Chapter VII and VIII describe the various forms of wild plant use by the Meru more in detail, focussing respectively on medicinal and non-medicinal wild plants.



Figure 1.2 *Kagera* woman showing a wild plant collected from the field for preparation of herbal medicine. *Photograph:* A.K. Ibui (2002).

The three regions of Meru which are referred to as the peoples' *environment* in this study, encompassing the villages where the respondents live, are characterized by varying types of vegetation as the result of their proximity to Mount Kenya where the cool climate in combination with permanent streams forms an environment in which a great variety of plant species can flourish. While the Meru South and Meru Central Districts enjoy the cool climate arising from their proximity to the mountain, some parts of Meru North District have a semi-arid climate which stretches towards Isiolo and the regions beyond. The region is also notorious for its insecurity because of recurrent cattle raids perpetrated by bands of thieves. These attacks have forced most of the inhabitants of the villages to give the danger zones which border the District from the north and the north-west a wide berth. Such feelings of insecurity also force the residents to avoid the wild

natural areas of their environment, and consequently also allowed only a limited collection of useful plants during the qualitative surveys, conducted in 2002. In contrast to the other two Districts with their relatively high plant species variety, here, the dry land tolerates only a small number of plant species. Notwithstanding these drawbacks, the people of the three environmental zones of Meru North, Meru Central and Meru South Districts are found to use wild plants for all the different types of uses listed above, while their knowledge of plant names, localities, habitats, descriptions, useful parts of the plants and related practices show the unique relationship which the Meru have with their wild plants, expressed in a pattern of use, management and conservation behaviour of plant resources which has not been previously documented and analysed.

Although generally speaking, Kenya is an agricultural country and the regions around Meru are very much agricultural lands, the use of wild food plants should not be underestimated. In this, the rainy seasons are very important, since they allow for the fast generation of food plants which provide the tender leafy vegetables used in local soups and stews and are also mashed in the special dishes regarded as local Meru delicacies. Although the local people may not know the exact chemical components of these plants and herbs, they have acquired an empirical knowledge of all the indigenous edible plants through many years of trial and error. They are certainly aware that these food plants are rich in nutrition as they prefer them to the products which can be bought at modern food markets. The drier climatic periods of the year are also known as the ripening seasons for wild fruits and nuts, which the children nibble on as candy as they look after domestic animals or pass through the bush on their way home from school. Prolonged contact with the wild vegetation has taught them to know and identify the edible fruits and seeds from the forest, and in certain circumstances the roots known to be edible are also dug up and eaten raw. The use of wild *material* plants purposes is another area in which the people of Meru demonstrate their knowledge and expertise.

Before Western utensils were introduced to the Meru people, the use of wooden cups, bowls, plates and spoons was common practice, and mortars to crush grain, digging tools, construction materials and traps for catching rodents were all made from wood. Sheds for cattle and other animals was built by using wood which was thorny to keep the animals inside and the invading wild animals outside. On every occasion, great care was taken in the selection of non-poisonous plants which could not harm people and animals. When defence was required, certain parts of bows and arrows were made out of the locally available plants, including the poisonous sap applied on arrow heads. Socially, plants played a major role in the life of the people of Meru as they were used during initiation ceremonies, births, discipline, rites of casting spells and inflicting curses, and as a mild narcotic for social gatherings and leisure, especially the well known *miraa* (*Catha edulis*) plant which is grown in Meru North District. Sap from chewed *miraa* is stimulant which induces a general feeling of relaxation and leisure, and its sales provide the people of Meru - and Kenya in general - with extra foreign currency. (*cf.* Figure 8.3).

The demand for *fuel* from plant material in Kenya, and in Meru in particular, has been swelled by the continual rises in the price of liquefied gas and electricity. Unable to afford these, most families have returned to plant resources for firewood and charcoal, threatening the diminishing resources with loss and extinction. Fortunately, as most forests have been declared a 'no-go-zone', most inhabitants have now turned to growing exotic trees for their firewood supply. Meru in particular has been virtually transformed into a forest of domesticated *Mukima* (*Grevillea robusta*) trees, a practice which confirms that the floral vegetation, especially on indigenous trees, can be regained if the local people want to put their effort into such a programme. One hundred per cent of the population in Meru use firewood for cooking and heating, and those people who live in the urban areas use charcoal as well. Although most people do not cut down trees for their firewood

supply, this natural resource is diminishing fast. The larger trees, once important providers of timber, are now found only in the protected forests, forcing the people to be more dependent on fast-drying shrubs and herbs. The use of these shrubs and herbs for fuel does not pose a major threat to conservation, but they cannot sustain fire for long periods of time. Another danger is that trees which are known to provide better quality charcoal are found in the protected forests where illegal loggers and forest guards sometimes come into conflict.

The indigenous Meru people have a reputation for taking good care of their homesteads which are normally demarcated by well-kept hedges of local shrubs, providing *environmental* cleanness and beauty. A few years after the incursion of the British into Meru during the colonial era, most homes - especially those of the 'well-educated' inhabitants - were fenced with cedar trees (*Juniperus sp*.), to display their higher class, a status symbol borrowed from people from the West. Unfortunately, these non-indigenous cedar trees soon fell prey to a disease and rot which has led to their slow extinction in Meru. Therefore, the local people have had to revert to the familiar indigenous trees and plants.

Although the *kaiaba* (*Dovyalis abyssinica*) plant which is used for fencing has withstood the test of time, most people have returned to the use of those indigenous plants resistant to disease, which they had previously abandoned. Similarly, indigenous trees and shrubs are used as land-markers, ornamentals, dust-and wind-breakers as well as providers of shade.

The Meru grain storage system involved putting cereals in a *ncuku* (granary) fitted with the appropriate *miuuru* (pl.) (storage containers) which required special precautions to protect them against pests. This needed the local production of insecticides from well-known plants, to prevent the grain from being destroyed. Similar non-vertebrate poisons plants were used against chiggers which seek to bore into the human skin. As these insects are found mostly in dusty compounds, sweeping the area with specific plants known to be imbued with these natural insecticides provided good protection. Chapter VIII provides further information on the invertebrate poisons from plants which have been customarily used among the people of Meru.

There are certain plants and trees used either to attract *njuki* (bees) to hives, so that they can deposit their honey, or to repel them during the harvesting of the honey. These plants are known to the Meru bee-keepers, whose knowledge and wisdom has been imparted to them by their ancestors over many generations, as this practice goes back to the early days of the migration from *Mbwaa*. Although these plants are easily identifiable by the local people, it is much more difficult for them to discover exactly from what plants bees tend to suck the nectar to produce their *nainchu* (honey). As reported by the respondents, the bees appear to be attracted mostly by the flowering plants in the area.

Although there are so far about eight known major types of uses of wild plants by the Meru, the people's concept of plant use in this region - and in Kenya as a whole - is very interesting. The notion of 'wild plant use' always conjures up the concepts of '*miti shamba'* (Kiswahili) and '*dawa cia miti'*, ('medicine from plants' in the Meru language), in the minds of Meru people, both referring to traditional herbal medicine. However, these local concepts generally imply a negative connotation, as such medicine used to be branded *urogi* (poison) by the intruding Europeans, a stigma which is still ingrained in the minds of many people today. Even though this pejorative concept is now changing because of the general reorientation towards traditional and complementary medicine, the majority of the Meru still tend to use traditional herbal medicine secretly with most interesting results, as described in Chapter VII.

1.2.2 Medicinal Plants for Health and Healing

The majority of the wild plants in Meru - as in other parts of Kenya and the rest of the world - have been used over many generations by the people for local health and healing. During the identification process of the indigenous plants in Meru, it was not easy to make a clear distinction between plants for food and plants for medicine. In the eyes of respondents, most food plants are also considered to be medicinal, and the research has shown that the actual method of preparation of mixtures provides a useful tool for the determination of local plants, defining whether the plant is used for food or medicine. To some extent, the respondents tend to regard most of the herbs used for food as also medicinal, since their consumption is believed to provide nutrition for keeping the body healthy, in this way combining plant properties both for health and healing.

Not all medicinal plants in Meru are used for food though, since there are some which cannot be used for nutrition because their fibrous roots and barks make them too tough for ordinary consumption. This condition is well understood by the local people and the plant experts of the community who are perfectly well aware that food plants involve the use of their leaves, fruits and seeds, but most medicinal plants include not only these, but also other parts, such as roots, barks and saps. Obviously, toxic barks, saps, inedible fibrous roots, branches and sometimes whole plants cannot be consumed. Medicinal plants have been studied and analysed over centuries, often leading to the industrial production of modern drugs. In particular, the tropical rain forests have been used as major sources of medicinal plants, not only in traditional medical systems but also as raw materials for modern drug development. Indeed, the rain forests contain more than 60 per cent of all higher plant species known on earth, providing all that is required for human survival, including many remedies against disease. Estimates of more than 35,000 plant species are being used for medicine in various human cultures around the globe, often in uncontrolled trade systems. So far, only natural products derived from fewer than forty tropical plant species have been incorporated into modern medicine, but only a small part of the tropical flora has been analysed for possible pharmacological activities (*cf.* Van Seters 1997).

Although modern medicine in the West replaced the usual plant-based medicines by industrially produced chemical drugs during the second half of the twentieth century, plant products are still providing over 80 per cent of the population in developing countries with their primary health care (*cf.* WHO 1991). However, recent increases in the price of modern medicines and simultaneously the growing disillusionment among clients and patients confronted with the diminishing success of these modern drugs during the 1990s has prompted a general reorientation towards the use of traditional and complementary medicine, including herbal medicine (*cf.* Bodeker 1997; Slikkerveer 2004; 2006). Most strikingly, this movement has resulted in the recent increase in the trade in raw health products and herbal medicines as part of non-timber forest products (NTFPs), but it has also led to the rediscovery of traditional herbal medicines from the tropical rainforests, which holds a promise of revenues from new drugs developed from medicinal plants and herbs. Some of the pharmaceutical companies have started to collaborate with traditional healers as partners in so-called *ethno-directed drug research*, in which the Intellectual Property Rights in conjunction with the concept of Equal Benefit Sharing are playing a major role. This approach has been shown to be more successful than the random sampling of a collection of plants in a particular area (*cf.* Balick & Cox 1997; Posey 1999).

In addition to the increased search involving the screening of plant extracts for specific activities related to new drug development on the basis of indigenous plant knowledge and practice, a few companies are also pioneering the application of natural products for complementary medicine,

homeopathy and natural healing in compliance with Government regulations, producing natural medicines by modern methods and applying quality control, plus hygiene and toxicity tests. An interesting example is provided by *Biohorma* in the Netherlands where as the result of a life-time of effort by the famous Swiss scholar, Dr Alfred Vogel in 1990 to develop natural medicine, phototherapy, homeopathy and related forms of alternative medicine, a company was established which produces such plant-based medicines drawing on the rich medicinal plant knowledge of indigenous peoples in North and South America, Africa, and Australia and Tasmania (Kosasi, pers.com. 2006). Since these alternative medicines have been tested, approved and registered by the Government - and as such accepted within the national health care system - many different types can now be purchased from most pharmacies in the Netherlands (*cf*. Figure 1.3).



Figure 1.3: Plant-based medicines produced in the Biohorma, Elburg, The Netherlands.
Source: Source: www.loba.be (2006).

Although Kenya has not reached this stage of official recognition and use of such plant-based medicines yet, the use of medicinal plants for health and healing has been practised in many parts of the country since the earliest times; a fact well documented for the Luo, Maasai, Gusii, Abaluya, Kikuyu and Meru (*cf.* Leakey 1977; Sindiga *et al.* 1995). The East African Plant Resources team in Kenya have also provided a significant contribution to drug development, in which fungi and

bacteria provide compounds which have been modified in order to produce antibiotics and other antimicrobials for current use. Kofi-Tsekpo (1995) provides an overview of current research conducted in drug development from plant-derived medicines or medicinal plants in Kenya at the Kenyan Medical Research Institute (KEMRI), using indigenous ethno-medical information sources from different population groups in the country. Through the implementation of this promising ethno-directed approach to new drug development, medicines for bronchial asthma, epilepsy, mild hypertension, gout, malaria, psoriasis and diabetes are currently being investigated. The down-side is that this expanded demand for medicinal plants in international health care development has also increased the pressure on wild plant resources, an effect which will be described in the next paragraph.

As elsewhere in Kenya, the people in the study area of Meru also possess in-depth knowledge of the local plants used for preparing traditional medicine, and as such are familiar with the vernacular names of the indigenous plants; the localities where they are found; habitats; special characteristics of size, height, leaf arrangements, colour, taste and smell. They are also well aware if a plant is rare and perhaps even in danger of becoming extinct in its habitat, dispersion and frequency. Similarly, they know the specific parts of the plant which should be used, as well as the special process of preparation and application traditional plant-based medicines.

The people's specific indigenous plant wisdom is also very well demonstrated in their ability to know what kind of diseases can be treated by what kind of plant species or their particular parts. In this regard, the knowledge and practice of many indigenous healers and experts cannot be underestimated as they are also known to be able to combine the different plants and plant parts for the treatment of specific illness or disease. In most situations, several parts of plants or trees are selected, boiled and used in mixtures, soups and teas for the promotion of people's health since they believe that by using these preparations on a daily basis, any disease in the body will be eradicated even before its symptoms are experienced. Many people in the study area reported that the use of these traditional herbal medicines has cured them of a wide range of disorders, ailments or disease, including those affecting the digestive, respiratory, circulatory, excretory and reproductive systems; the skin, ear, nose, mouth and throat; general body pains and aches, fevers; bone and muscle pain, not to mention such cultural illnesses as hypertension and stress. In the treatment and cure of all these ailments, the knowledge and practice of the *muga* (herbalist) and the beliefs and attitudes of the patient play a major role in their choice of use of certain medicines.

There are additional factors which influence the use of alternative medicine for both health and healing among the Meru, including their past experience with use of medicines, their efficacy and costs, the way in which these medicaments are prepared, their packaging, dosage and availability - especially during emergencies - and their possible side effects. Before the settlement of the Meru in the area east of Mount Kenya, when the forests still abounded in wild animals, certain animal parts were also included in the preparation of medicine. Nowadays, this old practice has been abandoned since a growing number of residents fear that they may be eating parts of unknown animals which they believe are not supposed to be eaten. Currently, the soups which provide the basis for most herbal medicines are prepared mainly from lean goat's meat and bones. The packaging of herbal medicines still remains a big challenge for local experts. The various determinants of the use behaviour of wild plants by the Meru for both medicinal and non-medicinal purposes have been identified, documented and analysed on the basis of the Meru *emic* view.

1.2.3 Conservation of Bio-Cultural Diversity

Biodiversity refers to the variety of genes, species and ecosystems on earth and the ecological process of which they are part (Bennun *et al.* 1995; Prain, Fujisaka & Warren 1999; Agung 2005). In the last half century, the ecosystems which encompass plants, animals and humans around the world are being faced with a growing threat of loss and extinction, largely attributable to overpopulation, expanding settlements, land cultivation, forest clearance and encroachment on ecological niches which host a variety of animal and plant species. This situation has been aggravated by the invasion of the natural forests for - sometimes illegal -logging, and climatic changes caused by the recent increase in global warming. Although this process is extremely difficult to control - even in developed countries where the laws on environmental protection are observed and measures are taken to try to stem global warming, it is becoming evident that the ongoing destruction of the Earth's environments and ecosystems is now threatening human survival. As Leakey & Lewin (1995) document, *the past five great extinctions in the long history of life on earth, all of them catastrophic causing the abrupt extinction of more than half of all living species, are now being surpassed by the sixth extinction now underway which threatens human survival. This time, however, the underlying cause is neither climate change, nor asteroids and evolutionary inadequacy, but the rapacious behaviour Homo sapiens themselves*.

The increasing rate of biodiversity loss and the concomitant negative impact on the future of humankind have also continued to draw the attention of a growing number of international organizations and foundations leading to a series of influential publications, conventions and strategies. These include relevant documents from the *World Bank* (1994), the *World Resources Institute* (1991), the *International Union for the Conservation of Nature* (IUCN) (McNeely *et al*. 1990), the *United States Agency for International Development* (USAID) (Knutsen 1992), and the *United Nations Environment Programme* (UNEP) (Heywood 1995).

As elsewhere in East Africa, recent data on the country's biodiversity status from various national and international sources indicate that over the past decades the equilibrium between people and their natural environment is being disturbed to the extent that Kenya is currently facing a serious biodiversity crisis: a high level of ecosystem destruction, species extinction and erosion of genetic resources, particularly in the expanding urban and semi-urban areas (*cf.* UNEP 1999; IUCN 1990; IUCN/UNEP/WWF 1991; Bennun *et al.* 199; Perrings *et al*. 1995; Heywood 1995; McNeely 1996). This process is most conspicuous in the transformation in the natural landscape which is currently being confronted with loss of natural forests and savannahs, and their flora and fauna. Consequently, the quality of the environment is rapidly deteriorating, posing a growing threat to the health and well-being of the Kenyan population throughout the country.

Kenya is part of East Africa which has been designated one of the world's 'Centers of Genetic Diversity' by Vavilov (1951), and which since prehistory has been a region in which major changes have continued to take place. Research shows that, before the formation of the Great Rift Valley, there was a forest in the eastern part similar to that remaining in the Congo today (Chesters 1957; Hamilton 1968; Jacobs & Kabuye 1987; Jacobs & Winkler 1992). After its formation, however, rain patterns altered inevitably leading to climatic changes which eventually transformed the vegetation to almost bare rock and sand dunes in the arid lands, bush-land of *Acacia commiphora*, and grasslands with scattered trees in other areas. Early human activities affecting the floral environment - recorded in lake sediments which include pollen sequences, charcoal stratigraphies and opaline silica bodies as well as charred leaf cuticles - had already begun to influence the environment in the past when bush burning affected the diversity of species as a result of the clearing of the bush, partly

for cultivation and pest control. Furthermore, the often enforced introduction of Western-based cash crops and their related agricultural support systems to help local farmers still continue to threaten the indigenous agricultural systems, causing a further threat of extinction of many plant and wildlife species (Maitima 1997; Maundu *et al.* 1999).

Studies by Maundu *et al.* (1999) on the use of wild plants in Kenya, particularly of food plants, indicate the continual loss of indigenous food plants at farm and village level, largely as the result of clearing of land, over-stocking and over-exploitation, and the introduction of cash crops. It has been noted that indigenous useful wild plant species are generally better conserved in the less cultivated areas of forests, semi-arid lands and national parks, whereas cultivated farmlands host the least number of these indigenous resources. Unquestionably, the intrusion into Kenya by the colonial powers and the related introduction of 'modern' technology, including the use of chemical fertilizers and pesticides for higher yields, compounded by forced permanent settlements of pastoralist communities, has produced a landscape which could no longer resist the pressures. Indeed, the land was never left to rejuvenate as the traditional practice had been, eventually resulting in bare fields useful neither to animals nor to the local population.

As mentioned above, the introduction of Western crops on the large, newly occupied farms of white settlers, as in Timau in Meru, led to vast clearings of the natural vegetation, creating ecosystems alien to most indigenous African animal and plant species. There seems indeed to be little hope for the survival of indigenous plants, as the exploitation of some of the wild food resources with modern technology is being brought to bear on the development of marketable products. In this context, in his Keynote Address to a Symposium at Leiden University on *Origins and Development of Agriculture in Kenya*, *East Africa,* Leakey (1991: viii) observes that: *'Vast quantities of plant species and genetic resources are being destroyed constantly in countries such as Kenya as a result of misguided application of modern technology'*. Commenting on the recent 'rediscovery' of indigenous plants which grow in Kenya's marginal regions, he says the belief of many people who feel that to develop the use of these plant resources would be a backward step, that: *'What may seem to be going backwards could be seen to be going forwards'*. In this same address, Leakey also shared with the participants in the Symposium his vision that: *Traditional knowledge about plants as food and plants as medicine could surely be something that could become fashionable, that could become something that people have to start to develop into a business in the future'*, a prediction which has indeed come true today as the result of the current general reorientation towards the potential and relevance of indigenous plant knowledge and practice for sustainable community development in Kenya and elsewhere around the globe.

Closely related to the diversity of its biodiverse plants resources, Kenya is similarly strikingly rich in its related cultural diversity, encapsulated in the great variety in languages, customs, knowledge, beliefs, values, ceremonies, rituals, institutions, artistic expressions, ways of life and local systems of use, management and conservation of resources. As part of the complex of indigenous knowledge, belief and practices, such cultural diversity can generally be understood as the variety of human expression and organization, including the interactions between humans and their environment (*cf.* Slikkerveer 1992; Harmon 1996; 1998; Sutherland 1998). The specific and complex inter-relationship between the diversity of species, genes and ecosystems on the one hand, and the related systems of indigenous knowledge, belief and practice - underscoring what Posey (1999) coined the *'inextricable link between nature and culture'* - has been referred to by Slikkerveer (1992) as *biocultural diversity*.

As will be elaborated in Chapter II, this concept has lately been extended to encompass all human cultural variety in language, customs, art and way of life. Although the concept of 'biocultural

diversity' has indeed come to refer to the all-embracing variety in the world's natural and cultural systems, in the context of the study of Meru, it is perceived to be pointing specifically to the relations and interactions between humans and their wild plant resources, which are now facing an inexorable threat of loss and extinction. In this context, the term *conservation* refers not only to the maintenance of the components of both biological and cultural diversity; it also includes their sustainable use, recovery or restoration: the linkage relationship between genes, species and ecosystems and their knowledge, belief and management systems (*cf.* Slikkerveer 1992; Heywood 1995; Harmon 1998; Prain, Fujisaka & Warren 1999; Carlson & Maffi 2004).

In Kenya, the general interest in the preservation of the country's rich cultural diversity as a major part of its cultural heritage is occurring through the holistic notion of 'cultural variety'. This concept clearly underscores the local people's respect for their natural and cultural environment, as part of their cosmology which guides their relationship through life with their fellow humans, with nature, and with the spirits and ancestors. The foundation of the *ecocentric* perspective on conservation of the 1980s, identifying the effect of human activities on the environment and their components as the main cause of the crisis supported the conservation strategy of a 'human-hands-off' position - popular among the conservation biologists of that era - is to separate natural ecosystems from human activities.

Following the rather disappointing results of this strategy, a different, largely *anthropo-centric* perspective emerged, pointing to the need to integrate human values, needs and activities into conservation strategies. Since then, the involvement of some of the local peoples has been shown to bring about an increase in biodiversity through such processes as increasing habitat heterogeneity, reducing the influence of dominant species or creating opportunities for new species to invade certain areas *(cf.* Harris 1984). Several authors have also described models of 'low intensity mosaic usage' of the environment and its resources by local communities with a view to biodiversity conservation. These writers include Altieri, & Merrick (1987); Alcorn (1991, 1994); Gonzalez-Bernaldez (1991); Toledo, Ortiz & Medellin-Morales (1994). This view on positive human contributions to biodiversity conservation at the community level is based on long-term anthropological and ethnoscience research in small-scale communities in developing countries which have developed well-adapted indigenous management systems enabling them to live and survive for many generations in their particular environments in a sustained way.

In this way, human activities of sustained use, management and conservation have led to a number of researchers to document that this kind of sustainable, often small-scale indigenous subsistence and resource management practices have been supported by the indigenous peoples 'conservation ethic' as part of their indigenous culture (*cf.* Redford 1990; Hames 1991; Kalland 1994; Alcorn 1994; Slikkerveer 1999; Carlson & Maffi 2004; Agung 2005). In contrast, others have expressed their scepticism about the notion that such indigenous subsistence and resource management practices have been guided by a kind of culture-based 'conservation ethic', pertaining to the ongoing discourse on 'indigenous conservation ethic', also identified as a creation of the myth of the *'ecologically noble savages'* (*cf.* Redford 1990; Hames 1991; Kalland 1994). It is interesting for the study in Meru to observe, that the debate deals not so much on the existence of traditional ecological wisdom and experience among indigenous peoples, but rather with the underlying determinants guiding their behaviour. Because of such renewed interest of a number of studies which describes indigenous peoples predominantly as living and surviving for centuries largely as a result of their sustained conservation practice, Persoon (1991: 115) notes, that: *'nature conservation and indigenous lifestyles are more or less synonymous'.*

Kenya is a nation which consists of many sub-cultures. It has over forty-two distinct population groups with diverse values, norms, beliefs, attitudes and practices, not only in relation to a whole diversity of ecosystems, but also to wild plant knowledge and use. The Maasai believe that all vegetation, animals and humans were given to them by a supernatural being, and as such require looking after, a phenomenon described as the 'Sacred Balance' between humans and their environment. This cosmology is also observed among other indigenous peoples around the globe (*cf.* Posey 1999; Millar 1999; Suzuki 1999). However, the cultural systems of most ethnic groups, which are based on the philosophy of care and protection of nature and the environment through traditional beliefs and values, have experienced severe erosion since the colonial domination of the areas. In particular, the local beliefs in such perceived relationships between culture and nature were virtually banned by Western religions which were introduced as part of the former colonial rule. Similarly, the conservation-based taboos on intrusion into sacred forests and groves were prohibited as timber from these forested areas was needed to supply the homes, offices and mission stations of the new settlers. Leakey (1991: viii) rightly underscores the negative impact of Western intrusion into the rich traditional African knowledge systems: *'I believe that the movement of western civilization, through the colonial process, into Africa cut short and violated a traditional knowledge about life in an ecosystem in which humans so successfully adapted for so long; cut short a body of knowledge, that could yet be of vital significance to the survival of our species in semi-tropical and tropical environments of the third world'.*

In Meru, the tropical forests which had been conserved since the early settlement of the *Ngaa* in the current Meru region were ruthlessly chopped down under the Mission of the Church of Scotland. Oral history of the Meru documents the systematic destruction of the great forest barricades which had protected *Chuka*, Meru South District, from its enemies. As Fadiman (1982) notes, *the entire structure had been ordered to be cut down by Orde-Browne*, the Assistant District Commissioner in the 1920s, when the *Thangiri* had been initiated (*cf.* Figure 5.5). It was one of his first public acts *to remind every African that peace was now maintained by England*. The forests known to be home of the Meru ancestors - including *Ka-Aga* - were protected by their sacrosanctity until the colonial intrusion. This action shocked the Meru as they feared most the ancestral spirits who did not retaliate - as they had been known to do - when the foreigners (*muchunku)* cut down all the forest trees under the regime of the United Methodist Mission (1912).

This brutal act exerted a devastating effect on the indigenous peoples' age-old beliefs and practices and which for years had safeguarded their environment and its vegetation (*cf.* Fadiman 1982). This event eventually led to the people themselves being involved in cutting down trees in a similar manner for a few shillings, rolling down huge logs of wood for construction to the quarters of the *muchunku*. The *muchunku* life-styles and attitudes towards nature took not only a heavy toll on the wild flora and fauna; even more deleterious was their commercial market system which ignored indigenous products and inexorably accelerated the loss of traditional knowledge and practice in many rural areas of the country.

As the critical process of the decrease in Kenya's vegetation has continued up until the present, it is vital for the future to learn from the past experience of the threats which were posed to the survival of the current peoples' ancestors in the past. In view of the mounting menace to Kenya's biocultural diversity, the understanding of the historical interaction process between humans and the plants they depended on for food, medicine and shelter may shed some light on the future. Notwithstanding the paucity in pre-historical and pre-complementary evidence so far, through diachronic comparison of past and present configurations - as developed by the Leiden *Ethnobotanical Knowledge Systems'* (EKS) approach to the study of human-plant relations - the documentation and analysis of the plant-related systems of indigenous knowledge and practice of

present-day people can indeed provide information most relevant to the reconstruction of the development of human-plant relations in Kenya, so well envisaged by Leakey & Lewin (1992) in his notion that: *the past is the key to the future.*

1.3 The Reconstruction of the Historical Interaction Process

1.3.1 Limited Traces from Pre-history

As the limitations of strictly utilitarian studies in ethnobotany gradually emerged and the focus shifted to the understanding of how cognitive and ecological factors have influenced the way in which indigenous peoples have interacted with plants, three different, rather complex, approaches have been developed in ethnobotanical research: utilitarian, cognitive and ecological. While utilitarian ethnobotany involves the collection of information on the use and management of plants, including their identification, cognitive ethnobotany refers to the study of cultural symbolism, assessing the local perception of different plants by the community. Ecological ethnobotany seeks to study the plant-human relations within the ecological context, in which plant resource management also has an effect on the environment.

The study in Meru seeks to integrate all three approaches in an endeavour to understand the human-plant relations in the research area over a longer period of time, using different methods for a much more meaningful understanding of the process than any which could be achieved solely on the basis of utilitarian evidence. The gaps in the evidence from the distant and more recent past will be taken into consideration in the approaches so far available and methods developed to understand the complex processes involved.

The choice of Meru as a key area of Kenya for such a study because of the present body of indigenous knowledge and the people's use of natural resources, including useful wild plants, is founded on the experience of a long-term process of human-plant relations which stretches back to the early times of prehistory. It is a process in a complex time span encompassing prehistory, pre-contemporary and present phenomena, which needs to be reconstructed and interpreted to arrive at an understanding of the continuity from the past through the present into the future. In order to undertake such an endeavour, this study has chosen a strategy which encompasses three parts: the prehistory field of palaeobotany and archaeology; the pre-contemporary field of ethnohistory and ethnobotany; and the present-day field of ethnoscience related to both Indigenous Knowledge Systems (IKS) and Ethnobotanical Knowledge Systems (EKS).

Plant fossils from prehistory have revealed traces of the earliest existence of flora in East Africa from some 18 million years BP, revealing a glimpse of early plants and their environments. Such intimations have been provided by a number of researchers in East African palaeobotany including Chesters (1957), Hamilton (1968); Wetterstrom (1991) and Jacobs & Winkler (1992). Plant fossils collected in Rusinga and Mfwanganu, 18 million year old sites in Kenya, are recorded to have, as Chesters (1957) notes: *'... affinities with recent species, genera or families with a tropical African distribution'*. Pertinently, petrified impressions of leaves on rock, a few twigs and a rare fruit, fifty-seven taxa of plants of 7 million year old leaves of *Pollia sp.*, consisting of 40 per cent of the most common taxa recovered in Ngorora, show affinities in what were wet forests with West African floras which still exist today (*cf.* Jacobs & Winkler 1992). Similar studies in other parts of the world show that most flowering plants known today have been in existence since the Mesozoic Era in the late Cretaceous Period, dispelling the notion that all plants in prehistory have become extinct (*cf.* Judd *et al.* 2002). While it might not be easy to imagine a comparison between present flora and its current uses to the utilization behaviour of the earliest human ancestors who lived about 2 million

years BP, the evidence indicates that vegetation may not have changed much over this period of time, intimating a certain similarity between past and present human behaviour in relation to plants. In the absence of verbal accounts on the subject from human ancestors, the study of present people and their knowledge and practice could be relevant to the understanding of wild plant use behaviour of the past on the basis of comparison of macro-plant remains, tools and utensils in a particular area through time.

Kenya in particular has achieved fame for the spectacular discoveries of human fossils of *Homo habilis*, *Homo ergaster* and *Archaic Homo sapiens*, which have been recovered in specific parts of Lake Turkana region, including the famous sites of Koobi Fora and West Turkana. In these sites, the reconstruction of fossil human skeletal remains - especially human skulls - depict individuals with huge jaws, gigantic teeth, and large mandible muscle attachments. The teeth and molars seem to have been used to crack hard nuts fruits and chew tuberous roots of plants as part of their diet. Studies on the limited archaeological evidence of subsequent early hunter/gatherers in the region indicate traces of use of stone tools and artefacts confirming the use of wild plants in prehistory. Although evidence on human-plant relations is particularly sparse in the period of time between 100,000 and 5,000 BP, traces of wild plants use do reappear with the ample evidence of grinding stones, wooden utensils and cultivar representatives of the first domesticated food crops, additional confirmation of the significant role which plants have played in the lives of human ancestors. As will be described later, the material evidence in the form of archaeological and palaeobotanical tools, artefacts and macro-plant remains link up very well with the material evidence available from pre-contemporary times in Kenya, and also in Meru (*cf.* Keeley & Toth 1981; Leakey 1982, 1992; Leakey & Slikkerveer 1991; Leakey & Lewin 1992; Leakey & Slikkerveer 1993; Maundu *et. al.* 1999; Ibui *et al*. 2003).

As will be elaborated in Chapter II, the *pre-historical* relationships between humans and plants have been documented on the basis of palaeo-ethnobotanical evidence, which includes not only material evidence from preserved plants and artefacts, but also extends to phytogeographical, genetic and linguistic data. The archaeological evidence includes preserved plant and animal remains and artefacts, whose analysis can provide information on the early use and processing of plants and related forest clearance activities. Plant fossils recovered from archaeological sites have been preserved either permineralized or as compressions or impressions, generally providing information on the evolution of plants. More recent macro-plant remains recovered from archaeological sites - still rather rare in the archaeological record - generally occur in charred, desiccated or waterlogged forms (*cf.* Maitima 1997).

In addition to the prehistorical evidence from plant remains, human remains can also provide indirect evidence on the past human-plant relations: skeletal and dental remains plus stomach contents and faecal matter. Chemical analysis of skeletal remains provides insight into early human diet and micro-wear patterns of tooth surfaces provide information on dietary composition and plant-food processing. The analysis of faecal matter - coprolite analysis - is not only yielding a deeper insight into dietary composition and food processing, but is particularly helpful in establishing the early use of medicinal plants (*cf.* Bryant 1993; Yesner 1994; and Cotton 1998). Finally, evidence from artefacts has proved extremely useful in the reconstruction of human-plant relations in prehistory. The use-wear patterns of tool surfaces can provide insight into early plant processing, refined even more sharply by microscopic analysis of wear polishes *(cf.* Keeley & Toth 1981). Similarly, analysis of the surface of grinding stones and mortars can produce more extensive information on the use of plants and roots.

1.3.2 Pre-contemporary Evidence

The construction of the historical interaction process is a difficult one, as many scholars have had to admit, but fortunately some have found some new ways to address this problem. Leakey (1991: viii) notes: *'I am not sure how best to approach this problem but I do think there are two approaches. There is one that is aggressive and looks to the research that will gather the knowledge that exists today and build upon it in a developmental sense. And there is also the component of looking backwards and realizing that not only did the generations that are now in their fifties and sixties have this knowledge, but that that knowledge itself has been handled down from previous generations now gone, but nonetheless generations that had the knowledge that was successful and worked well prior to the process of colonisation'.*

The oral tradition in Meru dates back to more than 300 years BP, and there is even traces which link this part of Kenya to the evidence discovered in some archaeological sites. The connections confirm the close relationships which have existed in the area between all peoples in the past and present and the use of wild plants. The oral stories in Meru, for instance, have revealed a whole range of pre-contemporary evidence of plant use by the people since their arrival from the coast of East Africa. Here, stories are told of the long and tiring trek by both the old and the young, including a story similar to that of the Israelite exodus from Egypt. These stories have been passed down over many generations by the elderly who could not read and write, dispelling the idea that they may have mimicked the biblical escape of the Jews. The stories have been told before the arrival of the Europeans in Kenya by parents to their children in the family for many generations. In these stories, the local peoples' struggle to feed themselves play a central role, as they often had to turn to the wild areas for food, medicine, materials and fuel for their daily needs.

Evidence of similar use has been documented from artefacts which are still used today, as well as those which have been abandoned as the result of the introduction of new technologies, in which machines and modern tools have taken over most of the jobs. Today, grinding machines, which have to a large extent replaced the traditional grinding-stones, now used to process flour within minutes, can be seen in use in most rural parts of Meru. Notwithstanding, there are certain age groups still living and working today who will not use these modern tools to make porridge, urging their relatives to adhere to the indigenous methods of grinding. In this way, they are promoting the continued use and conservation of traditional tools and utensils. Recently, more people, including the 'educated', are also turning to the re-use of these grinding stones in Meru in their quest to re-obtain a more authentic taste of drinks they remembered from those their parents made. As Leakey (1991: vii) rightly observes, there is: *'a generation of people who had handed down to them such incredible wisdom and such experience for so long, and who had not lost it'*. Agricultural tools including digging sticks have now been replaced by modern machetes and hoes in small-scale farming systems. Eating utensils have also been replaced by those made from glass, china, melamine and other materials from the developing countries. The mortar and the pestle mentioned later have likewise been replaced by machines which make short work of removing husks from maize and other grains.

The use of other foods from the wild, including honey from bees, has continued up to the present, and significantly the use of medicinal plants has remained an inevitable part of life since the early times. Although direct evidence from the past is lacking, oral stories abound in accounts of how fractured bones have been bandaged with well-known barks of local, non-poisonous trees until healing process is completed. Currently, most of these practices have been replaced by modern hospital plaster-casts and bandages. Further information on health care institutions in Meru, where

conventional medicine can be obtained in clinics, health centres and Government and private hospitals is given in Chapter IV.

The study of *historical human-plant relations* since the period of about 5,000 BP entails reference to the earliest writings from the Near East - clay tokens from Mesopotamia from 1400 BC - followed by later writings on various plant materials such as Ancient Egyptian manuscripts made from papyrus (*Cyperus papyrus*). The development of the alphabet in the Second Millennium BC formed the basis for the documentation of mainly plant-based remedies in China, Babylon and Ancient Greece, all representing a very significant, albeit very difficult area, of study. These writings are often appropriately highlighted with realistic illustrations of plants and people using them, rendering these manuscripts and herbals extremely useful to the study of historical human-plant relations.

Although until recently, most indigenous communities have had little or no dependence on written culture, their oral traditions enshrined in myths, legends and stories form a major source of pre-contemporary ethno-botanical information. The oral tradition often encompasses many local forms of experience and wisdom used in the local processes of education and socialization. In this context, linguistic evidence, specifically relating to the understanding of local taxonomies and classifications of plants, foods and diseases, is providing an important source of information. In Kenya, for instance, as Sindiga (1994) notes, Maasai boys are taught about the various grasses of the rangelands, while girls learn about the knowledge and use of traditional herbal medicines from their mothers, grandmothers and elders.

1.3.3 Indigenous Plant Knowledge Systems of the Present

So far it has been made clear that reconstructing the historical interaction process of human-plant relations is not an easy undertaking, but it is not impossible, for there is a process by which a study could be conducted *'that is aggressive and looks to the research that will gather the knowledge that exists today and build upon it in a developmental sense'* as Leakey (1991: viii) puts it, thus recognising the emancipation of indigenous peoples' and their knowledge systems. It escaped the interest of early ethnologists who imbued with their colonial 'exotic' manner, viewed the indigenous people as 'primitive', and it has now turned into the 'new' ethnoscience focused on indigenous knowledge systems in the context of development and change, further attracting the attention these people have long been denied (Slikkerveer 1999). The retrieval of quality data by reference to documented methodologies, coupled with resident-in-house indigenous experts, improves the quality of research data by means of accessing this, in a language which is original, and not through translations, which dilute the context contained in the respondents' wisdom.

In the case study recorded in this dissertation, data collected through qualitative and quantitative methods are subjected to multiple analyses, which include: bivariate, multivariate and regression analyses. The results of the analyses culminate into the construction of an analytical model, which is developed through statistical values produced by mathematical calculations of the multiple correlation coefficients. These originate from detailed measurements of the knowledge and practices of the indigenous people, thereby putting the local peoples' knowledge and practices into a scientific framework which can now face the challenge against other 'hard' sciences (Van der Burg 1983).

Therefore, in order to achieve the required standard, detailed qualitative research was conducted in 2002 in the three Districts of Meru. Through semi-structured interviews, field walks and participant observation, plants were identified, collected and pressed for conservation, and simultaneously data was collected detailing the wild plants which the Meru use for several purposes.

The people's knowledge of plant names, localities, habitats, descriptions and uses were recorded into a database which allowed multiple manipulations. In its turn, this has provided the information given in chapters V, VII and VIII and later contributed to the drawing up of the final conclusions. The first part of the field study led to the understanding of the incredible wisdom possessed by these people of their wild environments, revealing factors or variables which could be analysed to understand their behaviour towards wild plant use and helped to understand the historic reconstruction process of human-plant relations since there are people who could be interviewed and questions which could be answered, a dimension lacking in pre-contemporary and the pre-historic studies.

In a following stage, the qualitative data paved way for the construction of the questionnaires through the use of identified factors or variables which proved relevant to the people, especially of Meru, in their daily use of wild plants. This knowledge was compiled into household surveys which were conducted quantitatively in 2003. Details of the factors which include the predisposing, enabling, environment, conservation and institutional in this study were formulated into a questionnaire which is described in Chapter III. Besides this, the methodologies were used to acquire information from a knowledgeable community which lives on the eastern slopes of Mount Kenya. The data was also projected into the three types of analyses in which it was possible to project the variables which show the significant relationships of wild plants in Meru for both medicinal and non-medicinal plant use, thereby providing a deeper understanding of the peoples' interactive behaviour.

Finally, through analyses and identification of the variables which reveal the significations in these relationships, it was possible to construct an analytical study model of wild plant use behaviour in Meru, laying down a comprehensive understanding of the factors which lead to the wisdom, knowledge and practices not only of the people of Meru today, but also of many generations which have lived there before them. And since those in the past are history, it was possible to draw conclusions and to provide both theoretical and practical implications guided by the results of the study concerning the Meru people and their wild vegetation. The ultimate goal of providing a comprehensive understanding of the historical interaction process of human-plant relations, which is not only applicable to the Meru in Kenya but also to the rest of the country and other parts of the world, given the same conditions, factors and environment, was finally accomplished.

The method of the 'ethnographic analogy' has also provided a contribution to the interpretation of archaeological evidence in a number of studies - notably outside East Africa - where specific information from extant human societies has been used for the understanding of communities in the past. In addition to studying the prehistoric plant remains, archaeobotanists can learn much from ethnographic observation among indigenous peoples still practicing today their traditional methods of plant use and conservation. As will be described in more detail in Chapter II, the comparison over time of plant-related artefacts and utensils within a certain culture area will help to understand human-plant relations over a longer period of time. Not only has this method provided useful comparisons of useful plants past and present; modern ethnographic studies have provided important linguistic evidence to expand the scope of palaeoethnotaxonomy, including the significant study of South American Languages by Berlin (1992).

The complications caused and controversies aroused by the use of one or more of these approaches to the study of human-plant relations over time have led researchers in Leiden University to develop a specific approach - the 'Ethnobotanical Knowledge Systems' (EKS) approach which seeks to integrate both diachronic and synchronic dimensions in the study of how humans relate and interact with their plant resources in different areas and through longer periods of

time. In contrast to the method of the 'ethnographic analogy' which departs from past material evidence and seeks additional clues for explanation in the present, the advanced EKS approach focuses on present-day human-plant relationships and processes, and seeks further explanations of current complex configurations both in the recent as well as in the distant past. This means that despite some gaps in the information on the evolution of the complex human-plant relations in Meru, Kenya, due to the lack of substantial archaeobotanical material evidence and inherently the absence of the people from the past who used these plants - the approach to study such relationships in retrospect, *i.e.* embarking on present processes through the pre-contemporary period of time to the (pre-)history, this study focuses on the knowledge and use of wild plants as reported by respondents from three sample survey villages in Meru.

As will be further explained in Chapter II, this approach has been selected and adapted to the study of indigenous plant knowledge and practice in Meru, allowing for the integration of both qualitative and quantitative ethnobotany in the understanding of complex human-plant relationships. As the Ethnobotanical Knowledge Systems Approach is based on the anthropological / ethnoscientific ethnosystems approach, specifically developed to document, analyse and understand indigenous systems of knowledge and technology from an emic point of view, the three underlying major components of the 'Field of Ethnological Study (FES), the 'Historical Dimension (HD) and the Participants View (PV) will also be described in more detail in Chapter II.

1.4 Aim, Objectives and Structure of the Study

The sections mentioned above have already sketched the background of the Meru people and the way they have been using their wild plant resources before and after they had settled in the three regions of Meru North, Meru Central and Meru South Districts. In addition, their indigenous system of use, management and conservation of wild plants in relation to their way of life have been indicated. As briefly described above, the introduction of colonial rule to the Meru has brought a threat to the continuation of their Indigenous Knowledge System, indirectly paving the way for the loss of wild vegetation and the decrease of related knowledge and practices, transferred over many generations. Despite this process, the Meru have maintained and recently even strengthened their indigenous ways of using and conserving their wild plant resources, holding a promise for the future development of their resources in a sustainable mode (Fadiman 1982; Rimita 1988; Maundu *et al*. 1999; Ng'unyura 2000; Githae 2002; Kabuye 2002; Muya 2002; Njiro 2002).

In line with the growing world-wide recognition of local peoples' knowledge and wisdom which has enabled them the to use their wild resources for centuries in a sustained way, the need is highlighted to rescue from extinction not only the indigenous plant species, but also the related indigenous knowledge and experience, encapsulated in the concept of biocultural diversity conservation. The Meru, for instance, view their wild plants in a unique manner since they are providing them not only with traditional herbal health and healing, but also with a resource for multiple use for food, material, social events etc. In the meantime, however, the ongoing loss of both cultural and biological diversity has become a world-wide concern, a process which should urgently be stemmed. In this context, a comprehensive view on the human-plant relations among the Meru will be presented, assessing the process of local use, management and conservation of plants in terms of the various factors playing a determining role over a longer period of time. By consequence, the *general aim* of this study is to document, study and analyse the so far largely neglected, fast disappearing indigenous systems of wild plant knowledge and practice among the people of Meru in Kenya within the context of the human-plant relations as they have evolved in the Meru cultural area from the past to the present.

In order to realise the attainment of this general aim, there are a number of specific objectives which have to be to be fulfilled. Embarking on the relevant theoretical orientation on ethnobotanical theories, principles and concepts, which provide the background to the study of the human-plant relations in Greater Meru region of Kenya, and the selection of the appropriate ethnobotanical research methods and techniques and related analytical model of wild plant use behaviour, adapted for the comprehensive study, analysis and interpretation of qualitative and quantitative data, collected among the respondents of three sample survey villages in the study area, the *specific objectives* can be formulated as follows.

Firstly a general description of the research setting on the basis of the sociography of the Republic of Kenya and the Greater Meru region, sub-divided in Meru North, Meru Central and Meru South districts, encompassing the geography, population, and culture;

Secondly, a botanical collection of wild useful plant specimens of the Meru including drying and preservation for the East African Herbarium of the National Museum of Kenya for further documentation and storage for future research and reference.

Thirdly, the documentation of the life of the Meru people, based on research in three selected villages representing the three above mentioned Meru districts, including their socio-demographic, psycho-social, socio-economic structures and traditional institutions;

Fourthly, an assessment of the evolution of human-plant relations in Kenya, based on relevant so far available information of subsequent periods of time from the past to the present, and encompassing the heritage of the *hominins*, the *modern humans of the Neolithic* and the *pre-contemporary modern humans.*

Fifthly, the presentation of the results of the qualitative study of indigenous Meru knowledge and use of useful wild plants. In addition, the indigenous, rather utilitarian classification of useful wild plants of the Meru will be constructed. The inventorisation and classification of the useful plants of the Meru will be implemented for the structure of the emic study of the various categories of useful plants in the research area.

Sixthly, the documentation of the classification, use and conservation of *medicinal wild plants* of the Meru as the first main category of plants used in traditional medicine, based on their knowledge, use and conservation practices. In addition to the indigenous classification of medicinal plants among the Meru, the related indigenous diseases classification will also be constructed.

Seventhly, the documentation of the classification, use and conservation of *non-medicinal wild plants* of the Meru as the second main category of plants used in the research area, based on Meru knowledge, use and conservation practices. This part of the study will seek to elaborate on the local sub-categories of wild plants use, including food plants, material plants, fuel plants, environmental plants, social plants, non-vertebrate poisons plants and bee plants.

Eighthly, the execution of *a first phase* of the quantitative analysis encompassing the bivariate analysis of data, operationalised in independent, intervening and dependent variables, to be presented in the conventional mode of cross-tabulations in order to measure possible significant associations in the relationships.

Ninthly, the execution of a *second phase* of the analysis of quantitative data, encompassing the multivariate analysis of the same independent, intervening and dependent variables, where interaction is measured between independent and intervening variables *vis a vis* the dependent variables of specific useful wild plant use behaviour. The *first step* of this analysis will be conducted on the interaction of the groups of independent and intervening variables with the two dependent patterns of *medicinal* and *non-medicinal* plant use behaviour. Then, a *second step* of this analysis will seek to provide deeper understanding of the process by measuring the interaction of

independent and intervening variables *separately* on dependent patterns of use behaviour of the non-medicinal plants*, i.e.* food plants, material plants, fuel plants, environmental plants, social plants, non-vertebrate poisons plants and bee plants, as to be collected from the surveys in the three sample villages in Meru.

Finally, multiple regression analysis, aimed at the completion of the analytical model, designed to document, analyse and explain the complicated wild plant use behaviour process by identifying and measuring the interactions among the various categories of factors - or blocks' in the model - and vis a vis the use of medicinal and non-medicinal wild plants among the Meru. This part of the study seeks to provide the interpretation of relationships and interactions among and between independent, intervening and dependent variables of the wild plants use behaviour of the local population. Thereafter, the implications of the study will be identified, and sub-divided into theoretical, methodological and practical implications. Here, the *theoretical implications* of the study will seek to highlight the possible contributions of the study to the development of the interdisciplinary field of ethnobotanical knowledge systems, with particular focus on the diachronic approach needed to reconstruct significant human-plant relations over longer periods of time in specific areas. Similarly, the implications will be presented for the field of study of biocultural conservation in developing countries, where indigenous peoples have shown to play a key role in transitional situations of interaction between global and local knowledge systems. In this context, the contribution of the study in Meru will also seek to focus on the documentation, analysis and integration of indigenous knowledge systems in several sectors of the society.

The *methodological* implications will review the construction, application and testing of the appropriate analytical model, developed at Leiden University by the Leiden Ethnosystems and Development Program (LEAD) which seeks to further understand indigenous systems of wild plant knowledge and practice in this part of the world, specifically as this model is tested in Kenya for the first time (*cf*. Leakey & Slikkerveer 1989; Slikkerveer 1995; Slikkerveer 1999). The *practical implications* encompass the identification of factors which could be addressed in future policy planning and implementation process of the government, related to the management, use and conservation of wild plants in Meru as well as in other parts of Kenya, paying particular attention to development, in this way applying the ethnobotanical knowledge systems approach towards sustainable community development in this part of Sub-Saharan Africa. In order to meet the general aim and specific objectives of this study in Meru, the structure and organisation of this study is as follows:

Chapter I includes the *Introduction*, describing the background to the study in Kenya, East Africa, the wild plant knowledge and use among the Meru, the assessment of human-plant relations since prehistory, and the major role of indigenous plant knowledge systems for sustainable community development.

Chapter II presents the theoretical orientation towards the research, encompassing an overview of the evolution of ethnobotany into today's interdisciplinary field of study, the issues related to the complex reconstruction of (pre-) historical associations, and the recent approaches to human-plant interactions in conjunction with the Leiden 'Ethnobotanical Knowledge Systems' (EKS) approach to the comparative study of human-plant use behaviour.

Chapter III describes the research methods and techniques selected for this particular, emic-oriented study in Meru, followed by the methods of qualitative and quantitative data collection in three sample villages, including the choice of instruments, the identification of local plant experts and the training of research assistants. In this endeavour, tools used for collecting data are discussed as well as the process of acquiring the appropriate research protocol. Similarly the selection of the

key informants and the training of local plants experts on proper plant collecting methods and techniques are indicated. A detailed analysis on how useful wild plants are collected, dried, and conserved is also presented in this chapter. Similarly, the details of the choice on factors or variables relevant to this study are used to construct questionnaires to capture data on useful wild plants of Meru. In this endeavour questionnaires were prepared for same number of respondents interviewed, twenty five from each of the three villages in Meru. The questionnaires' components included the factors relating to socio-demographic, psycho-social, socio-economic, environmental, conservation, intervening and policies which thereafter are used to construct the conceptual model. Furthermore the methods which are made operational in order to document the required information are presented.

Chapter IV presents the description on the sociography of Kenya as a developing Nation which includes geography and climate and the effects of colonial rule before independence. The detailed account of the geography, climate, landscape and natural resources of Greater Meru region, together with the history, culture and distribution of the present population of Meru provides a comprehensive overview of the sociography of the people and culture in the study area.

Chapter V presents the general data collected among the respondents in the three villages of the sample survey in 2003, including socio-demographic, psycho-social and socio-economic factors of the Meru population as reported by the household heads. Data are also presented relating to the Meru indigenous knowledge, belief use and of conservation of wild plants. Also, the institutions which play a major role in governing the lives of the Meru are described in this chapter.

Chapter VI provides an assessment of the overall process of evolution of human-plant relations in Kenya since prehistory, embarking on the early dependence of the hominins of the Palaeolithic on wild plants. Then, the agricultural revolution of modern humans of the Neolithic is reviewed on the basis of the yet rather limited number of recent findings of material evidence of about 10,000 years ago. This chapter shows that information which is bridging the gap between prehistoric and present studies also could pave the way to a better understanding of modern human-plant relations in the area. It concludes with an assessment of the significance of the development of processual models of indigenous management systems of the contemporary Meru people in relation to wild plants in the region.

Chapter VII discusses the various categories of uses of the wild plants collected in Meru in 2002, paying special attention to the medicinal plants as the largest indigenous category of wild plants used by the local population today. The information presented in this chapter is brought together by informants who are local experts on knowledge and practice of wild plants in the study area. This chapter also provides details on the indigenous classification of medicinal plants as well as of diseases and describes the ways of conservation of medicinal plants by the Meru. In relation to wild plant use for medicine, the ways of preparation and application of these medicines are also presented. Furthermore, the chapter explains who the traditional Meru healers, birth attendants and plant experts are, and what specific tasks they performed in the community. At the end of the chapter, the process of integration of traditional and modern medicine in Kenya is also discussed.

Chapter VIII further presents information on Meru knowledge and use of non-medicinal wild plants, similarly collected in Meru in 2002 and 2003. This chapter focuses on the utilitarian sub-categories of useful wild plants, including food plants, material plants, social plants, fuel plants, environmental plants, non-vertebrate poisons plants and bee plants in Meru.

Chapter IX presents the analysis of the quantitative data collected during the household surveys in the three sample survey villages, as reported by 75 household heads in 2003. The major components of this chapter subsequently encompass the Bivariate Analysis, the Multivariate Analysis (OVERALS) and the Multiple Regression Analysis, all pertaining to the completion of the

final Analytical Model of useful wild plant use behaviour of the Meru. The chapter presents the various technical steps followed in order to achieve a succession of complex analyses which result in the final identification of significant variables as determinants of wild plant use behaviour, reported over the 12 preceding months by the respondents. At the end, the chapter presents an interpretation and discussion of results.

Finally, *Chapter X* presents the conclusions and interpretation of the research findings in conjunction with the theoretical, methodological and practical implications as well as the recommendations of the study of indigenous wild plant knowledge, belief and practice among the Meru in Kenya.

II Theoretical Framework

The major purpose of this chapter is to describe the theoretical orientation towards the ethnobotanical study of human-plant relations from the rather dynamic approach of the Ethnobotanical Knowledge Systems (EKS) to human-plant relations among indigenous peoples in developing nations. The *first part* focuses on the development of the advanced study of human-plant relations which has evolved into ethnobotany as an increasingly dynamic and interdisciplinary field of study. It embarks on the achievements of the various inter-related fields which developed from classical ethnobotany to enter the era of ethnoscience of the 1950s. This presaged the emerging significance of the *emic* perspective on indigenous peoples' plant knowledge, belief and practice. Following the assessment of the subsequent applied orientation in ethnoscience of the 1980s, a review is presented of the currently burgeoning interest in indigenous plant use in conjunction with biocultural conservation and sustainable community development.

The *second part* of this chapter is an effort to draw more attention to the reconstruction of prehistorical and historical processes of human-plant relations, making use of the recent method of the 'ethnographic analogy' and its implications for the understanding of long-term relationships between humans and plants. The *third part* highlights the processual approaches to the study of human-plant relations, embarking on Traditional Ecological Knowledge (TEK) as a new field of study of indigenous peoples interacting with and surviving in their environment and its components, including wild plants. This part culminates in the presentation of the above- mentioned dynamic perspective of the comparative approach of 'Ethnobotanical Knowledge Systems' for the purpose of studying and analysing different indigenous systems of knowledge and practice in an interactive configuration of local and global systems in a diachronic perspective. In doing so, the advantages of innovative quantitative ethnobotany is stressed in making an analysis of human-plant use behaviour among different individuals and communities, as this is reported over a longer period of time.

The *last part* is devoted to the actual understanding the decision-making process of human behaviour as it applies to local plant knowledge, belief and practice. The analysis of the decision-making environment is based on the description of the 'Knowledge-Belief-Practice' Complex, which forms the underlying principle of the analytical model, presented in the next chapter. Finally, the conceptualization of traditional plant use behaviour, as it has been adapted to the challenging study and analysis of such complex patterns among the intriguing Meru people living on the north-eastern slopes of Mount Kenya in East Africa, is set out.

2.1 The Advanced Study of Human-Plant Relations

2.1.1 Ethnobotany: Evolution of a Multidisciplinary Field

The study of the relationships between humans and plants as major components of the natural environment initially evolved into ethnobotany as the sub-discipline of ethno-ecology which at present encompasses all studies describing local people’s interaction with the natural environment. Cotton (1998) documents how since its inception more than a century ago the term *ethnobotany* has grown rather difficult to define. John M. Harshberger (1896), a botanist at the University of Pennsylvania, who was working on the use of ancient plants by aboriginal peoples in cliff dwellings in the south-western part of North America, described 'ethnobotany' for the first time as: *‘the study*

of primitive and native peoples' and their plants'. Other scientists conducting similar research at that time referred to it as: *'the study of all forms of vegetation and their use'*. Later, as Cotton (1998) shows, more research of this kind was described differently as the study of: *'traditional impressions of the total environment as revealed through custom and ritual'; 'relationships between humans and their ambient vegetation'; 'the interpretation between 'primitive' humans and plants'; 'direct relationships between humans and plants';* and *'the recording and evaluation of environmental knowledge that different cultures have accumulated throughout millennia'*. According to McClatchey *et al.* (1999), the subsequently emerging fields of *economic botany*, *ethnobotany*, *ethno-ecology* and *ethnobiology* were divided into two interrelated sub-disciplines which represent two levels in the evolution of the discipline. The *first*, older field of 'economic botany' was defined by Hill (1937) as: *'the study of the array of plant usages by people*. These studies are focused on plants, and remain largely descriptive as they seek to contribute to a database of plant usages in different cultures around the globe. Indeed, studies in economic botany generally focus on both traditional and modern uses of plants, and often concentrate either on the use of a single plant or a group of plants throughout a series of cultures, or an array of plant uses from different cultures.

The *second*, more evolved field of 'ethnobotany' encompasses the study of the relations between people and plants, emphasizing the processes of interaction, and is neither plant nor culture specific. Although ethnobotany is built on the basis of data largely provided by studies in economic botany, it has recently developed an interactive orientation towards relevant processes. Publications in ethnobotany as a 'new' theoretical science of human-plant relations are, as McClatchey *et al.* (1999) document, still relatively rare. Examples of these advanced publications include Leakey & Slikkerveer (1991), Phillips *et al.* (1993), Martin (1998); Anderson (1996) and Slikkerveer (2006). In short, economic botany refers to the study and documentation of largely physical data of useful plants, used in the field, while ethnobotany refers to a more comprehensive study, analysis and interpretation of human-plant relations. As will be elaborated below, the 'Ethnobotanical Knowledge Systems' (EKS) approach, developed by the LEAD Programme of Leiden University in The Netherlands has recently introduced a more dynamic and comparative dimension to the field of ethnobotany, combining a *horizontal* and *vertical* comparison between systems of plant use, management and conservation in different cultures.

From its modest beginnings, ethnobotany has gained substantially both in size and importance, and has recently evolved into a multidisciplinary research endeavour transforming it into a dynamic discipline encompassing six major fields of study: botany; ethno-pharmacology; anthropology; ecology; economics; and linguistics (*cf*. Martin 1998). Scholarly publications, books, journals and documentaries are now becoming widely available, and growing support for further research and training in ethnobotany is being provided by international organizations, governmental and non-governmental organizations, universities and academic societies around the world. Recently, ethnobotanists have been increasingly willing to admit that working with peoples of indigenous, non-Western cultures - who make up the vast majority of humanity and have done so in the past - should be accorded a special place in ethnobotanical inquiry. As Minnis (2000) observes: *'this is because the contributions of these peoples have been previously undervalued in academia and industry'*.

Initially, most ethnobotanical studies were conducted in South America, where more botanists became involved in research on indigenous peoples and their plants. Although in the beginning plant collecting remained largely the speciality of explorers, it later aroused the fascination of many scientists. The discipline gained wider recognition in North America through the early studies of Gilmore (1919), Desmore (1928) and Barrows (1931), culminating in the establishment of the *International Society of Ethnobiology* in 1981. Studies on European plants - flourishing since the

Renaissance - also picked up momentum at this time. In this, the greatest contributions were made in the sub-field of ethnopharmacology as the main objective was the scientific' validation of traditional herbal medicines for modern drug development' (*cf.* Chadwick 1994; Balick & Cox 1997; Dutfield 1997; Slikkerveer 2000; 2005; Bogers *et al.* 2006). At the same time, the palaeo-ethnobotanical study of fossilized pollen evolved from the sub-field of palynology, providing a deeper understanding of past environments and their vegetation types (*cf.* Iverson 1941; Dimbleby 1963; Ucko & Dimbleby 1969; Bryant & Holloway 1983; Cotton 1998).

In Africa, recent ethnobotanical studies have focused on indigenous agriculture and horticulture, in which the production and use of coffee and tea as the main East African crops were both paid special attention in studies by Wickens *et al.* (1985); Abbiw (1990); and Homewood & Rogers (1991). More application-oriented, innovative studies of peoples' traditional agricultural knowledge and practice and their implications for future sustainable food production have been conducted in Sierra Leone by Richards (1985) and in Kenya by Leakey & Slikkerveer (1991) and Maundu *et al.* (1999). Palaeo-ethnobotanical studies have been conducted by scientists including Wetterstrom (1991) and Maitima (1995).

2.1.2 The Emic Perspective on Indigenous Plant Knowledge

The classical ethnographic tradition in anthropology, which evolved since the first half of the nineteenth century, produced studies by such scholars as Evans-Pritchard (1934), and Schapera (1940), largely focusing on the non-Western, sometimes even 'exotic' aspects of indigenous people's culture and way of life from an observer's, that is the 'outsider's or the *etic* point of view. Indeed, as Slikkerveer (2006:12) documents, this era paralleled the prolonged period of time during and immediately after the colonial era in which indigenous people's knowledge and practice tended to be ridiculed and ignored as 'primitive', 'native', 'old-fashioned' or even 'magic', *'...pertaining to their marginalisation and in some cases even to their virtual disappearance'*. In the course of the 1950s, however, a growing academic interest emerged in the study of local ideas, taxonomies and classifications from the participant's own, that is the 'insider's or the *emic* point of view.

Then, a group of anthropologists, including Conklin (1957), Goodenough (1956) and Kay (1966), developed a new approach to the study of non-Western peoples and cultures which pertained to the sub-field of 'cognitive anthropology'. Their objective was to study indigenous and traditional communities from the viewpoint of the members *themselves*, encompassing a reassessment of local knowledge, ideas, belief, wisdom, experience and practices in many sectors of the community. Although earlier a few ethnologists such as Franz Boas (1940) and Bronislaw Malinowski (1932) had pointed out the importance of the 'native point of view', the new ethnoscience approach sought to set aside the researcher's own ideas and norms. In the beginning, these cognitive anthropological studies were identified as *ethnoscience* - encompassing such various sub-fields as ethnolinguistics, ethnohistory, ethnomedicine, ethnobiology, ethnobotany and ethno-ecology - as they sought to understand how indigenous communities organize and use their own cultures, and which organizing principles underlie the particular behaviour of its members.

Although initially ethnoscience remained rather formalized in its orientation, later its practicality and potential for more operational development projects and programmes emerged in such special areas as human and animal health, agriculture, and the use and conservation of natural resources, eventually making it essential to local decision-making and planning activities in developing countries (*cf.* Slikkerveer 1999; 2006). Consequently, by the end of the 1970s, an extensive body of knowledge and documentation of substantial data derived from local semantics, folk taxonomies and

indigenous classifications from different cultures and communities from around the globe had been assembled, substantiating the rich cultural heritage of indigenous peoples in developing countries (*cf.* Goodenough 1956; Conklin 1957; Kay 1966; Tyler 1969). Characteristic of the first studies in ethnoscience was their rather theoretical orientation, in which the praxis tended to limp behind. During the 1970s, several social anthropologists and sociologists interested in processes of development and change in 'other' cultures from the inside or emic approach made important contributions to the recognition of the complexity, variety and validity of indigenous knowledge systems in transcultural configurations.

Towards the end of the 1970s, the first breakthrough came in international health care development through the introduction of the Primary Health Care strategy of the integration of traditional medicine into health care coverage. In this, local people's medical knowledge and practice were respected and recognized (WHO/Alma Ata 1978; Slikkerveer 1982; Young 1982; Warren 1982). At the beginning of the 1980s, a 'new' ethnoscience was introduced by Brokensha, Warren and Werner (1980), who presented comprehensive collection of numerous case studies from among different disciplines in their publication on *Indigenous Knowledge Systems and Development*, in which local people's knowledge and skills were shown to possess a greater potentiality for the successful implementation of development programmes than many Western-based interventions. This pioneering study was soon followed by a number of studies by researchers who focused their attention on the relationship between local ideas, perceptions and practices, and imported Western knowledge and technology in various sectors of the developing world, including health care, agriculture, fisheries, forestry and environmental management.

Subsequently, this applied re-orientation towards peoples and their knowledge systems gained solid ground in ethnobotanical studies, concentrating on efforts to integrate traditional farming systems successfully into a new and more environmentally-sound form of agriculture (*cf.* Chambers 1983; Richards 1985; Altieri 1987; Warren, Slikkerveer & Titilola 1989; Richards, Slikkerveer & Phillips 1989; Nabhan 1989; Leakey & Slikkerveer 1991; Warren, Brokensha & Slikkerveer 1995). These studies in agro-ecology highlighted the significance of indigenous knowledge for the optimal use and conservation of the natural and agricultural resources available in the practical setting of less arable environments, appreciating the need to sustain the productive resource base and the environment over longer periods of time. Similarly, other studies in applied-oriented ethnobotany on local use of such forest resources as rattan by Dransfield (1981), palm trees by Johnson (1991), medicinal plants and herbs by Balick (1990), Elisabetsky & Castilhos (1990), Johns (1990) and Cunningham (1997), and other non-timber forest products (NTFP) have been conducted among various indigenous communities around the globe.

One particular group of researchers has been paying special attention to the related significance of indigenous or traditional ecological knowledge - or TEK- to the management and conservation of natural resources in various non-Western regions (*cf.* Johannes 1989; Fairhead 1992; Inglis 1993; Slikkerveer 1999). The relevance of these ethno-ecological studies to the research in Meru is revealed in the predominant position which is devoted to the local peoples' emic view of their relations with their environment, in which plants and herbs, some of its most significant components, play a major role in local people's plant use and conservation behaviour. The particular significance of traditional ecological knowledge to the present study, representing the combination of biophysical and socio-cultural factors which determine the participant's decision-making environment will be elaborated in Paragraph 2.3.1. Apart from the theoretical considerations of the newly-developing field of 'Indigenous Knowledge Systems and Development' (IKS&D) in terms of the establishment of a comprehensive body of applicable indigenous knowledge and practice, the development of a specific research methodology which is needed to study, analyse and compare

several systems of indigenous local and regional knowledge and technology from the above-mentioned *emic* point of view has been confronted with several complicated problems. Given the practical value of universally applicable principles derived from the accumulating number of case studies and network information systems, a special research methodology to study the complex emic point of view has been developed at Leiden University, specifically as the 'Participant's View' (PV) as a major component of the so-called 'Ethnosystems Approach' (*cf.* Slikkerveer 1995; 1999). In view of its direct relevance to the present study in Meru, this important method is described in greater detail in Chapter III in the context of the specific research methodology chosen as that most appropriate to the study of indigenous plant knowledge and practice in the research area.

2.1.3 Plant Use, Conservation and Community Development

Alerted by such landmark publications as those by Wilson (1988) on the *Diversity of Life* and by Leakey & Lewin (1995), worldwide concern has been growing about the growing threat of loss of the Earth's biodiversity. An increasing body of books, journals and articles has appeared, followed by international policy agendas, conventions and declarations, all sharing anxiety about the unavoidable biodiversity crisis. As a consequence, an urgent call for a concerted effort has been made at an international level in order to try to stem the accelerating process of loss of genes, species and ecosystems around the globe, for which the UN Conference on *Environment and Development* in Rio de Janeiro (UNCED 1992) marked the beginning of a series of conventions and declarations, aimed to launch various efforts and initiatives to stop the ongoing loss of genes, species and ecosystems on a world-wide scale (*cf.* IUCN/UNEP/WWF 1991; CBD 1992; WRI/IUCN/UNEP 1992; Heywood/UNEP 1995; WWF 1998). These declarations linked up with the exocentric perspective on conservation of the late 1980s, in which the negative impacts of human activities on the environment and its biodiverse components are regarded as the main cause of the biodiversity crisis. As Agung (2005: 42) rightly notes: *'the proponents of this view on a 'human-made crisis' supported the conservation strategy of a 'human hands-off' position, popular among conservation biologists of that era'.*

In the wake of this concern, a different, largely *anthropocentric* perspective emerged at the same time, drawing attention to the necessity to integrate human values, needs and activities into conservation strategies. A number of these studies, such as those by Harris (1984); Altieri & Merrick (1987); Alcorn (1991; 1994); Gonzalez-Bernaldez (1991); and Toledo, Ortiz & Medellin-Morales (1994) documented that some human interventions have been shown either to increase biodiversity by intensifying habitat heterogeneity, reducing dominant species and diminishing invading new species in certain areas, or to introduce models of low intensity mosaic usages of natural resources and ecosystems. These studies were founded on the premise of the close relationship between nature and culture, making the active involvement of indigenous peoples in grass-roots strategies of community-based conservation highly significant.

The growing recognition of the close relationship between biodiversity and cultural diversity reflected in indigenous people's extensive knowledge of the appropriate management of animals and plants was initially expressed in the *Global Biodiversity Strategy* (CBS) (WRI/IUCN/UNEP 1992), devised to substantiate what the late Darrell Posey (1999) called the 'inextricable link' between biological and cultural diversity, a *strategy* which aims to strengthen the sustainable management and conservation of animals and plants, and more specifically to deepen humankind's collective knowledge, perceptions and practices encapsulated in the concept of 'biocultural diversity' (*cf.* Slikkerveer 1995; 1999). Likewise, a similar solicitude has been emerging among anthropologists

and ethnoscientists anxious about the imminent loss of these closely related forms of cultural diversity, seen in their eyes in the rapidly disappearing local and regional systems of indigenous knowledge, belief and practice of specific groups and communities around the globe. These concerns have given a major impetus to the documentation and understanding of Indigenous Knowledge Systems (IKS), particularly with regard to the living species, ecosystems and genes, rooted in the traditional ecological knowledge of indigenous peoples and communities.

These studies do far more than just highlight the contribution which traditional communities have made to the sustainable use, conservation and management of natural resources - also referred to as *indigenous management systems* - they have also demonstrated the empirical value of the new ethnoscientific perspective of practical problem-solving activities in development programmes. Indeed, the contribution of such indigenous knowledge systems to socio-economic development in such sectors as human and animal health, agriculture, environment and conservation has led to a change in the previous, rather obsolete development paradigm of 'Transfer-of-Technology' (TOT) to more appropriate strategies of 'Farmer First' (FF), 'Participatory Technology Development' (PTD) and 'Endogenous Development' (ED), which were launched on the more participatory principles of 'development-from-the-bottom' *(cf.* Chambers, Pacey & Thrupp 1989; Haverkort *et al*. 1991; Warren *et al.* 1995; and Haverkort *et al.* 2003).

Recently, following the World Conference on Science, organized by UNESCO and the International Council for Science (ICSU) in Budapest in 1999, two principal documents - the 'Declaration on Science and the Use of Scientific Knowledge' and the 'Science Agenda Framework for Action' - are now explicating the valuable contribution of: *'...traditional and local knowledge systems as dynamic expressions of perceiving and understanding the world'*, and are also stressing the need: *...to preserve, protect, research and promote this cultural heritage and empirical knowledge'.* In May 2000, at its 5th meeting in Nairobi, Kenya, the previous 'Conference of Parties' (COP-5) to the *Convention on Biological Diversity* (CBD) adopted a formal decision implementing Article 8(j) which reinforces the position of the knowledge, innovations and practices of indigenous and local communities as factors relevant to the conservation and sustainable use of biological diversity, substantiating growing international attention paid to the close relationships between humans and their natural environment. As will be elaborated in Paragraph 2.3.1, this *biocultural systems approach* to conservation has definitely substantiated the urgent need of the study and integration of TEK into more participatory-oriented strategies of conservation, and it has also fuelled the international debate on the indigenous conservation ethic among traditional communities.

The active involvement of human needs and values in conservation is linked up with the changing views on the value to and potential of indigenous peoples and their knowledge systems for sustainable community development, formalized into new strategies of 'sustainable development'. Although it took some time before the concept of 'sustainable development' was introduced into development circles by Brundlandt (1987) as: *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*, the principle of management systems which combine the sustainable use, management and conservation of resources experience built up by numerous indigenous communities over many centuries had already been described by many anthropologists and ethnoscientists since the emergence of ethnoscience in the course of the 1950s. Basically, these traditional forms of human interaction with the environment refer to the successful use and conservation of resources to satisfy changing human needs, while maintaining and conserving the resources and the environment (*cf.* Altieri 1993; Slikkerveer 1994; 2001; Warren *et al.*; 1995; Posey 1999; and Toledo 1997).

Although these authors do recognize the usefulness of the concept of 'sustainability' as a largely technical strategy to design more environmentally sound programmes, it remains, as Agung (2005:

77) notes: *'...for them a rather limited strategy incapable to implement a more holistic, endogenous development process 'from below'.* As a consequence, these researchers have proposed a broader, more integrative approach to enable them to focus on sustainable community development as an indigenous mechanism to enable local peoples to manage and control the processes which affect communities in relation to their environment. In such an extended conceptualization - as represented by Toledo (2001) - sustainable community development encompasses six different types of processes which are based on the application of nine philosophical principles. The implication of this community-oriented paradigm is rooted in its focus on local self-reliance and local empowerment, for the purpose of taking control of the use, management and conservation of resources, and therefore extremely valuable to community-based conservation.

In ethnobotany, three recent orientations have been involved in programmes related to sustainable community development. In the first predominant orientation, attention in the sub-field of economic botany is paid to the 'discovery' of indigenous plants and crops which have a commercial value for the development of new natural products and drugs in the developed countries. Related projects focus largely on the analysis of useful medicinal and toxic plants with the objective of developing new medicines for the well-being of humanity. Apart from the so far only partially resolved problems related to the issue of Intellectual Property Rights (IPRs) of the local communities involved, the participation of traditional healers and birth attendants in the so-called 'ethno directed approaches' to drug development has been rather successful (*cf.* Evans Schultes & Raffauf 1990).

In the second orientation, the major approach in ethnobotanical research is to apply its results to local conservation and development. These studies are focused mainly on the return of research results to the host communities, strengthening traditional farming and agro-forestry systems in their relationship to modern agricultural systems (*cf.* Altieri 1987; Slikkerveer & Leakey 1991; Slikkerveer 2000). In this context, Martin (1998) provides a useful description of related community projects in which ethnobotanical research results are applied to conservation and sustainable development in such areas as agro-forestry and agro-ecosystems, conservation of endangered useful plants, education and protected areas.

The third orientation involves the advanced study and analysis of Medicinal, Aromatic and Cosmetic (MAC) plants using the Leiden 'Ethnobotanical Knowledge Systems' (EKS) approach, beginning with four interrelated perspectives: 1) for local health-care improvement in pluralistic health-care configurations; 2) for conservation of biodiversity in terms of species, genes and ecosystems; 3) for the preservation of related cultural diversity: local and global plant knowledge, belief and practices; 4) for recognition of Intellectual Property Rights (IPRs) of local peoples and communities by equal benefit sharing of new drugs and medicines (*cf.* Posey 1996; Cotton 1998; Slikkerveer 2006).

The third orientation in particular unequivocally provides the major theoretical framework for and also adduces the methodological considerations required to realize the general aim of the present study as it seeks to conduct research on wild plant knowledge and practice in Meru, implementing a complementary qualitative and quantitative analytical model, presented in the next chapter. Pertinently, the attempt at the reconstruction of the pre-historic associations clearly underlines the significance of human-plant relations in the past, and simultaneously provides a link to the understanding of the evolution of such relations in history and prehistory as well as in contemporary times, providing a basis for future sustainable use and development of indigenous wild plants in the study area.

2.2 The Reconstruction of (Pre-)Historical Associations

2.2.1 Palaeo-ethnobotany: The Evidence from Prehistory

As indicated in the *Introduction*, the overall goal of the study in Meru is to integrate various approaches in an endeavour to understand the dynamic human-plant relations in the research area over a longer period of time, using different methods to arrive at a much more meaningful understanding of the process than could be achieved only on the basis of utilitarian ethnobotanical evidence. Therefore, the first step is to find an answer to the question of what actually constitutes the human status within the process of human-plant relations. Basically, humans are just another primate, but nevertheless, humans also differ from other primates in many respects: in their bipedalism; a large brain; and language and a cultural way of life, also referred to as the *basic attributes of humanness* (*cf*. Leakey & Lewin 1992; Leakey 1994; McKee, Poirier & McGraw 2004).

Following recent taxonomic definitions, the study of prehistoric human-plant relations has been confined to an assessment of the role in the process of humans belonging to the family of *Hominidae*, a taxon traditionally restricted to modern humans and their non-ape fossil ancestors; the apes belonging to the related taxa of *Hylobatidae.* While *'hominid evolution'* was used to refer to the lineages leading to modern humans and their evolutionary cousins, recently a lower-level designation has been introduced to categorize the living and fossil higher primates. Consequently, the term *Homininae* is now used to designate chimpanzees, gorillas and humans with the orangutans in the *Ponginae,* and as such the term *Hominini* as a taxonomic designation has been recently introduced to isolate humans and their fossil ancestors (*cf*. McKee, Poirier & McGraw 2004) (2)

Since the oldest *Homo sapiens* appeared in Africa by about 130,000 BP, the sub-species of modern humans first evolved in Africa. Remarkably, after their discovery by Richard Leakey back in 1967, the fossils of the 'Man from Kibish River', the few bone fragments remained in Addis Ababa for more than thirty years before they proved to be crucial to a fundamental rethinking of the evolution of modern humans. As Stringer & McKie (1996:1) observe: *This reappraisal has since formed part of an entirely new hypothesis, developed in the last fifteen years about the origin of modern humans'.* (*cf*. Figure 2.1). Therefore, in the study in Meru, prehistoric human-plant relations in a strict sense refer to *Homo sapiens sapiens* - a sub-species to which present-day humans belong. This sub-species inhabited a large part of the world by 40,000 years ago in the geological period of time of the Upper Palaeolithic. Then, about 10,000 years ago, the world's temperature began to rise as the last Ice Age ended, making climatic change a key factor in the change in life-style from hunting/gathering to the first forms of agriculture. The important transformation of modern human foragers into the first farmers brought the availability of a steady food supply, and a rise in population. Subsequently people began to settle and to live in sedentary communities. Within a relatively short period of time, humans had commenced manipulating plants and animals in several areas of the world.

The palaeobotanical research conducted throughout the twentieth century on the both prehistoric and historical relationships between people and plants has provided ample information on the evolution and consequences of use of plants by humans and their immediate ancestors, often in association with many aspects of prehistoric life. This research has been carried out predominantly on the basis of material evidence of micro and macro remains of plants, woods, tools, utensils, secondary dietary evidence and related interpretations of changes in modes of subsistence in the environment. In addition to the analysis of such micro-plant remains as pollen, spores and

phytolites, the examination of macro-plant remains, including woods, seeds and - rather rarely - such soft tissues as leaves, roots and flowers, has been shown to be conducive to the reconstruction of prehistoric human-plant relations and as an indication of related changes in ecosystems and vegetation in a number of study areas.

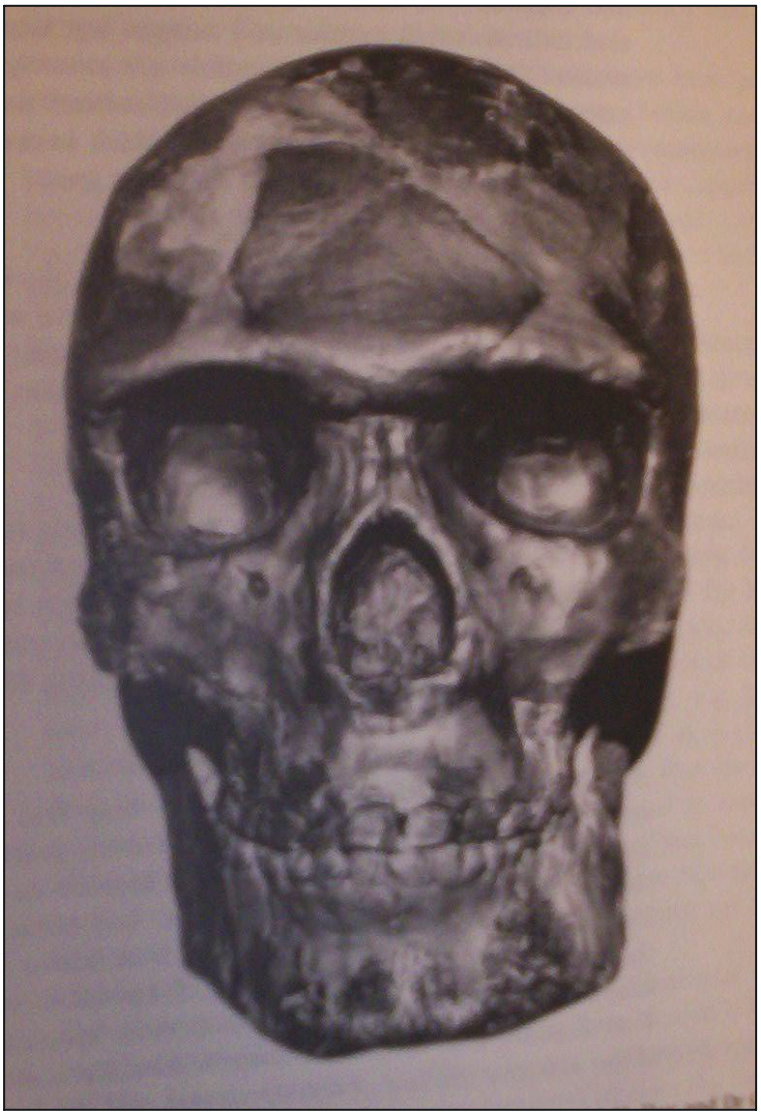


Figure 2.1 The famous fossil skull 'Omo I', the earliest fossil evidence of anatomically modern humans in Africa, named the 'Pathfinder', was discovered by Richard Leakey in the Omo-Kibish Valley in 1967. (*Source:* Stringer & McKie 1996).

The prehistoric relationships between humans and plants have largely been documented on the basis of a variety of palaeo-ethnobotanical evidence, including both material from preserved plants and artefacts and phytogeographical, genetic and linguistic data. Plant fossils recovered in early archaeological sites have been preserved either in a pre-mineralized form or as compressions or impressions, and both provide information on the evolution of plants. The direct palaeobotanical

evidence from early fossil plants has been particularly useful in discovering the internal structure of early plant species. Such fossils have been discovered in the form of leaves, roots, flowers, fruits, wood, pollen, grass cuticles and phytoliths, and have been used to reconstruct past prehistoric changes in vegetation. The fossil plants once played a significant role in the survival and evolution of such human ancestors in Africa as the *Australopithecines, Homo erectus/ergaster* and *Homo habilis*. The relatively 'younger', not fossilized but mostly carbonized or charred remains of seeds found at locations in Africa and on other continents have provided extremely interesting information on the use of plants, albeit they may also have been the result of natural or artificial fires or sometimes from burning animal dung for fuel. More recent macro-plant remains recovered from archaeological sites - still rather rare in the archaeological record - generally occur in charred, desiccated or waterlogged forms (*cf.* Purseglove 1976; Harlan *et al.* 1976). These remains open the way to an interpretation of early ways of human life, and they also provide significant information about the progenitors of present-day plants for food.

Looking at other direct evidence from prehistory, artefacts have also been shown to be very useful in the reconstruction of human-plant relations in various areas around the globe. The use-wear patterns of tool surfaces can provide insights into early plant processing, and these can be refined in microscopic analysis of wear polishes. Similarly, analysis of the surface of grinding stones and mortars can produce more detailed information on the use and processing of plants and roots. These studies reveal that careful analyses of use-wear patterns of tool surfaces can provide insights into the development of plant food processing, while micro-wear patterns, direction of striations, the nature and extent of edge damage, have shown that these tools have also been used for cutting soft plant tissues, as well as the scraping and sawing of wood. Similarly, tools can prove that plants were processed at specific sites, where on rare occasions residues of the plant species concerned can be identified (*cf*. Keeley 1980; Keeley & Toth 1981; Renfrew & Bahn 1993). Apart from their being rather rarely retrieved, such well-preserved macro-plant remains as seeds and wood fragments present yet another problem as their accurate interpretation in the archaeological context still continues to be tricky.

Cotton (1998) argues that the nature of the specific archaeological context in which preserved tissue is found, may also provide valuable information about plant use, in which the ecological behaviour of modern plant populations may provide useful models for the interpretation of the fossil evidence. Complementary to the direct evidence from macro-plant materials and tools, human remains have also been shown to provide indirect evidence of the past relations between humans and their ancestors and plants, including skeletal remains, teeth, stomach contents and faecal matter (coprolites). Relevant chemical analysis of skeletal remains has provided insights into early human diet, in which micro-wear patterns on tooth surfaces provides information on dietary composition and plant food processing. Human teeth generally survive in very good condition, and microscopic examination of the abrasions on dental surfaces indicates whether the food intake was meat or vegetable. Sometimes, tooth decay may also provide dietary information (*cf*. Brothwell 1969; Lewin 1993; Renfrew & Bahn 1993).

The examination of faecal matter - known as coprolite analysis - is now yielding deeper insights into dietary composition and food processing, and by extension into the early use of medicinal plants. Recent research has been done on *coprolites* to determine the composition prehistoric diets, and this has provided insights into the types of foods eaten. Plants used in prehistoric diets have also been identified from the chemical make-up of fossil bones, which reveal levels of such nutrients as iron, calcium, magnesium, lead, zinc, copper and strontium. These can be used as indicators of the relative proportion of animal and vegetable foods consumed, as higher proportions of strontium reflect high levels of plant foods. Carbon isotope analysis has also been used to establish the

presence of certain cultigens in the diet, and analysis of microwear patterns using scanning electron microscopy has revealed the nature of plant foods and the level of processing used. Recovery and identification of phytoliths from tooth surfaces may also indicate the nature of plant foods used (Rose *et al.* 1984; Goodman *et al.* 1984; Eaton *et al.* 1988; Bryant 1993, 1994; Cotton 1998; Cerling *et al.* 1997 & 2003). A more contextual approach to the archaeological interpretation of early human use of resources has been presented, encompassing two methods*: site catchments analysis* (SCA) and *site exploitation territory* (SET). On the basis of the assumption that humans can bring such varied material as foodstuffs, tools, fuel and other raw materials into their sites, site catchments analysis attempts to compile a full inventory of the contents of the location and its resources. The site exploitation territory examines the wider area immediately surrounding the site which may have been exploited by the occupants of the location (*cf*. Lewin 1993).

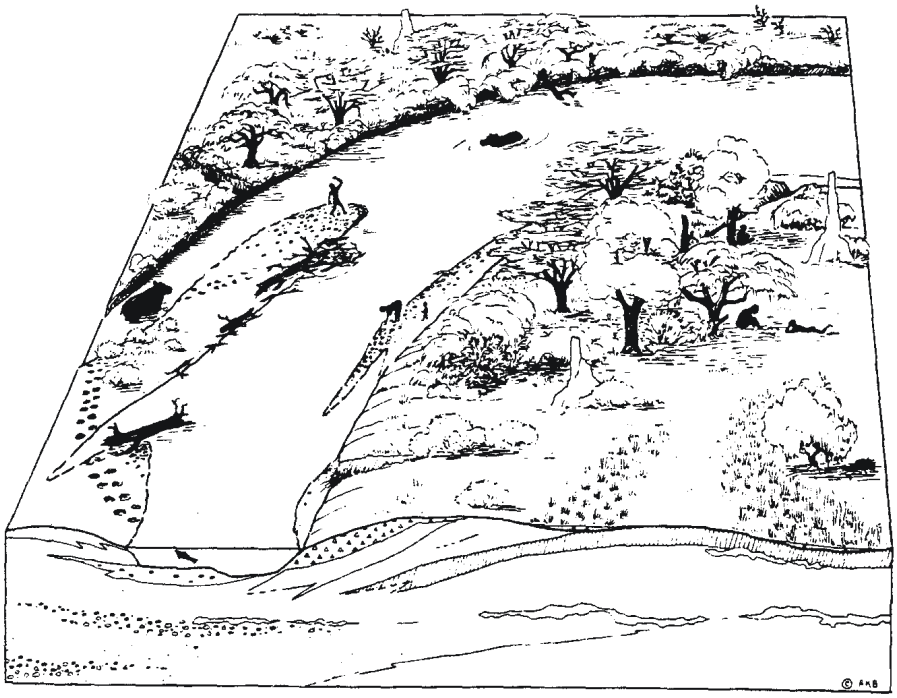


Figure 2.2 Reconstruction of the 'Site 50', east of Lake Turkana, showing a camp site near a river used about 1.5 million years ago by a *Homo erectus* group. (*Source:* Lewin (1993).

In line with such environmentally-oriented approaches to the study of early human exploitation of the environment in prehistory, during the mid-1970s Isaac (1978) introduced his 'food sharing hypothesis' into the debate on behavioural adaptation of the early genus *Homo* about 2.5 million years ago. This paradigmatic shift from the hunter/gatherer way of life to co-operation in the sharing of meat and plant food resources introduced the social aspect of these early sites. It showed early behaviour patterns in the roles of males bringing back their hunted or scavenged animals and females carrying back plants for food. The reconstruction of these early site-specific assemblages of numerous bone fragments and stone artefacts shows the site dynamics of many factors influencing what may have been brought to and may have been removed from the localities, including stone tools whose edges have revealed microscopic patterns of their use for cutting not only meat, but also soft plant and wood materials (*cf.* Figure 2.2).

Palaeo-ethnobotanical evidence from early art history, preserved in rock paintings and engravings which have been found on rocks, walls and ceilings of caves, are relatively rare in Africa and elsewhere, although fruits, nut, seeds, tubers and other plant parts have been important in human diet. As Mary Leakey (1983: 123) documents, *'Only stylized palm and candelabra trees are represented and we believe that they are both borassus (Borassus flabellifer) and wild date (Phoenix reclinata) palms'* (*cf.* Figure 2.3). Cave art has definitely substantiated the role of prehistoric art as a means of representing significant information about prehistoric life in general. Early plant use has also been determined from plant motifs identified from various sources including pictures on 2,000-year-old Peruvian textiles and decorations on Egyptian and Hellenic ceramics, which are often also specifically shaped in form of specific plant parts. Symbolic representations of plants and trees in art have also proved to be very informative as they tend to portray major aspects of human-plant relations. As time passed from the pre-historical to the historical period, the palaeo-ethnobotanical evidence from art developed apace, and information became more direct and detailed.

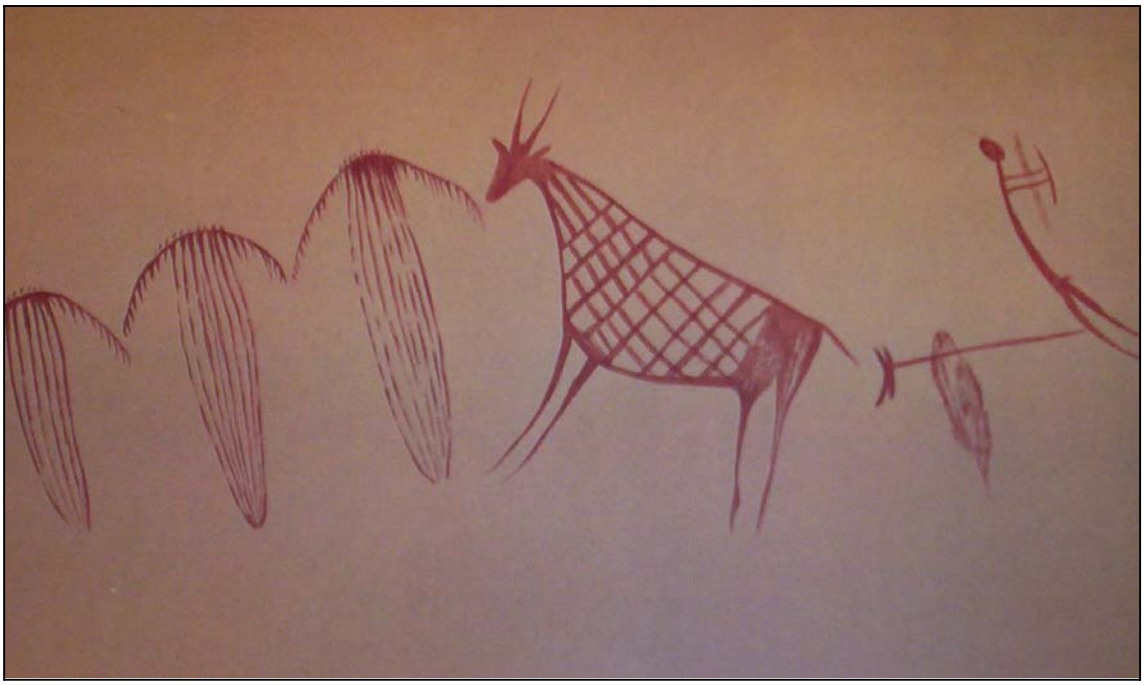


Figure 2.3 Cave painting from the Chora I site of the Chora Valley in Tanzania, probably representing three stylized wild date palm trees shown in silhouette with dead fronds hanging down over the upper part of the trunk.
(*Source*: M. Leakey 1978).

In addition to the early forms of art, in areas where archaeology and other sciences have failed, language has provided linguistic evidence to assist in understanding early human-plant relations (Greenberg 1964; Ehret 1974b, 1979, 1980a; Krzyzaniak 1978). For this reason, it may be used to try to fill the gaps in prehistory. The terms used for certain food plants which can be traced through the history of the peoples of Africa to as early as 7,000 BC have revealed that the domestication of wild plants may have commenced earlier than some archaeologists had supposed. Combined evidence from plant and animal domestication and the growth of certain food crops which still exist today has also been gathered. Linguistic evidence from the Horn of Africa and the Niger Congo, for

instance, dating back to 7,000 BC, indicate that certain food crops were grown by the Omotic people in Ethiopia, and verbs which refer to such animals as sheep and goats have been recorded as being similar to the words used today. Among the Niger- Congo people of Western Africa, similar terms for sorghum are widespread. Westermann (1927) cites the terms *-gin* and *-li* as ancient suffixes which are in use even today. These terms used for such steps in land preparation as digging or cultivation can be traced back to early times. For example, the Bantu name from the Proto-Niger-Congo root (8,000 BP) is *-lim*, and in Fulani *-rim* (Greenberg 1964). Such words are still found among the living Bantu languages even today. Here the notion of clearances of natural plant resources begins to come into the picture as land is cleared to grow sorghum and yams, and possibly to keep sheep and goats at the same time (*cf.* Greenberg 1964).

Evidence from the Nilo-Saharan farmers shows that the peoples of the Sudan, who may have lived there around 5,000 BC, used verbs which can be employed to reconstruct the local vocabulary for both cultivation and grains (Ehret 1974b). Some of the verbs used for 'to weed', 'to cultivate' and 'to milk' are still today in use. The Kadero Site in the Sudan, dating to 4,000 BC, has yielded bones of cattle, sheep, goats as well as sorghum and (bulrush) millet seed impressions, meaning that, in addition to being pastoralists, early humans had already started producing food (Krzyzaniak 1978). Food production therefore may have begun as early as 3,000 BC, and, although some form of cultivation may have been practised earlier by the Omotic people of Southern Ethiopia, no linguistic evidence is so far available to confirm this hypothesis. The agricultural systems involved had a livestock component of some sort with goats, sheep and cows being kept, revealing a period of development towards food production and less dependence on the hunting and gathering life-style.

Although the study in Meru is confined to the knowledge and use of wild plants, the theoretical orientation on the study of human-plant relations is also built on the rich body of knowledge accumulated on the transition from food gathering to farming - known as the 'Agricultural Revolution'. While this type of information is not directly relevant to the actual subject matter, it provides a major background to a deeper understanding of the human-plant relations in this significant part of East Africa. In this context, it is interesting to note that the linguistic evidence of the farther spread of food production points to agriculture in many parts of Western Equatorial Africa by 3,000-500 BC, the same time in which the sphere of Bantu languages were expanding (*cf.* Ehret 1972, 1973, 1974a; Meussen 1956). Some Bantu words for such artefacts as the clay pot – *cangu* - can still be traced to present-day languages, including Meru (*kongu/kangu*). The term - *rungu*, used to refer to a gourd or the creeping plant which produces the gourd, is still used today by some Meru (*Bantu*) communities. By 3,000 BC, agriculture had already been introduced into East Africa by the Southern Cushites from the north, and this linguistic evidence has also been supported by the archaeological records (*cf*. Ehret 1974b; Clark & Brandt 1984).

The last stages in the spread of food production during this period of time show that immigration into most East and Central African countries took place by between 500 BC and AD 500, at which time the Bantu settlements in the Kenyan Highlands were founded (*cf.* Ehret 1980, 1981b). By the First Millennium AD, food crops including sorghum, bulrush millet and finger millet were introduced into the wetter areas, where the full adoption of cattle-raising by the Bantu-speaking communities took place (*cf*. Ehret 1974, 1980a). As Cotton (1998) notes, the palaeobotanical data from chemical, botanical, ethnographic or other sources have been used to develop various hypotheses to deepen the insight into past relationships between plants and humans. He argues that the study of plant evolution and the development of modern humans, based largely on pollen analysis and the examination of dentition, confirm that ancestral hominids remained essentially vegetarian until the emergence of *Homo erectus*/*ergaster*. Although plant materials appear only sporadically in the fossil record, direct and indirect evidence of plant use underscore the importance

of plants in the development of the material culture of modern humans (*cf.* Rudgely 1993). In a concerted endeavour, archaeologists, anthropologists, art historians, linguists and palaeo-ethnobotanists are currently engaged in completing the jigsaw puzzle of plants which have played such a major role in human evolution from prehistory up to the present. This relationship has prompted Rindos (1993) to suppose a co-evolutionary relationship between humans and plants which would have evolved during the human interaction with wild vegetation in and around the camps of hunter-gatherers, soon followed by the process of domestication.

The combination of the various forms of palaeo-ethnobotanical evidence is contributing to the current view that the variety of indigenous African crops - yams, African rice, sorghum, bulrush millet, finger millet, *fonio*, peanuts, *teff*, *ensete* and *noog* - were grown near the areas where they were first domesticated, and that sorghum and millet were established as staples throughout the continent. As Klein (1993) documents, cultivation appears to have spread rather slowly southwards from North Africa, partly because of the long process of the domestication of indigenous plants. Since the principal crops of the North African farmers - barley and wheat - could not be grown in tropical Africa, with the exception of the isolated highland areas, a wide variety of indigenous Sub-Saharan food plants were domesticated, including the tremendously important sorghum and millet. Although the documentation of the process of domestication is a difficult undertaking since there are yet very few identifiable plant remains retrieved from archaeological sites - the oldest date for a variety of millet is 1,200 BC, and a progenitor of finger millet, *Eleusine indica Africana*, dating back to between 6,670 and 5,500 BC, was retrieved from the archaeological site Gogo Falls, east of Lake Victoria (*cf.* Slikkerveer & Lange 1991).

In Kenya , the diachronic comparative approach to the study of early food production in East Africa by Leakey & Slikkerveer (1991) is the most appropriate starting point for research in Meru as it substantiates the valuable orientation of the 'Ethnobotanical Knowledge Systems approach', focusing in the case of the pre-historic material component on retrieving Neolithic human-related macro-plant remains from archaeological sites, preferably within the same culture area under study for modern associations (*cf.* Paragraph 2.3.2). The still rare findings of fossil macro plants in the study area of Meru indicate that the introduction of such direct material components into this part of the study is as yet impossible.

2.2.2 Historical Ethnobotany: Oral and Written Records

Towards the later end of the Second Millennium, East Africa was blessed with a great diversity of food crops, richness largely attributable to the early domestication of a range of such indigenous African crops as yams, African rice, sorghum, bulrush millet, *teff*, finger millet, *fonio*, peanuts, *ensete* and *noog*. After European contact, the indigenous food crops were diversified with some other food crops introduced from Europe, Asia and the Americas; among them wet rice, potatoes, maize, beans, peas and wheat. Later, these newly-introduced food plants and crops were assimilated into East Africa's current diet which is largely deficient in essential nutrients. In addition to the continuation of collection, preparation and use of wild plants after the processes of cultivation and domestication of food plants which had begun during the Neolithic, the subsequent spread of civilizations and literate societies produced an abundance of evidence for the domestication of plants, as well as for farming practices, cookery and other aspects of diet. Historical ethnobotany focuses on the study of such pre-contemporary evidence, laid down in oral and written documents and art. In such early literate societies as the great civilizations of Meso-America, China, Egypt and the Near East, historical records have been found in the form of clay writing tablets, stone

inscriptions and papyrus rolls. The use of such historical records in combination with material remains has yielded an enormous amount of information about early human societies and the inhabitants' way of life. In non-literate societies in particular, valuable information about the recent past is encapsulated in the oral tradition, a treasure-trove of poems, hymns, sayings, proverbs, legends, myths and expressions handed down by word of mouth over many generations. These traditions have been a major source of ethnobotanical evidence. Similarly, as Alcorn (1989) notes, oral tradition has shown itself to be a crucial element in the transfer of Traditional Ecological Knowledge (TEK) over generations, as it disseminates specific knowledge and wisdom pertaining to plant use and conservation, often encoded within ceremonial activities marking the various stages of food plant use and management. The ethnographic record of evidence from extant human societies has revealed that the study of ethnohistory and ethno-archaeology as a means to document people's own representation of their past has provided useful information for the field of palaeo-ethnobotany. For any extant group, this evidence can be discovered in their oral history; the oral equivalent of the archives of those cultures which are intrinsically literate.

Cotton (1998) argues that this could be achieved through myths and legends, which appear to be correlated with well-known historical events. Especially in their perception of the past, it is valid to take local views, in which a distinction between the recent and distant past is drawn, into consideration (*cf.* Layton 1998). Where such factors have been considered, collaborative research between archaeologists and local peoples has already proved successful, as is illustrated by a project carried out in the region of *Mitongoa* in Madagascar. Here, local *Belsileo* peoples showed knowledge of local sites of archaeological interest which were previously known to Western archaeologists. Pertinently, many local names for these sites provide useful insights into the functional and symbolic significance of both the sites and their preserved artefacts (*cf.* Raharijaona 1989).

As will be documented in more detail on the basis of the qualitative survey, local oral records enshrining the clearing of vast pieces of land during the colonial era have also been encountered in the study area of Meru. This was the prelude to the large-scale introduction of new food crops. These traditions are invaluable in providing detailed information about the deforestation and destruction of the rain catchments areas, and they also recount the loss of many important indigenous plants and the related knowledge which the local people had accumulated over many generations. Although linguistic evidence is incomplete in itself for the provision of a complete reconstruction of historical associations between humans and plants - particularly in the last two centuries -, the current study of living populations as its major objective can be expected to extrapolate such associations to the present successfully. But before taking this step, it is important to tackle the challenge thrown down by the method of the ethnographic analogy which seeks to provide additional information for the understanding of human-plant relations in Meru.

2.2.3 The Challenge of the 'Ethnographic Analogy'

In their endeavours to strengthen the interpretation of prehistoric artefacts, tools, utensils, buildings and structures, ethno-archaeologists have developed an interesting approach by making a comparative study of past and present-day phenomena. Although early twentieth-century archaeologists often turned to research carried out by ethnographers on existing cultures for inspiration, the field of ethno-archaeology has only fully developed as an autonomous study over the past four decades. Among its pioneering efforts is the work of Binford (1969; 1977) on the Mousterian archaeological sites in France dating back to between 100,000 and 40,000 years ago,

during which the realization dawned on him that only by studying how modern hunter/gatherers used their bone and stone tools could he begin to understand the Mousterian archaeological record. His work among the Nunamiut Eskimos, a hunter/gatherer group in Alaska, provided him with new insights into the knowledge and production modes of bone tools, comparable with similar prehistoric remains in France

Another well-known example of this type of research implementing the method of the 'ethnographic analogy' has been provided by Lee (1979), using modern hunter/gatherers to model early human behaviour in Sub-Saharan Africa, including obtaining food. Lee spent long periods of time living in the Kalahari Desert among the present-day !San people, observing and recording their particular way of life. He studied the basic tools of the !San, including some unworked stones for cracking nuts and digging sticks, similar to those retrieved from archaeological sites. He also found the !San's most important carrying device - *kaross* - a drape with a pocket used to transport foods such as nuts, berries and roots, which provide the bulk of their diet. This had most probably been developed by earlier populations because of its incontrovertible utilitarian value. The current food patterns of the !San, in which plant foods provide the bulk of the diet, obtaining meat is a riskier undertaking with less predictable success, are an indication of the comparable dietary patterns of prehistoric peoples in the area.

Besides being a source of information on the use of tools and utensils, dietary patterns and the formation of living sites, present-day foragers have also helped to understand social behaviour and organization as well as migration patterns of prehistoric populations in the area. An example is provided by Lee's (1978) studies of the !San social behaviour and organization including their choice of living sites, which gave a clearer idea of living-floor patterns at long-deserted camp sites. Despite its undoubted promise, the method of 'Ethnographic Analogy' has so far scarcely been adapted and applied to deepening the understanding of human-plant relations covering the time span from prehistory through the pre-contemporary period of time to the present. In their classical study of the causes and consequences of food production in Africa, Clark and Brands (1984) note that Africa represents one of the most important 'laboratories' for investigating the processes of change in life-styles leading to food production in the past. They point out the importance of traditional forms of use of plants and crops which still persist on the continent and, as such, can be used to compare and contrast the growing evidence of such traditional systems provided by the archaeological record.

In her study on early African agriculture, Howell (1984) reiterates the significance of demographic data in the understanding of the transition from hunter/gatherers to settled agriculture in prehistory - known as the 'Agricultural Revolution' - a point at which archaeologists are faced with the dilemma that detailed data on mortality, fertility, migration and boundary maintenance are lacking. Howell (1984) shares the view that the ethnographic analogy allows an opportunity to pose questions on a wide range of issues by focusing attention on functioning contemporary communities with some of the characteristics of prehistoric peoples. However, after describing such contemporary groups in the area, problems of interpretation of the evidence from archaeological sites still have to be resolved. Howell (1984: 357) pleads for the study of not just one, but: *'...ideally a random sample but more realistically a selection of convenient groups that encompass geographical, climatic and economic variation.*' . Meanwhile, a debate emerged in the late 1960s concerning the nature and limits of ethnographic analogy for analysing prehistoric human behaviour, in which unquestionably the drawing of direct analogies of social organizations between prehistoric and modern foragers can be misleading. Freeman (1968) argues that the material effects of cultural behaviour in adaptive systems may differ substantially from those of today. In her research on the formation of prehistoric sites Gifford-Gonzalez (1980) rightly noted that*: 'The key to elucidation of the past by studies of the present lies in assuming a comprehensive approach to the study of process*

and effect. By closely defining site formation processes, one can frame and test hypotheses concerning areas of knowledge which at present remain hazy.' Despite the critical reviews which insist that 'ethnographic analogy' might run the inherent risk of portraying contemporary indigenous peoples as 'primitive people still living in the Stone Age', this method does permit the gathering of a kind of detailed information about a total ecological/economic niche and the way in which local people use their resources. As Harlan (1969: 313) already commented earlier on the value of the 'ethnographic analogy': *'We have in the Ethiopian centre a survival of an entire agricultural system little changed from prehistoric times...It is as if a vanished world had been rediscovered by the use of a time machine.'*

Howell (1984) cautions that the overall task of combining direct observation of contemporary evidence with the excavated evidence from the past in the ethno-archaeological hypothesis is that archaeological remains have to be survivals from an ongoing society just the same as the contemporary one. This endeavour can be approached from the archaeological perspective, as Schrire (1980) has attempted, or from an anthropological perspective, as demonstrated by Lee (1978). As a consequence, the larger task is to conduct equally detailed studies of more traditional societies in their relations with their natural resources, including wild plants in Africa and elsewhere. In this way, a more comprehensive view on the processes of interaction between humans and plants can be constructed, specifically if processual models of modern peoples enable the extrapolation of both causal and also interactive relations among the factors which influence people's utilization behaviour of their plants and crops. The evolution of such relationships over longer periods of time can be better understood if - as Gifford (1984) suggests - various socio-demographic and related background characteristics are analysed in models constructed to explain such interactive relationships established by the study of contemporary communities.

Whereas prehistory is mainly reconstructed on the basis of *material* palaeo-ethnobotanical evidence from tools, artefacts and preserved plant remains; the pre-contemporary era cannot be understood only by reference to such material evidence. In the study of this stage, the *immaterial* evidence of the oral tradition of myths, stories; epics and legends is indispensable. Interestingly, comparable present-day communities in the area most probably will use not only similar *material* evidence of plants, tools and utensils known from the past, but also reveal the related *immaterial* evidence in terms of indigenous systems of knowledge and technology which have been transferred over many generations in that particular area or community. In Kenya, an interesting study in ethno-archaeology was carried out, examining female ear decorations among the Tugen, Njemps and Pokot ethnic groups in the Lake Baringo area. The purpose of the study was to test to what extent material culture was used to express differences between these groups; a methodology which was indeed found to work well in the case of these distinctive ornaments. In a similar approach, Bower *et al*. (1977) studied present-day pastorals in the Rift Valley and the Serengeti regions of Kenya, East Africa, to try to reconstruct comparable prehistoric culture models between early humans and the present pastoralists.

Evidence from living plants, as noted by Cotton (1998), shows that researchers have also relied heavily on the analysis of present plant populations to suggest probable sites of domestication and likely progenitors of wild ancestors of modern domesticates. Modern plants therefore can also provide useful information in instances where archaeological evidence has failed. Similarly, ethological data from studies of animal behaviour show that much can be learned from behaviour of non-human primates, especially in relation to the social structures of early humans encompassing such factors as body size, sexual dimorphism and food sharing. The pioneering studies on chimpanzees *(Pan troglodytes)* in Tanzania by Jane Goodall, and by Diane Fossey of gorillas (*Gorilla gorilla*) in Rwanda have provided an abundance of new insights into this field. For

instance, chimpanzees in Assirik, Senegal, have been observed using tree roots in order to open hard-shelled palm fruits, while chimpanzees in Gombe, Tanzania, are known to use modified branches to dip for termites (*cf.* McGrew 1992, Goodall 1996).

For the study of human-plant relations in Kenya, the solution to the application of the method of 'ethnographic analogy' seems to provide a promising base from which to obtain more insights into these relations over a longer period of time, although as yet archaeobotanical evidence is rather scanty, as relatively less effort has been put into the study of early agricultural systems in this part of East Africa. The rich human palaeontological evidence - amply demonstrating human origins in East Africa, largely by the pioneering work of the Leakey family, their teams from the National Museums of Kenya and collaborating researchers from around the word - has only occasionally been analysed in the context of (pre)human-plant relations. Examples are the study by Willis (1989) of the giant jaws and their muscle attachments of *Australopithecus africanus*, which have been postulated to have been used for crushing hard fruits and nuts and chewing tuberous roots. Other results from related studies in Kenya will be elaborated in Chapter VI.

Unquestionably, from prehistory to the pre-contemporary times, this kind of (pre)historical evidence has indeed been very limited, prompting the use of alternative approaches to the study of the interactive process on humans and plants in Meru over a longer period of time. In East Africa, for instance, as Marshall (1991) rightly observes about prehistoric agriculture but also remarks relevant to plant remains, *the failure is attributed to the emphasis on small-scale excavations, lack of application of appropriate techniques for the recovery of archaeological remains, and generally poor preservation of such remains*. Except for the unique recovery of cultigens of finger millet at Gogo Falls in western Kenya too little plant material has been retrieved to warrant consistent evidence. Not that this retrieval has been impossible; it is just that the search for the ancestors of the human species has been paramount, given priority over other sciences. Beginning with the view of Leakey (1991) that the ethnographic analogy permits: *'the component of looking backwards and realizing that not only did the generations that are now in their fifties and sixties have this knowledge, but that that knowledge itself has been handed down from previous generations now gone, but nonetheless generations that had the knowledge that was successful and worked well…'*, this method should be adopted and refined to the actual situation in Meru.

Although archaeological evidence on human-plant relations in Meru is - as elsewhere in Kenya - still very scanty, the local linguistic tradition includes a rich variety of oral stories passed down by word of mouth which may produce relevant data. Since there is indeed a need for material prehistoric evidence in the form of plant remains, tools, artefacts and utensils, which so far have been very minimal if not virtually lacking, the development of an approach which also includes a retrospective view from the present back to the past - most relevant to this study in Meru - poses a real challenge to the overall endeavour to explain the whole process.

2.3 Recent Approaches to Human-Plant Relations

2.3.1 Ethno-ecology: Traditional Ecological Knowledge (TEK)

As several interdisciplinary studies indicate, there has been considerable cross-cultural variation in the environmental impact of humankind around the globe. Extensive historical and contemporary research taking into account the negative and the positive consequences of human activities on biodiversity has been conducted in both industrial and traditional, often small-scale societies. It includes studies by Diamond (1987; 1991); Harris & Hillman (1989); Posey & Balee (1989); Hames

(1991); Ponting (1991). Recently, a growing body of knowledge has documented that many traditional, mostly small-scale communities with a system of unchallenged management and use of their environments and resources have accumulated detailed, accurate indigenous knowledge of and practice for their ecosystems over many generations. As many of these studies highlight, these communities have also shown that they use their knowledge and wisdom in such a way as to manage and conserve their resources in an environmentally sustained way (*cf.* Redford 1990; Bahn & Flenley 1992; Denevan 1992; Blackburh & Anderson 1992; Adams & Slikkerveer 1996; Balee 1994; Ellen 1994; Norgaard 1994; Eldredge 1995; Flannery 1996; Alcorn 1996; Anderson 1996; Kirch & Hunt 1996; Atran & Medin 1997; Prain, Fujisaka & Warren 1999; and Maffi 1999; 2004; Agung 2005).

Most of these studies in which the ethno-ecological perspective on human-environment relationships has been applied tend to focus on the well-adapted systems of Traditional Ecological Knowledge (TEK), integrating biological, cultural and linguistic approaches to analyse and understand the knowledge, belief and experience of indigenous peoples in their use, management and conservation of their biocultural resources. In this context, as Slikkerveer (1996) notes, Traditional Ecological Knowledge (TEK) refers to: *'a cumulative body of indigenous knowledge, belief and practices concerning the interaction of humans with each other and with their environment, handed down over many generations in a particular culture or region'.* Recent research in this sub-field includes studies by Johannes (1989); Berlin (1992); Slikkerveer (1992); Toledo (1992); Martin (1998); Warren, Slikkerveer & Brokensha (1995); Adams & Slikkerveer (1996); Berkes (1999); Slikkerveer (1999); Posey (1999); Carlson & Maffi (2004). Most of these studies emphasize the sustainability of the indigenous resource management and conservation strategies followed by local farmers around the world, working with wild as well as with domesticated species.

In line with the current efforts being made by members of the 'Global Network of Indigenous Knowledge Resource Centres', to document these traditional systems of natural resources management, several ethno-ecologists, ethnobiologists and ethnobotanists have engaged in the urgent documentation and analysis of indigenous management systems, spurred on by the looming threat of loss of such important ethno-ecological knowledge over the past decades. In their work, most authors have identified ongoing processes of socio-economic development and globalization as the main causes of the rapidly disappearing systems of traditional ecological knowledge of the developing countries (*cf.* Warren 1995; Berkes 1999; Medin & Atran 1999; Adimihardja 1999; Posey 1999; Slikkerveer 1999; Zent 1999). The results of growing ethno-ecology research have led to the recent rise in the biological, environmental and social sciences of an *integrated biocultural systems approach* towards the current, world-wide environmental crisis.

The previously mentioned concept of biocultural diversity - representing the inextricable link between nature and culture - has exposed to what extent the current environmental crisis is threatening the maintenance and continuation of the diversity of life on Earth in both nature and culture (*cf*. Wilson 1988; Slikkerveer 1992). As Maffi & Oviedo (2000) note on such integrated approach: *'...success in conserving biological diversity may well be interrelated to the maintenance of cultural diversity, and that conversely, the loss of cultural diversity is part and parcel of the same socio-economic and political processes leading to biodiversity loss.*' Agung (2005) mentions that the growing awareness of the major value of Traditional Ecological Knowledge (TEK) for the conservation of biocultural diversity has also received high priority in recent international policy agendas, conventions and declarations. This awareness was initiated by the publication of *Caring for the Earth* (IUCN/UNEP/WWF (1991) and the *Report of the United Nations Conference of Environment and Development* (UNCED 1992). This new perspective on humans' role in environmental conservation was set out in more detail in such action plans as *Agenda 21, Rio*

Declaration (1992), and the *Convention on Biological Diversity* (CBD 1992). Global biodiversity conservation plans and policies include the *Global Biodiversity Strategy* (WRI/IUCN/UNEP 1992), the *Global Biodiversity Assessment* (Heywood/UNEP 1995), *Resolutions and Recommendations to the World Conservation Congress* (IUCN 1997), *Implementation of Art. 8 (j),* and *Related Provisions* (IUCN/WWF 1998), WWF's *Global Conservation Priorities* (WWF 1998), and UNEP's *Cultural and Spiritual Values of Biodiversity* (Posey 1999). More recently, as a result of the recent *World Conference on Science*, organized by UNESCO and the *International Council for Science* (ICSU) in Budapest in 1999, two principal documents - the *'Declaration on Science and the Use of Scientific Knowledge'* and the *'Science Agenda Framework for Action'* - have helped to stress the important contribution of indigenous knowledge systems, pointing out the urgent need: '*...to preserve, protect, research and promote this cultural heritage and empirical knowledge'*.

In 2000, at its 5th meeting in Nairobi, Kenya, the *'Conference of Parties'* (COP-5) to the *Convention on Biological Diversity* adopted the motion to implement *Article* 8(j) so as to reinforce the position of the knowledge, innovations and practices of indigenous and local communities in their relevance to the sustainable use and conservation of biological and cultural diversity. In this way, growing international attention about the environmental crisis has been drawn to the close relationships between humans and their natural environment, including their plant resources. Since ethno-ecology basically includes all research on people's interaction with their natural environment, including the sub-discipline of ethnobotany studying human-plant relations, the information on people's Traditional Ecological Knowledge (TEK) provides a multifaceted background to the analysis of indigenous people's systems use, management and conservation behaviour. The variety of environmental factors in East Africa, in Kenya in particular, has provided the diverse habitats suited to the development of livelihood systems of gatherers, hunters, pastoralist, and agriculturalists. Consequently, related studies carried out on the relationships of communities and their environments in Kenya have helped to emphasize the adaptive aspects of the indigenous communities to their environments. For instance, Brokensha & Riley (1980) conducted a fairly dynamic anthropological study on the relations between the traditional ecological technologies and use of plants among the Mbeere - a neighbouring community to the Meru - demonstrating that their extensive Traditional Ecological Knowledge of their vegetation has existed over many generations as part of the local culture.

2.3.2 The Leiden 'Ethnobotanical Knowledge Systems' Approach

As indicated in the previous Paragraph 2.2.3, the 'Ethnographic Analogy', notwithstanding its usefulness in reconstructing the past through a comparison of living populations, needs to be developed, refined and adapted, specifically in the assessment of comparative, existing systems of indigenous knowledge and practice. Apart from the undesirable labelling of comparable modern communities as 'primitive Stone Age people' compounded by the paucity of useful material evidence from archaeological sites, there is a need to provide a longitudinal perspective over a prolonged period of time as the basis for a processual assessment of human behaviour. Moreover, the current systems of indigenous knowledge, belief and practice are often too complex for Western-oriented, 'rational' and 'scientific' analysis which is based predominantly on empirical evidence (*cf.* Slikkerveer 2005).

The study and analysis of human-plant relations in the complex situation in Meru, to where the present-day inhabitants migrated from the coastal area around the seventeenth century, requires a research methodology which embarks on the analysis of the present and subsequently seeks to 'return' to the past in a stepwise mode. Such a methodology should allow a *horizontal* comparison of

different interacting knowledge systems at present, and also enable a *vertical*, that is, historical comparison extrapolated from the present back through the pre-contemporary to the prehistoric plant related systems. Besides this classical method of the ethnographic analogy, a specific approach has been developed at Leiden University's Leiden Ethnosystems and Development Programme (LEAD), known as the 'Ethnobotanical Knowledge Systems' (EKS) approach (*cf.* Leakey & Slikkerveer 1991; Slikkerveer 1995; Slikkerveer 1999).

This approach is built on the method of the 'Ethnosystems Approach' to the advanced study and analysis of Indigenous Knowledge Systems (IKS), previously developed in Leiden in order to assess the major role in their livelihood and survival which these systems have played for many generations of indigenous people. Above all it has been the local people's Traditional Ecological Knowledge (TEK) which has enabled them to evolve their detailed understanding, use and management of their environment and the natural resources for many centuries. Most ethno-ecological studies have documented how indigenous peoples have constructed a particular cultural system through time and this has enabled them to live, cope, survive and deal with their environments which include wild plants, crops, habitats, water - including water catchments, flood plains, rainy and dry seasons - as well as calamity-prone ecozones with wild animal paths, active volcanic sites and recurrent wild fires. These communities' knowledge and practice are based on an 'emic' point of view, which needs a specific research method to attempt a more adequate analysis and understanding.

The deeper understanding of present and past human-plant relations achieved by the implementation of such a new methodology as the *ethnosystems approach* was re-emphasized during the Symposium on 'Origins and Development of Agriculture in East Africa', organized in 1989 jointly by the National Museums of Kenya and the LEAD Programme of Leiden University in The Netherlands. In his *Keynote Address* to the Symposium, Leakey (1991) pointed out that: '*an aggressive study can be conducted that gathers data that exists today and develop upon it'*. But he went on to stress that: *'the component of looking backwards and seeing the fact that knowledge has been handed down from previous generations who no longer exist which is working now and has nonetheless worked far back in time'* may provide a valid contribution to the reconstruction of both the present and the past.

At the same time, Slikkerveer and Lange (1991) took the opportunity to point out the various factors which are included in specific, historical, area, and community-bound ethnobotanical evidence. Both authors stated that: *'...apart from methodological problems of measurement of direct observation versus archaeological data, analysis and interpretation of evidence, such as revealed in ethnosystems approach could provide a deeper insight into the total ecological processes over time, in which people have managed their indigenous natural resources with enough knowledge on how to exploit them'*.

The ethnographic record of such evidence derived from relationships between living communities and their environments indicates that environmental scientists have studied the interaction between communities and their environment largely by focusing on the adaptive aspects of indigenous peoples involved in agriculture and pastoralism. This overlooks the fact that the indigenous peoples have developed rather sophisticated local classifications of plants, animals, soils and plants as part of their indigenous knowledge systems, and this accumulation of knowledge deserves to be paid much more attention as these systems have provided the local base for the well-adapted methods and techniques to use, manage and conserve their resources in a sustainable way. The next chapter will elaborate on the related concepts on which this research method is based.

As already stated, as a multidisciplinary study of relations between people and plants ethnobotany involves contributions from botany, ethnopharmacology and anthropology, as well as from ecology,

economics and linguistics, building on different methods developed to study and analyse indigenous botanical knowledge and use of plants in a particular culture or community. Therefore, a number of ethnobotanical studies in traditional cultures reflect such a multidisciplinary orientation in their research methodology. However, given the growing scarcity of ethnobotanical information from intact indigenous peoples, and the growing attention being paid to the dynamic processes of acculturation and trans-acculturation among communities which incorporate both non-Western and Western forms of knowledge and practices, a more realistic view is now concentrating on the development of a comparative approach of Ethnobotanical Knowledge Systems (EKS) to expand knowledge and use of plant resources among different cultures and communities. The intricate link which can be found in the interactive 'knowledge-belief-practice complex could promote a clearer understanding of human-plant relations in the present and provide insights into the past and the future.

2.3.3 The Advance of Quantitative Ethnobotany

The execution of a number of core tasks in the development of the field of ethnobotany - gathering data, testing hypothesis, formulating recommendations and contributing to biocultural diversity conservation - has recently been declared by Lewis and Elvin-Lewis (1996) to include: *'basic, quantitative and experimental ethnobotany'.* Since the study in Meru seeks to provide insights into human-plant relations among the indigenous peoples, with a focus on wild medicinal and non-medicinal plants, and with that purpose in mind has embarked on a comparative analysis of the characteristics of the inhabitants of the three Districts – Meru North, Meru Central and Meru South - it links up with the quantitative approach in ethnobotany. However, in order to assess the comparative data from different sample surveys of present-day respondents in the three Districts and also gain insights into the historical processual aspects of human-plant relations in the past, the classical method of the ethnographic analogy is not fully adequate as there is still a paucity in the plant-related archaeological material evidence in the study areas.

Consequently, the specific approach developed at Leiden University's Leiden Ethnosystems and Development Programme (LEAD), known as the 'Ethnobotanical Knowledge Systems' (EKS) approach, has been chosen, since it allows for both a *horizontal* comparison of different interacting knowledge systems at present, and a *vertical*, that is, historical comparison from the present back through the pre-contemporary into the prehistoric plant related systems. Such a 'knowledge system' includes the collective cultural heritage of a community or society, defined as*: 'an enclosed and dynamic whole of, perceptions, beliefs, practices, skills, technologies and experiences, which within a certain culture or region has been developed and transferred over several generations, and of which the elements in mutual relations have a meaning surpassing the sum of the separate part's a phenomenon referred to as 'synergy'*, in which the documentation, study and analysis of these phenomena requires an integrated comparative and quantitative approach. (*cf.* Slikkerveer 2000: 9-10). The introduction of the 'knowledge system' perspective into the field of ethnobotany has allowed for the application of a less *normative* and also permitted a more *realistic* approach to the study of comparable, mainly holistic knowledge systems in traditional and modern societies. In doing so it has opened a way by which to gain a deeper insight into the complex, historical processes of interaction between human and plants within their ecological context. Therefore, the 'knowledge system' perspective is generally able to interpret often complex configurations of various systems in the use, management and conservation of plants and herbs which can be interpreted from the

participant's point of view as co-existing traditional, transitional and modern systems of knowledge and practice from which the people can choose to sustain their way of life.

The quantitative data collected in the three sample surveys cover a broad range of information on how the local people interact with their natural environment, including the wild plant resources. Many categories are involved encompassing plant collections, artefact collections, recorded interviews, photographs, and household surveys, conducted in three comparative communities in the study area of Meru. The advanced quantitative approach of *Ethnobotanical Knowledge Systems* (EKS) of a complex of interacting botanical knowledge systems within a specific region or country can provide a new, more culturally relative method by which to increase the understanding of the complex patterns of behaviour of respondents relating to the sustainable use and conservation of wild plants, thereby contributing even more to the predictive value of the outcome of the analysis of such behaviour. The quantitative analyses of collected data, including the bivariate, multivariate and multiple regression analyses will be elaborated in Chapter III.

Therefore, this study also seeks to contribute to the extending the field of quantitative ethnobotany, as indicated by Prance (1991) and Lewis & Elvin-Lewis (1994). Since such a special approach in applied-oriented ethnoscience research has been developed at LEAD, Leiden University, since the early 1980s, the conceptual model of this study, as described in the next chapter, will be based on the knowledge and experience gained from the related advanced quantitative methods and techniques.

2.4 The Study of Traditional Plant Use Behaviour

2.4.1 Conceptualization of Human-plant Use Behaviour

The valuable, albeit sometimes ignored, knowledge and wisdom about the use of their wild plant resources among indigenous peoples has been accumulated over many generations as part of the indigenous management system, and often includes local methods and practices of conservation of bio- and cultural diversity. Whereas biodiversity refers to the diversity of species, genes and ecosystems, cultural diversity includes the diversity of related knowledge, belief and practices, recently referred to as *biocultural diversity* (*cf.* Slikkerveer 1999; Posey 1999; Agung 2005). The local practices are generally rooted in a combination of traditional ecological knowledge and belief systems which have evolved over a longer period of time.

However, for many Western-trained scientists, most indigenous systems of the fairly holistic knowledge about the management and conservation of biocultural diversity are still difficult to comprehend. As the understanding of peoples' use behaviour of their wild plant resources is based on a full understanding of the underlying indigenous belief systems, cosmologies and perceptions of nature and culture, adequate parameters need to be established to identify and substantiate the often 'invisible' factors which play a major role in influencing the resulting patterns of behaviour. Several recent studies have shown that the complex patterns of indigenous use, management and conservation of plants are essentially based on the interaction between the bio-physical and socio-cultural factors which determine the 'individual's' *decision-making environment*. Since this, in turn, is based on indigenous perceptions of the natural world, including local beliefs and attitudes which often exert a strong influence on the use behaviour of resources, it is important that these are properly understood. The different aspects which seem to influence local environmental perceptions and people's behaviour include biophysical and sociological, as well as spiritual and personal factors. As Cotton (1998: 245) rightly notes: '*...this aspect of ethnobotanical study is one which has*

often been overlooked in utilitarian surveys, yet which is of singular importance, particularly where traditional knowledge is to be applied cross-culturally. Despite the fact that the in-depth study of such local perceptions of the natural world has recently been extended to include both the etic approaches towards the objective 'outsider's' assessment of the environment and the emic approach towards the subjective 'insider's' perception, the understanding of the socio-cultural and spiritual aspects of biodiversity management and conservation remains problematic.

In the recent debate on the position of indigenous knowledge systems, in adducing their assessment some authors continue to maintain artificial dichotomies between 'traditional' and 'modern' knowledge, or between 'scientific' and 'folk' knowledge. Despite the controversies created on 'subjective' *versus* 'objective' views, 'qualitative' *versus* 'quantitative' techniques, 'practical' *versus* 'theoretical' approaches, and 'oral' *versus* 'written' sources - contributing to the stereotyped if not ethnocentric views from Western authors towards non-Western knowledge in the past - there is a general agreement that the explanation of human behaviour is based principally on the interaction between people's knowledge, beliefs and practices. The methods applied to assess and measure the concept of *'knowledge'* in both Western and non-Western societies have now been adequately developed along linguistic, philosophical and socio-cultural principles to allow a valid comparison. Therefore, several studies have sought to identify the similarities and differences between indigenous and 'scientific' knowledge, or between *global* and *local* knowledge (*cf.* Warren, Slikkerveer & Titilola 1989; Johannes 1989; Agrawal 1999; Berkes 1999). Although most of these studies tend to draw attention to the assumed differences between knowledge systems, they substantiate the convenient use of *knowledge assessment* as a generally applicable parameter.

Using ethnobotanical methodology, however, local people's plant knowledge is recorded mainly in indigenous classifications and taxonomies, and related to the practice of use of plants and their parts. Ellen (1994) argues that any further demarcation encompasses commonly shared knowledge of the members of a community, often encoded in formal vocabularies, whereas specific knowledge tends to reflect personal wisdom. In the differentiation between *tacit* and *explicit* indigenous knowledge, the first refers to knowledge embedded in taboos and local institutions, and the latter is the preserve of local experts and healers. The overriding conclusion is that, regardless of such categorization of knowledge systems, their determining role in shaping human behaviour has generally been shown in many pieces of behavioural research around the globe.

In the context of the study of local perceptions, views and belief systems in relation to use and conservation of nature, the concept of *'belief'* has been widely studied and this has strongly influenced the recent academic interest in 'indigenous management systems' from the local people's point of view. In these studies, the key to maintaining the sustained use of resources lies in local belief referring to the management of botanical and agricultural resources (*cf.* Martin 1998; Maffi 2001; Cotton 1995; Posey 1999; Slikkerveer 2000; Eghenter 1999; Alcorn 1999). Comparative research in medicinal, aromatic and cosmetic (MAC) plants and herbs has also revealed a similar predominant influence of traditional beliefs and views about nature in the use of these plants for forest conservation and improvement of health care (*cf.* Cunningham 1997; Slikkerveer 2003).The local concept of *'respect for nature'*, especially for 'sacred sites', stresses the indigenous people's cosmo-vision as an integral part of their belief system. Although basically, management and conservation are fairly pragmatic activities, indigenous peoples generally consider their knowledge to be rooted in a spiritual base in which all creation is sacred, reflecting that in their holistic view of the universe, the secular and sacred are often inseparable. As Agung (2005) describes for the local people of Bali, Indonesia, traditional ecological knowledge certainly depends on the relationship between humans and nature, but it also draws on the relationship between humans and the invisible

world of the ancestors and their spirits.

The interaction between life, land and society, encapsulated in the concept of the 'Sacred Balance', is often part of the local belief system. Similar relationships are well represented in traditional African religions, which are regarded as a way of life with the purpose of bringing order into human relationships with fellow humans, and with the environment (*cf.* Opoku 1978; Odera Oruka 1994; Agazzi 1994; Odera Oruka & Juma 1994; Millar 1999). As is the case with indigenous knowledge, indigenous beliefs have been shown to play a determining role in people's behaviour.

The concept of *'behaviour'* has been paid plenty of attention by many different disciplines, resulting in a number of elaborate methods and techniques for the observation, study and analysis of patterns of human behaviour in various domains of life. Most of these methods include the compilation of empirical information of patterns of behaviour, and are based on such techniques as participant observation, monitoring techniques, life-histories and case studies. In the context of ethnobotany, such behaviour is generally assessed in relation to the use, management and conservation of plant resources by indigenous and local peoples. These studies are often recorded and quantified as 'use reports', either by direct participant observation or retrospectively. The related models of human behaviour tend to regard the actual patterns of behaviour as a result of causal relations with factors or determinants of behaviour, which include age, sex, and education, socio-economic status, complemented by knowledge, attitude and belief.

As a methodological approach to document, analyse and explain such complicated patterns of human utilization behaviour, Slikkerveer (1999) developed an integrated strategy in the advanced study of the various dimensions of Indigenous Knowledge Systems (IKS) to categorize the overall process into three categories of factors of knowledge, belief and practice. This so-called *Knowledge-Belief-Practice Complex* has made it possible to assess the rather complicated use behaviour of respondents as *one* integrated complex of human-environment relationships and interactions, which could be divided analytically along the *three* above- mentioned, interrelated components and subsequently be operationalised into *three* interacting levels of *independent, intervening* and *dependent variables*. Later, this methodology was elaborated by Toledo (2000) who refers to three levels in ethnobiology research: the *corpus* (knowledge); the *cosmos* (beliefs); and the *praxis* (practices).

2.4.2 The Integrated Approach Selected for the Study in Meru

The foregoing theoretical overview shows that the objectives which were used to realize the study of the human-plant relationships among the people in Meru are facilitated by a rich academic tradition in advanced quantitative ethnobotany in the documentation, analysis and explanation of the processes and factors involved. Nevertheless a few theoretical, methodological and analytical difficulties still remain to be cleared up. Although, the as yet scanty palaeontological/archaeological and palaeo-ethnobotanical material evidence sheds some light on the process in prehistory, pre-contemporary evidence gathered from oral stories provides relevant data, an absolute necessity in any reconstruction of the relationships over a longer period of time. The 'ethnographic analogy' approach of which the objective is to compare specific past and present cultures with similar life-styles on the basis of largely material evidence from the past by and large has been shown to allow for the reconstruction of prehistoric cultures, as far as sufficient material evidence of tools, artefacts, utensils and plant remains have been collected to be used as a basis for such diachronic comparison and interpretation. Since relatively very little material evidence from the past has yet been recovered in the study area of Meru, in the search for more pre-contemporary evidence, the research strategy chosen was a study, analysis and explanation of present-day human-plant relationships, followed by

a retrospective assessment of the pre-contemporary and prehistoric evidence from the same culture area.

Hence, the focus of the research concentrates on the comparative study and analysis of ethnobotanical data collected in the three villages of Meru, in which various factors are used as variables in the derived analytical model of plant use behaviour. Embarking on the preliminary assessment of the indigenous peoples' perception of useful wild plants, a distinction in the approach is introduced in the study on the basis of the local classification of useful wild plants into *medicinal* and *non-medicinal plants,* followed by a sub-division of various forms of use of wild plants, encompassing use for food, material, fuel etc. In this way, the explanation of present-day relationships, supported by understanding of similar relations in the past would eventually allow for prediction of relationships in the future, attaining the aim and objectives of the study of the evolutionary process of human-plant relational in Meru.

In this research strategy, the modern approaches of anthropology and ethnoscience will encompass the emic view on several types of use of wild plants of the indigenous peoples of the north-eastern slopes of Mount Kenya where the study, as Leakey (1991) puts it, would: '*..gather the knowledge that exists today and build upon it in a developmental sense',* as similar studies have shown to be successful elsewhere (*cf.* Clark 1957; Raharijaona 1989; Layton 1989; McGrew 1992). In this way, the conceptualization of indigenous plant use behaviour among present-day peoples of Meru, represented in the 'Knowledge-Belief-Practice' complex, is encapsulated in the understanding of the relations and interactions among various categories of background factors, in which behaviour patterns are regarded as outcome factors. The explanation of the relations and interactions are put to work in the construction of the analytical model which is described in greater detail in the next chapter.

III Methodology and Analytical Model

The general methodological strategy chosen for the study in Meru began with the inventory and qualitative compilation and organization of information about indigenous people's knowledge, beliefs and practices affecting their use and conservation of wild plants which are significant to them. Therefore, this part was complemented by the use of quantitative methods and techniques, including the conducting of household surveys in pre-selected areas, with a relevance to the comparative description, evaluation, analysis and explanation of data, conveniently structured in the analytical model of the research in the three Meru villages.

Following the theoretical orientation of the study in Meru, the methodological strategy which included the carrying out of complementary qualitative and quantitative research pertaining to the design and implementation of a multivariate model of wild plant use behaviour building on the foundations of the development of a new paradigm of the Leiden School of Thought of 'Ethnosynergy' and the application of the 'Ethnosystems Approach' to the study and analysis of Indigenous Knowledge Systems (IKS), recently developed by the Leiden Ethnosystems and Development Programme (LEAD) of Leiden University, was applied.

Hence, this chapter presents the methodological considerations which were taken into account in the selection of the research methods and techniques appropriate to the study in Meru. The research methodology was focused on the execution of both a qualitative and a quantitative survey which taken together formed one inseparable research strategy. The qualitative study component was composed of both ethnobotanical and botanical surveys carried out throughout the greater Meru region, whereas the quantitative study component involved the collection of data through household surveys in three villages representing each of the three Meru Districts. The *first part* of the chapter begins with the description of the 'Ethnosystems Approach', specifically designed to study and understand indigenous people's knowledge systems. This approach is based on three concepts - Participants View (PV), Field of Ethnological Study (FES) and Historical Dimension (HD) - each of which is described in the first section. The *second part* elaborates on the qualitative research of both the complementary botanical and ethnobotanical studies carried out in the research area.

The *third part* of the chapter describes quantitative research, including the selection of the sample survey villages and the composition of the questionnaire. The *fourth part* presents the operationalisation of human-plant use behaviour into relevant analytical components and the construction of the interactive model designed to analyse and explain human-plant relations in Meru.

3.1 The Ethnosystems Approach to the Study in Meru

3.1.1 The Participant's View (PV)

A specific methodology by which to reach an understanding of the complicated indigenous systems of knowledge, beliefs and practices, recently developed by Slikkerveer (1991;1995; 1999) and known as the 'Ethnosystems Approach', has been shown to allow the assessment and explanation of Indigenous Knowledge Systems (IKS) in various cultures on the basis of the anthropological and geo-historical concepts of the 'Participant's View' (PV), the 'Field of Ethnological Study' (FES), and the 'Historical Dimension'(HD), which in combination permit the analysis of the emic view of the local people on their life and livelihood.

Consequently, the 'Ethnosystems Approach' is composed of the documentation, study, and revitalization of systems of indigenous knowledge which have evolved over many generations in the field of linguistics, education, socialization, medicine and natural resource management, use and conservation in a particular culture or society. The Ethnosystems approach has been shown to be particularly useful in the re-integration of Local Knowledge Systems into global systems of knowledge and technology, thereby contributing to sustainable community development in many Third World countries. The approach was initially evolved in Medical Anthropology and Sociology at Leiden University in the 1970s, where it had largely been operationalised in policy-based research in projects in Ethiopia, Kenya, the Ivory Coast, Senegal, Sri Lanka and Indonesia, and refined for use in other sectors of society in the LEAD Programme of Leiden University (Slikkerveer 1989; 1991; 1995; 1999; Van den Breemer 1989; 1991; Leakey & Slikkerveer 1991).

The three core concepts in this approach focus on the understanding of *ethno-specific systems*, which are founded on the accumulation of the long-standing experience of many generations of indigenous peoples in their ecological and cultural setting. The goal of the approach is to analyse such dynamic concepts as beliefs, perceptions, practices and decision-making processes which might be revitalized and integrated into the socio-economic development of various sectors of the communities involved. In this way, this emic-based approach broadens the perspective on local peoples and their culture in a more holistic fashion. At the same time, this approach allows the analysis of the dynamic interface and interaction between local and global systems of knowledge and technology, highlighting the potential of local knowledge and practices for sustainable community development. In the field of applied anthropology, this approach focuses on the interaction between the local structures of perceptions and practices balanced against the outside forces of innovation, development and socio-cultural change. Slikkerveer (1991) elaborates on the configuration of the term 'Ethnosystems' which can be viewed in four different ways as a:

- more dynamic concept of appropriate, in-depth culture assessment;
- culture-specific or cultural-bound reference of the term;
- more realistic instead of a normative, Western inspired orientation;
- (pre)historical assessment of a community-bound reference of the term.

The methodological implementation of the 'Ethnosystems Approach' in an attempt to achieve the target of the depiction of the Indigenous Knowledge System of a particular population unquestionably injects a more dynamic character into the analysis of the historical interaction processes between local and global systems, thereby extending the research to include the component of patterns of human behaviour in the overall process. By so doing, important behavioural concepts are brought within the scope of the Indigenous Knowledge which encompasses the 'Participant's View' (PV); the 'Field of Ethnological Study' (FES) and the 'Historical Dimension' (HD). Its specific relevance to the study in Meru was its diachronic orientation, emphasized by Slikkerveer & Lange (1991: 183) who, in their palaeo-ethnobotanical study in Kenya, point out its contribution to the greater understanding of such processes by: *'...widening the Ethnosystems Approach to the study of Indigenous Agricultural Knowledge Systems (IAKS) as ethnospecific phenomena through the time in particular regions of East Africa, emphasizing on both the prehistorical and historical dimension of this new approach.'* The particular role and integration of each of these three significant concepts into the overall approach justifies a closer look at each of them in the following sections.

3.1.2 The 'Field of Ethnological Study' (FES)

The '*Participant's View*' (PV) includes the assessment of indigenous people's knowledge, world views, perceptions, attitudes, opinions and the like as part of the underlying structure of their values, norms and belief systems. It has been developed from the anthropological concept of the *emic* view, looking at cultures from within as opposed to the *etic* view taken from the outside, and forms the basic element in the local decision-making process. Taking the target population's point of view on their own way of life - including their system of management, use and conservation of natural resources - into consideration has steadily grown more important in the field of cognitive anthropology, and it has also emerged as a major guiding principle in applied-oriented policy planning and implementation at the local level in the dynamic context of development and change (*cf*. Brokensha, Warren & Werner 1980; Warren, Slikkerveer & Brokensha 1995).

The important factors of the knowledge, experience and beliefs to be found among the local population can be studied and analysed by comparing them to their actual patterns of behaviour, in the context of interacting insider's and outsider's views. This produces a better understanding of the underlying determinants of human behaviour, which are crucial to both maintaining a local life-style and their readiness to adopt new methods and practices as part of the processes of development and change. In the study of Meru, the respondents were motivated to report their views on the use of their wild plants as part of their culture; a process in which their knowledge, experience and wisdom gained over so many generations in the area are all respected and processed as a major research component in the overall analysis.

The '*Field of Ethnological Study*' (FES) refers to a concept which had been developed as a major principle of the 'Leiden Tradition' in Structural Anthropology during the 1930s. It evolved from significant ethnological fieldwork in Indonesia by Van Wouden (1935) who observed that in the Archipelago in addition to rather diverse local cultural features, a pan-Indonesian culture existed characterised by similar, comparative cultural traits such as regional language, kinship, social organisation, patterns of woven clothes, perceptions and practices in agriculture, forestry and medicine (*cf*. De Josselin de Jong 1980; Schefold 1988). It refers to the later introduced concept of 'culture area', in which certain cultural features are spread over a particular geographical region and which later on has initiated regional comparative research among different ethnic groups within the same region. In this way, Indonesia, despite its wide variety of sub-cultures can be regarded as *one culture area*: the 'Indonesian Field of Ethnological Study'. Within the dynamic context of processes of development and change, the advantage of regional comparative studies of sub-cultures within a larger culture area refers to a more realistic assessment of cultures. Instead of normative comparisons with Western cultures, a rather realistic study can be represented of the local cultures concerned. The methodological advantage of the use of the concept of the 'Field of Ethnological Study' as part of the Ethnosystems Approach for the research in Meru, emerges from the research strategy to the study of the three villages as part of the wider cultural area of the Meru in Kenya.

3.1.3 The 'Historical Dimension' (HD)

The incorporation of the concept of '*Historical Perspective*' (HP) - useful in any study of present-day situations - in the context of the 'Ethnosystems Approach' refers specifically to the (pre-) historical analysis of complex contemporary configurations, including religion, agriculture, natural resource management, conservation and medicine. Particularly in development research on transcultural settings of interacting inside and outside forces, contemporary-oriented approaches

have largely failed to unravel the dynamics of origins and development of processes which have led to present-day complexes. In their efforts to understand the complex processes of development and change in various sectors of indigenous communities, anthropologists and historians have been working in close collaboration to substantiate the 'Historical Perspective', in which both the historically-oriented methodology is complementary to the method of the ethnographic analogy more solidly (*cf*. Wigboldus & Slikkerveer 1991). It is often difficult to comprehend present-day complexes in such cultural systems as natural resources management. This can be attributed largely to the lack of adequate evidence from the past which might explain the evolution of the different ways of exploitation of resources in the study area. More than to anywhere else, the application of the famous *dictum* of Leakey & Lewin (1992): *'the past is the key to the present'* is relevant to the study in Meru. In the Horn of Africa, the application of this concept in the historical analysis of the medical traditions among the various cultures has facilitated the reconstruction of the current complex plural medical configuration of interacting local, regional and global systems in the region in order to provide the population with a wider range of medical care services (*cf.* Slikkerveer 1982, 1990).

So far, the understanding of the interactive processes which have led to current practices in the use of wild plants in this part of Sub-Saharan Africa has been hampered by a general lack of (pre-) historical evidence crucial to the reconstruction of human-plant relations. Therefore, the Ethnosystems Approach turns out to be highly relevant as it allows a focus on the contemporary configurations, and seeks to understand pre-contemporary processes in a retrospective mode. The operationalisation of this approach for the study in Meru is based on the comparative documentation of the knowledge, perceptions and practices at the local level, as identified in the analytical model of the study. The range of the analyses of the factors which interact as determinants of the peoples' use behaviour of wild plants eventually pertains to the explanation and prediction of how such processes evolved in human-plant relations in the study area. Appropriate research methods and techniques encompass both qualitative and quantitative ethnobotanical data collection, including the documentation of interacting determinant factors in relation to reported patterns of wild plant use behaviour in the three villages of Meru.

3.2 Qualitative Study

3.2.1 Botanical Survey: Collection of Useful Wild Plants

The long-term research in Meru focused on the quantitative assessment of the use and conservation of wild plant resources permitted an integrated approach to be taken to ethnobotanical documentation and analysis, which began with the collection and identification of specimens of useful wild plants from the area, and their storage in the East African Herbarium of the National Museums of Kenya in Nairobi. This basic botanical component of the qualitative ethnobotanical study in Meru was complemented by ethnobotanical information gathered to consolidate the documentation of the people's knowledge, perception and use of local wild plants, and their indigenous taxonomy, as will be elaborated in Section 3.2.2. Consequently, at the outset of the research in Meru, the relevant aims and objectives were explained to various groups in the population, ranging from the Government administrative staff to the indigenous inhabitants of the communities in Meru, the principal target population in the area. During the introduction, the opportunity was seized to explain the methods and techniques of the study as appropriate tools with which to gather relevant information.

The identification and selection of the key informants required some preparation. A month prior to the research, the Curator of the National Museum of Kenya (NMK) in Meru assisted in finding three key people from each District who were knowledgeable about useful wild plants in the greater Meru region. Local plant experts who had previously worked with the Museum and who had shown great skill and knowledge on wild plants during District competitions which also involved preparation of plants for recipes for food, medicine, insect repellents, and harvesting and use of honey were identified. In this way, three key people were selected from each of the three areas who had previously worked with various plant-collecting teams and had been involved in various natural and cultural conservation programmes in each of the three Districts. This team was trained in more depth on the objectives of the study in Meru by the researcher, who laid a special emphasis on plant collection and preservation techniques. In principle, the local experts covered only their own District and Divisions. With the help of local chiefs and community elders, these experts also brought into their team a representative, who was knowledgeable about useful wild plants from every administrative Location in their communities.

Eventually, the field team included a total of twenty-five local experts who identified and collected the useful wild plants from their Locations. The plant specimens assembled were then documented by the researcher with the help of two university undergraduate student assistants from each of the three Districts. The employment of local experts and assistants from each District and village definitely underpinned the area-specific collection of plants, and it indubitably enhanced the positive reception of the research team by the various communities who proved to be proud about their young people who were acknowledged to be knowledgeable about the indigenous peoples and their use of wild plants. The twenty-five local plant experts required special training in botanical plant collection from the various Locations in the Districts, therefore it was arranged that the three key informants would provide them with a short training course on the requisite methods and techniques. During the course, the local experts were taught the best way to collect the useful wild plant specimens which would be preserved for later scientific identification at the East African Herbarium in Nairobi.

The actual qualitative research was conducted during the months of August, September and October 2002. Before the collection of useful wild plants commenced, the local experts were assured that the Government authorities had given permission for the study to be conducted, obviating any chance of the experts being accused of unlawful trespass or of having harvested plants for illegal purposes. The plant-based information on the plants collected was compiled with the assistance of the local plant experts, and also included data on *habitat, description of plants, usefulness and frequency, knowledge on the origin of the flora, names, locality and altitudes.* The Country, Province and District names were recorded, since the material was later to be stored in the East African Herbarium in Nairobi, where other herbaria from other parts of Kenya, as well as from East and Central Africa have been brought together. The plant-based data from the field were collected by the tried and tested botanical and anthropological methods and techniques stipulated by Martin (1998) and Minnis (2000). The information collected consisted of qualitative botanical data which were obtained largely from the team of local plant experts who, assisted by knowledgeable local informants, were able to compile an interesting botanical profile of useful wild plants in the Meru area, including a unique herbarium collection of useful wild plant specimens for documentation and detailed analysis in the East African Herbarium in Nairobi.

As a preparation for the actual collection of the ethnobotanical data, several visits were paid to the larger Meru region beforehand in order to become better acquainted with the local people, their wild plants and related practices. Practical preparations were made to go about the collection and documentation of specimens of the plant species, their preservation and conservation for future

reference and study in the best possible way. Following the instructions from the botanists at the East African Herbarium in Nairobi, the local plant experts were trained to collect a branch or a twig of the plant specimen which would show leaf arrangements and flowers, and fruits and/or seeds were also supposed to be part of the collection, if in season. For those plants of which the bark was used, a piece would be collected with a correct description of the texture of the bark, made in conjunction with the identification of the plant as a whole. In cases where roots were being used, a part was collected in the same way. As a rule, only very small parts of roots and bark were collected and with great care in order not to damage any wild plant. Uncovered roots were therefore carefully re-covered after the collection. Herbaceous plants were collected as a whole as they are found widespread in most locations. Part of the preparation for field walks is the assembling of appropriate outfits and clothing which would not be easily snagged on thorns and spikes. A pair of garden scissors and a machete was bought for collecting the useful wild plant specimens. Other useful tools included old newspapers, cardboard, felt blotters, plant presses, plastic straps and detailed maps, ink, pens, and pre-printed collection field slips (cards).

The first part of the fieldwork concentrated on collecting useful plant specimens from the wild under the guidance of local plant experts, after which the collected plants were pressed and dried, preserved and eventually transported to the East African Herbarium for safe storage and in depth scientific identification. After the initial assessment of the position of wild plants generally used by the local community, the requirements necessary for such field research were fulfilled. This included obtaining tools, documents and official research permits. Field cards and note books were also prepared for written documentation in the field. The wild plant specimens collected had to be dried and pressed in order to highlight most of the details for herbarium identification. Appropriate plant presses were made by a local carpenter in Meru and materials for boiling succulents plants instead of soaking them in acid were acquired locally. Since succulent plants continue to grow even after harvesting, they were blanched to stop further growth, and then pressed after most of the water had been drained away. The period of time 2002 when the fieldwork was carried out included the months of August, September and October, which are generally dry and sunny, providing a convenient way of drying the plant species collected in the sun or in the shade on the very hot days. Special bags were also made for collecting fruits and seeds in the field

Following the standard botanical guidelines for collecting plant species, a checklist of the equipment used for collecting, pressing and drying plant specimens in the field is shown in Table 3.1. The qualitative data gathered at this stage focused primarily on the wild plants species, that is, were plant oriented. The issues covered in this survey included the flora; local or vernacular name; scientific name (if known), locality; habitat; altitude; description; uses; preparation and application of products made from wild plants; frequency; collectors name; date of collection; and field number; - referring to the serial number of the collected specimens. In order to apply the best methods to plant collection in the study area, the researcher had undertaken preliminary training on how to collect and dry plants in the field from a botanist at the East African Herbarium in Nairobi. This training was later extended to the field assistants, and thereafter also to the local experts in Meru. Since it had been decided to assemble a small herbarium collection with detailed information on Meru, the local experts were asked to compile a local priority plant collection of maximum of twenty-five plant specimens. These specimens generally encompassed parts of trees and shrubs, while the herbs were collected as complete plant specimens to be subsequently documented and pressed, and then dried. In practice, an entire morning or afternoon was reserved for checking the plant collection of one local expert. Since the herbaria collections in the East African Herbarium in Nairobi are referenced according to the name of the collector, for this study the ‘collector’s name’ was also recorded for every collected specimen. While the plants which had to be conserved were

duly labelled with their date and year of collection, the field number of the specimens provided each with a unique identity used as a non-repeatable serial reference.

Table 3.1 Checklist of the equipment for collecting, pressing and drying useful wild plants in Meru

Field	Drying area
Maps of the study areas; Camera and coloured film; Field notebooks and permanent ink pens; Cutting tools which included garden scissors, Ordinary scissors and machetes; Collecting bags; Plant presses and cardboards; Paper labels (cards) as field slips	Plant press, straps, cardboard and felt blotters; Used newspapers; Plastic bags; Pre-printed field collection slips; Hard cover books.

(*Source:* Adapted from Martin 1998).

The process of pressing the collected plants for preservation must be carried out as quickly as possible, taking care not to lose any details. As in all collected flora, speed is the essence as colours are best retained in specimens which are dried quickly. The field team, which consisted of the researcher as the principal interviewer who recorded the information on field slips of the collected plants, was helped by one assistant who recorded information in a hard-cover field book, and a second assistant, who pressed the plant specimens collected in-between blotters in preparation for the drying process. Unquestionably it would be a virtual physical impossibility for a collector to cover the whole of the three Districts in a quest for all useful wild plants - especially since Meru is rather notorious for the fairly rough terrain of its steep hills, deep valleys and impassable river gorges, where only local people know how to find their way. These physical hazards are compounded by security risks and wildlife - including buffalo and African elephant in the extended Mount Kenya forests. In such forested areas of the Mount Kenya region as the Timau Division of Meru Central District where the study was conducted, elephants and buffalos would sometimes wander into local people's farms leaving behind them a trail of destroyed plants, crops and trees. In such hazardous areas, the local plant experts had to reside in camps under administrative security from where they ventured forth to collect plant specimens and bring them back for documentation.

The indigenous Meru plant names have been recorded for reference and where possible, Latin classifications were also documented, but in general it was difficult to assign English names to most of the plants collected since these were simply not available. It was important to discover if the local experts were aware of the localities where useful wild plants were collected in juxtaposition with the administrative boundaries of the Government. This technique enables the exact position of the site to be given on the map, not only nationally, but also globally. Although Global Positioning Instruments (GPS) were not available for the study, most regions in the greater Meru region have already been put on the global map making them easier to locate in the future. Although most local experts would not necessarily know the exact altitude of geographical points of collection in metres above sea level, they were able to document whether the useful wild plants were from mountainous regions or from the plains. For most of the plant specimens collected, altitude details were provided by the Chief Curator of the East African Herbarium on the basis of data from general collections formerly carried out throughout Kenya. In this way, the botanical component of the study eventually resulted in the collection and preservation of useful wild plant specimens, retrieved in the three Districts, and

documented in terms of the collector's name, the informant's name, date, indigenous plant name, scientific plant name, locality, habitat, description, economics, frequency and uses.

3.2.2 Ethnobotanical Survey: Meru Knowledge and Practice

Besides their invaluable contribution to the collection of useful wild plant specimens from the field, the input of local plant experts in the apposite documentation the rich indigenous plant knowledge and wisdom, assembled largely from local key informants and community elders, was likewise crucial to the conceptualization of the local plant-related knowledge, beliefs and practices. The qualitative assessment was based on the standard methods of participant observation, guided field walks, and open-ended and semi-structured interviews with key informants from the target population in Meru. In essence, the qualitative data formed the basis for the subsequent quantitative surveys in three comparative villages as representative samples subsequently drawn from the target population, as described in Paragraph 3.3. Consequently, besides their basic training in the collection of wild plant specimens, the team members were also instructed in the documentation of the local names of the plants, in which the prepared fields on the collection cards were used to formulate the relevant questions needed to obtain the further qualitative information. Table 3.2 below shows an example a collection slip used to document information on each useful wild plant collected.

Table 3.2 Example of a Collection Slip of the East African Herbarium of the National Museums of Kenya, Nairobi

Flora of:	*Kenya, Eastern Province, Meru North District*
Scientific Name:	*Prunus africana*
Vernacular Name:	*Mwiria*
Locality:	*KK Lumbi* village*, KK Lumbi* sub-Location*, Akithi* Location*, Akithi* Division
Habitat:	*growing on the forest edge on a slope*
Description:	*tree about 10 m high, leaves alternate*
Economics:	*medicinal, material*
Frequency:	*one*
Date:	*5/08/2002*
Collected by:	*A.K. Ibui*
No.	*8*
Plant expert:	*Godfrey Bariu*
Uses:	*bark boiled in water and liquid drank one glass a day for 2 days to treat rheumatism; wood used in construction*

(*Source:* East African Herbarium at the National Museums of Kenya).

The questions put to plant experts were generally asked in the form of semi-structured interviews, in which the interviewers guided the respondents in their answers by asking specific questions on selected ethnobotanical topics. Later, these topics were operationalised into variables (fields) for the database which was used to list and document the various categories of uses as reported by the local plant experts as key informants from the communities. This database is also important for future reference for the East African Herbarium, where the specimens collected have been deposited. The variables have been coded and written on a field slip, tagged to each collected plant specimen for

easy data collection and reference. Similar information was recorded in the hard-cover field book to serve as an archive for future research. The use of open-ended interviews also gave the local plant experts the opportunity to elaborate on important information, as they were guided to provide additional details about various aspects of the useful wild plants in the area. Notwithstanding, a certain gentle confinement had to be built in the interviews as some informants tended to wander off the main topic of useful wild plants.

After the extensive documentation of useful wild plants, the researcher, the plant expert and the two assistants made guided field walks to observe the wild useful plants *in situ* and to record more details about the plants discussed during the interviews. During these field walks, the method of monitoring the knowledge of the local experts on the various topics which had been covered during the interviews - such as plant description and habitat - often resulted in additional, important ethnobotanical information. The method of 'participant observation' was frequently used in cases in which the team was invited to visit local homes in order to observe which wild plant species were selected and how they were prepared for food, medicine or other purposes. At such times, local recipes were provided on the actual preparation of specific wild plants for medicine, food and drink.

Since the ethnobotanical research forms the core of this study in Meru, the methodological considerations of the research strategy selected for the study need more detailed elaboration on the assessment of the participant's view and behaviour in the process of human-plant relations in the area. As described in the theoretical orientation of the study, the assessment of the role of the various categories of factors which are interacting in this process assumes a central position in the research, in which particular attention is drawn to the understanding of the so far often ignored, but rather significant 'invisible' factors of knowledge, perceptions, beliefs and worldviews. Indeed, as documented in Chapter II, the results of similar research elsewhere in human behaviour around the globe has amply highlighted the determinant role which this category of factors tend to play in the interaction between background factors and intervening factors in relation to factors of use behaviour.

Keeping to the literature review focused primarily on lessons learned in the specific research methodology of indigenous knowledge systems, as presented in Chapter II, the preparation, reconnaissance and situational analysis in the three Meru Districts paved the way for the quantitative, in-depth research. Therefore, specific information was gathered on the role of factors, processes, and patterns in this field, followed by the identification and pre-selection of appropriate research sites, on the basis of the principle of representation of the prevailing environmental situation in the research area. Thereafter, preliminary results were supplemented where necessary and substantiated by comparative measurement of their spread and distribution over the communities living in the three Districts. Furthermore, the information on use- and conservation-related factors, practices, systems, processes and policies in relation to wild plants was compiled, and brought together in field notes, tape recordings, photographs and interim-reports. The rather descriptive part in the complex field of indigenous wild useful plants provided in-depth information on central issues including the role of local actors - their knowledge, perceptions, beliefs and practices. Similarly, local people’s religion, worldview, philosophies, ceremonies and rituals germane to their norms, values and customs related to their wild plant resources were recorded during the qualitative survey.

These activities eventually provided a wide variety of categories of factors directly or indirectly related to the general patterns of wild plant use among the Meru people in relation to their environment. By the end of the qualitative study, conducted in the period of time between September – November 2002, a fairly comprehensive view of the situation was compiled which served as a major guideline for the next quantitative phase: the design of the quantitative household surveys to

be held in the three pre-selected villages in Meru. Most local plant experts were familiar with the indigenous Meru names of wild plants, emphasizing the knowledge they possessed about the plants as well as the practical experience acquired through the years. Their knowledge of the particular habitat in which the wild plants are found as part of the vegetation, which might be forest, savannah, grassland, marshland or riverbeds, is important, as were their comments on types and colours of soils and the topography.

The local usefulness of wild plants was documented in Meru adhering to the thirteen well-known categories of plant uses, identified by Heywood & Skoula (1996) for the *Medusa Network of the Mediterranean Region on Identification, Conservation and use of Wild Plants of the Mediterranean Region*. Upon the insistence of the local plant experts from Meru, the number of plants of similar genus and species growing within a radius of at least 20 metres was recorded to show the frequency of the particular plant within its environment. In the context of local protection and conservation of wild plant resources, the qualitative survey focuses specifically on conservation by the identification of plants which are perceived to be in danger of extinction, and as such may not be in use much longer. The indigenous people's perception of the conservation status of wild useful plants is very important information as it relates directly to their use behaviour. This kind of information about wild plant conservation was also vital to the local plant experts, as some of them personally went to the trouble of raising seedlings for replanting.

Unquestionably, the East African Herbarium was also interested to know if particular plant species are regarded locally as being in danger of extinction, and to what degree the local population was taking measures to conserve them. The local plant experts personally possessed extremely pertinent knowledge about the local names and the classification of useful wild plants. They had no difficulty, with the exception of the buds and bulbs, in naming the parts of the plants which could be used, for which they sometimes had to give an explanatory name. During the fieldwork, they were also quick to assist the local collectors by explaining if a plant to which they were referring belonged to a specific local category, for instance that it was not a shrub (g*ikamba),* but a tree (*muti)*. The knowledge of those wild plant parts which were required for use is very important as it demonstrates whether a plant expert knew exactly what part of the plant to collect, and also bearing in mind that certain plants have to be harvested during specific seasons. Likewise, information was needed about the people's knowledge of the availability of particular wild plants, especially the plant parts during well-defined periods of time of the year. In this context, special attention was paid to people's knowledge of the way in which many plants are prepared for use. This information provides insights into the degree of experience the respondents acquired of the preparation and use of their local plants. It was also important for assessing whether the plant experts knew the precise dosage of the herbal medicine prepared from wild plants.

Such information is important to the assessment of people's ideas about and practices of conservation, as it indicates a local method of careful and restricted collecting of specific plants which would conserve the plants for second and third harvestings. Incontrovertibly it was important to know the plants used, the parts required and preparation, but the knowledge of portions or amounts for the application of the medicine was also vital as this information avoids waste through overproduction and excessive harvesting. Eventually, the qualitative surveys identified a range of factors involved in the use of wild useful plants in the study area, including socio-demographic, psycho-social, socio-economic and institutional factors which interact mutually in relation to the patterns of use of wild plants by the respondents in the three sample survey villages. Finally, the next step to conduct quantitative study was set in place. The next section describes the way in which the spread of these qualitative phenomena can be documented in more detail and analysed quantitatively.

3.3 Quantitative Study

3.3.1 The Selection of the Sample Surveys

The qualitative survey methodology for the study in Meru just discussed, combined with the previously mentioned 'Ethnosystems Approach' to the study of indigenous knowledge and practice - designed to examine the specific role of relevant factors involved in complex processes of interaction at the individual level -, reveals the need for an explicit quantitative comparison of data between and among groups and communities in the same culture area. Such a quantitative methodology was greatly boosted by the subsequent multivariate analysis of quantitative variables involved in the knowledge, belief, and use of plant resources. As indicated before, the methods of quantification of data bolstered both the contribution to explanatory and predictive value of results and the related multivariate analysis. Such 'subjective' and 'invisible' factors as perceptions, cosmologies and belief systems may be transformed statistically into 'objective' system variables for analysis, eventually reinforcing the applied implications of the outcome variables for future sustainable wild plant use and conservation efforts in the research area.

Since this quantitative approach is also supported by current efforts to increase the mutual understanding between global and local knowledge, a number of ethnoscientists are busy endeavouring to increase the integration and synergy among these systems in a number of ways. Conventional descriptive methods certainly assist in the documentation of indigenous knowledge, beliefs, cosmologies and practices, and recent developments in data collection and analysis have introduced this kind of research methodology to advanced, complementary qualitative and quantitative approaches. As Slikkerveer (2001) notes, recent advances in quantitative ethnoscience have attempted to improve the field of study by introducing and extending quantitative methods in both data collection, analysis and interpretation of results. Prance (1991) introduced this new approach into ethnobotany in 1987. It was then elaborated by Philips & Gentry (1993a and b) as: *'the application of quantitative techniques to the direct analysis of contemporary plant use data'.*

Generally speaking, quantitative methods and techniques indubitably strengthen both the indicative and the predictive value of variables in ethnoscience research, and importantly they also permit cross-cultural comparison of data between and among different communities. The application of this methodology to the study of biocultural conservation in Bali, Indonesia, by Agung (2005) has paved the way for an increased understanding of phenomena and processes in human-environment interactions, eventually contributing to community-based resource conservation and sustainable development. The implementation of advanced, quantitative analytical tools has augmented the collection of detailed quantitative data on specific subjects, involving the application of such techniques as preference and matrix ranking, paired comparisons and triad comparisons (*cf.* Martin 1998). The quantitative survey consists of three subsequent phases: the selection of three representative sample survey villages; pre-testing of the structured questionnaire; and the execution of the actual quantitative household surveys. In this study, the selection of the sample survey villages was carried out with the goal of attaining a fairly evenly balanced image of human-plant relations which was representative of the entire Meru region. The pre-testing of questionnaires was undertaken in order to determine whether the questions in the survey were structured in accordance with the sequence of the analytical model, and would be readily understandable to the respondents. As the next section describes, the questionnaire was constructed to reflect as many issues relevant to the participant’s emic point of view as possible.

In order to measure the spread of data collected from the complementary qualitative surveys in Meru, the quantitative surveys were conducted in three comparative villages, selected as representative for the three Districts of the Greater Meru region: Meru South; Meru Central; and Meru North. The selection criteria for the sample survey villages included the geographical administrative Location, evenly distributed over the three Districts of Meru and comparable eco-zones in the selected villages. Embarking on the body of knowledge accumulated in recent behavioural studies, the methodological strategy was focused on the measurement of levels of different categories of factors which were shown by these studies to influence or determine the related patterns of behaviour in a differential way. Therefore, the methods of measurement most suited to these relations and interactions were applied in household surveys in which no formal, subject-specific statistics on human behaviour are yet available. As Kohn *et al.* (1996) note: *'Household surveys are also a means of obtaining use data where, as in some study areas, adequate records are not available: in addition, a survey is essential for obtaining cumulative use patterns of individuals'*. Although the category of the 'hard' socio-demographic factors of age, sex, education, marital status and so forth can be empirically verified outside the household surveys, such 'soft' factors as knowledge, perceptions, beliefs and opinions are best obtained during interviews conducted during the household surveys. Similarly, although it would perhaps be ideal to follow all respondents in quantitative studies over the generally accepted longitudinal period of twelve months to observe, measure and verify their patterns of behaviour empirically, research has shown that, although certain differences between empirically measured patterns of behaviour and the patterns reported retrospectively during interviews do exist, the assessment of relationships and interactions in the overall processes among the various categories of factors has been shown to attain a high level of comparability (*cf*. Kohn & White 1996; Agung 2005; Slikkerveer 2006).

As a preparation for the household surveys, the three Chief Assistants chosen from the three Districts received a short training in the methods and techniques of conducting household surveys. The selection of the household heads to be interviewed was made at random. The first individual was suggested by the chief informant one of whom was selected for each of the three sample survey villages. Any inhabitant of the villages who was unwilling to co-operate was omitted from the sample. Such reluctance was an exception as most respondents selected seemed rather proud, as they experienced their interview as an expression of the great value of their individual knowledge and practice. They were very happy to answer many questions concerning 'their' indigenous plants in terms of related psycho-social, socio-demographic, socio-economic and intervening factors, and their use and conservation practices of wild plants.

The measurement of socio-demographic factors included the documentation of the household size, sex, age, formal education, marital status and profession, enabling an understanding to be built up of how each of these factors influenced the life of the respondents in relation to their use of wild plants. Certain difficulties were to be expected in the determination of such factors as the number of children in a household group and the age of respondents, in which case contextual questions were helpful in obtaining the correct information. Similarly, psycho-social factors of knowledge, belief and perceptions were difficult but important factors to document as information reported by the respondents in relation to the useful wild plants. For the determination of the Socio-Economic Status (SES) of the household, a number of subjective and objective criteria were used, which combined to determine the actual socio-economic status: 'poor'; 'average'; and 'rich. These criteria were based on the assessment of the interviewer, and shored up by such indicators as 'type of house', 'area of land', 'number of livestock', 'possession of a car', 'telephone', 'radio', or 'TV'. Given the special interest of the study in the people's knowledge, belief and practice related to the conservation of useful wild plants, this issue was measured by the respondent's perceptions and ideas about this topic, and the

practice of restricted use and re-planting of wild plants and trees. Likewise, questions also focused on the practice of the replacement of trees felled in the forest in conjunction with re-planting practices to counter the rate of felling. The qualitative study had shown that if there were no conservation practices or respectively the rate of felling trees exceeded that of planting, this was an indication of 'no' conservation or 'low' conservation practices, but if there were planting practices or should the planting exceed the felling, this indicated 'high' conservation. When a respondent reported that cutting and planting of the same number of trees was practised, the rate of 'average' conservation was given.

In view of the possible influence of intervening forces such as Government policies and non-gevernment regulations, the quantitative study also needed to measure the local people's perception of these policies and regulations which encourage or discourage the use and conservation of useful wild plants in the area. Information gathered dealing with environmental conservation, revealed that there were no particular laws as yet prohibiting Kenyans from making use of wild plants. There was also no information available about any policies and regulations designed to hinder or encourage wild plant use in the country. On the informal side, quantitative data were collected to assess to what degree public slogans and mottos of NGOs and other environmental institutions are related to use and conservation of wild plants. Such institutions include the Kenya Wildlife Service (KWS), the East African Wildlife Society (EAWS), the Green Belt Movement (GBM), the National Environment Management Authority (NEMA), the National Museums of Kenya (NMK), and the Forestry Services Department (FSD).

3.3.2 Composition of the Questionnaire

Following the objective of conducting the comparative quantitative surveys to buttress the key issues in human-plant relations in Meru, identified during the qualitative survey, the measurement of the spread of factors and processes related to the reported differential wild plant use behaviour was carried out by using a structured questionnaire. The final version of the questionnaire is sub-divided into five main sections, referring to the design of the analytical model as described in the next section.

The *first section* of the questionnaire was composed of general questions dealing with the introduction to the interview, the purpose and expected results of the research, and the standard documentation of the interview as part of the overall sample survey in the three villages.

The *second section* of the questionnaire focused on the documentation of the various categories of the background characteristics of the respondent, covering such factors as the predisposing socio-demographic and psycho-social factors, and the enabling socio-economic factors.

The *third section* of the questionnaire included the intervening factors of differential plant use behaviour, as reported by the respondents.

The *fourth section* of the questionnaire encompassed the two dependent variables of use behaviour of wild medicinal and non-medicinal plants as reported by respondents over the preceding twelve months in the study area of Meru.

The *fifth section* of the questionnaire covered information concerning additional issues related to useful wild plants in Meru, conductive to the interpretation of the results on the subsequent analyses of data from the analytical model.

As will be elaborated in the next section, the division and set-up of categories of relevant factors followed the design of the analytical model of plant use behaviour, in which the *factors* of the

survey are operationalised as *variables* in the model. Hence, the sequence of factors followed the structure of the variables:

Section 1:	*Introduction*:	Names of the two collaborating institutions: Title of the Study: Name of the Interviewer: Name of the Assistant: Details concerning the respondent's Location: Date and place of the interview:
Section 2:	*Background information*:	General information on the respondent's household
Section 3:	*Independent variables:*	
	Predisposing factors:	Socio-demographic factors Psycho-social factors
	Enabling factors:	Socio-economic factors
	Environmental factors:	Village location factors
	Intervening factors:	Institutions, policy and planning factors
Section 4:	*Dependent variables:*	
	Outcome factors	Wild medicinal plant use factors Wild non-medicinal plant use factors
Section 5:		Additional questions relating to useful wild plants

The formal questionnaires were compiled in English and the interviews with respondents were also conducted in the same language as the researcher and the assistants were fluent in both English and the Meru languages. When the respondents also understood English, the questions were posed in this language. Depending on the respondent, the interviews took between one to three hours. The variation in time depended on the degree of education of the respondent: about one hour for those who were educated and could speak English and two or more hours for others, including the elderly respondents, who needed some extra time as a result of their age. The older respondents sometimes tended to drift into longer stories, and required patience to keep them on track. As will be described in chapter V on the household surveys in the three sample villages, the target population in Meru included the entire spread of village communities in the research area from which a random sample was drawn from among all household heads in order to achieve maximum representation of results.

3.4 The Construction of the Conceptual Model

3.4.1 The Interactive Model of Wild Plant Use Behaviour

The study of the dynamic human-plant relations in Meru focused on the process of various categories of independent variables interacting with dependent variables encompassing the differentiation in wild plant use behaviour. The analysis of these interactions among background characteristics related to patterns of human behaviour sought to identify particularly significant factors as determinants, each of which might show a certain variability in their influence on the behaviour pattern reported by respondents over a period of time of twelve months preceding the surveys. Possible relevant factors

known from other studies were identified and formulated after the qualitative surveys of the target population, and formulated into questions pertaining to the data gathered from respondents, followed by the translation into variables of the analytical model presented in Figure 3.1.

In current efforts to increase the mutual understanding between global and local knowledge systems, a number of ethnobotanists - in collaboration with local peoples and extension agents - are seeking to achieve better integration between these systems in a variety of ways. Besides the conventional descriptive methods used to record local classifications and uses of plant species, recent developments in data collection and analysis have taken ethnobotanical research methodology to advanced qualitative and quantitative approaches. Prance (1991) introduced this new approach in 1987, and this is defined by Philips and Gentry (1993) as: *'the application of quantitative techniques to the direct analysis of contemporary plants use data'*. Unquestionably, quantitative methods and techniques strengthen the indicative and predictive value of factors or variables in Ethnobotanical research, and they also permit cross-cultural comparison of data between and among different ethno-linguistic groups and communities. In this way, increased understanding of phenomena and processes will contribute to improve resource conservation and sustainable community development.

Since quantitative analysis is enormously dependent on the availability and reliability of quantitative field data, and the refinement and extension of data collection, the specific methods and techniques have attracted the attention of ethnobotanists. Therefore, the development of a variety of methods, ranging from structured and semi-structured interviews, participant observation, household surveys, and various forms of comparative methods, have enabled the compilation of ethnobotanical data sets, including socio-demographic, psycho-social, enabling, environmental, conservational and intervening factors operational in ethnobotanical knowledge and practice, specifically conducive to the analysis of plants use behaviour of respondents. Incontrovertibly, the refinement in analytical tools has honed the quantitative analysis of detailed quantitative data on specific subjects, involving the use of preference ranking, matrix ranking, paired comparisons and triad comparisons.

In the work of processing and analysing data techniques, the recent advance in statistical methods and computerized data theory have enabled ethnobotanists to proceed apace from simple enumerations to complicated multivariate analyses which elucidate the explanation of complex relations and interactions between different factors involved in the use behaviour of plant resources. The initial analysis of the association between each determinant - or independent - variable against the outcome - or dependent - variable can easily be measured by the rather simple statistical technique of defining a two-way table or data matrix, constructed with objects as rows and variables as columns. When the various categories of factors in the analysis are grouped together as variables in data sets, the basic linear technique of simply relating the first and the second data set is called a 'bivariate canonical correlation analysis'. In general, as a result of the increasing complexity of quantitative ethnobotany in which the relationships among several variables or groups of variables are assessed and interpreted, the use of advanced computer software has become indispensable. Various useful computer packages have been developed, including Statistical Programs for Social Sciences (SPSS), CANALS, PRINCALS and OVERALS *(cf.* Van der Burg 1983; Slikkerveer 1990).

In the representation of the relations in analytical models, the *factors* are redefined as *variables*. This technique reveals possible interaction between one independent variable - for instance wild plant knowledge - with one dependent variable - for instance the reported use of a wild plant species. However, complications in the analysis occur when all independent and dependent variables are brought into the analysis. The problem arises because of the interactive influence among and

between the data sets of independent variables in relationship to their influence on the data set of dependent variables. This problem has been solved by the development of multivariate analysis techniques including the 'basic correlation analysis' to measure the general relationships among variables, 'cluster analysis' to assess similarities or dissimilarities among variables, 'principal component analysis' to determine variance among variables, and 'regression analysis' to establish quantitative relationships among variables and prediction (*cf.* Van der Burg 1983; Slikkerveer 1990; Agung 2005).

The regression analysis also allows for the explanation of interaction between groups of variables, and as such is an appropriate tool for the explanation and prediction of behaviour as a dependent variable from a set of independent background, that is predictor variables. For the measurement of the predicting value of different sets - or 'blocks' - of background variables in interaction with each other and with a set - or 'block' - of dependent variables, the choice of a non-linear correlation analysis has the advantage that it is a technique which may lead to different solutions from different starting points.

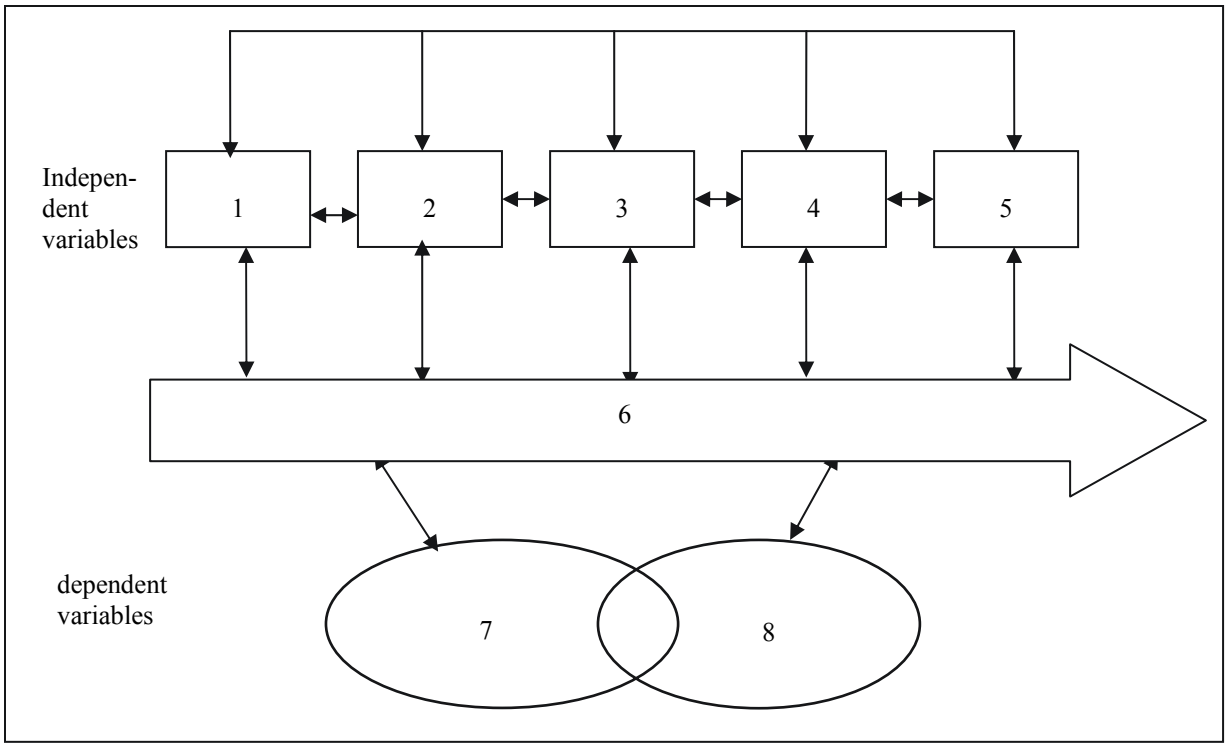


Figure 3.1 The conceptual model of relationships between independent and dependent variables of wild plant use behaviour in Meru, Kenya.
(*Source:* Adapted from Kohn & White 1976; Slikkerveer 1990; Agung 2005).

The selection of the model appropriate to the explanation and prediction of wild plant use behaviour in the study area is based on a strategy in which three subsequent analytical phases are implemented: the bivariate analysis; the multivariate analysis; and eventually the multiple regression analysis. For embarking on the general aim of this study to analyse and explain the role of various categories of factors involved in the complicated interaction process of human-plant relations in Meru from the indigenous people's point of view, the most appropriate analytical model is a particular multivariate model, developed by Van der Burg (1983) and Slikkerveer (1982; 1990; 1999, 2005), used in

predominantly trans-cultural settings on interacting local and global knowledge systems (*cf*. Figure 3.1). The final regression analysis allows for predicting values of response, dependent variables from a group of explanatory, independent variables, and as such is appropriate to the explanation and prediction of behaviour as a dependent variable from a group of independent background (that is, predictor variables). In addition, multiple regression models also encompass interaction terms between and among variables. For the measurement of the predicting value of different sets (or 'blocks') of background variables in *interaction* with each other and with a set (or 'block') of dependent variables, the choice of a non-linear correlation analysis has the advantage of a technique which may lead to different solutions from different starting points (Van der Burg 1983). In this application, the selected multivariate analysis is able to cover all the variables in the survey without discriminating between variables or 'blocks' of variables, and allows conclusions to be drawn on *correlation, interaction* and *predictability* using the canonical correlation analysis of the total number of variables. However, when an explanatory model of use behaviour with wild plants had to be developed, multivariate analysis was used to examine the correlation among 'blocks' of independent background variables with the 'blocks' of dependent variables of the various uses of plants in the model.

Although such a model could also be developed as a pathway model using a linear partial canonical correlation analysis, a non-linear correlation analysis (OVERALS) is preferred as it increases the predicting value on use by respondents in the survey from an increasing number of background variables. The model of wild plants use behaviour, in which the calculated correlation coefficients indicated separately, is constructed on the basis of the position and interaction among 'blocks' of various groupings of independent and dependent variables. A further understanding of the complex coherence between variables and their accompanying observations or categories is achieved by projecting the correlations as points onto the space of the canonical variates known as the *canonical space*. If the variable points are geographically connected with zero, a vector diagram is created which shows the links between the variables and the canonical variates. The length of the vectors indicates the relative significance of the variables. The coherences between variables could be enhanced further by studying the degree of convergence between the dependent variable and the independent variables. Eventually, the final analytical model in which all calculated multiple regression values are presented in the analysis Chapter IX in Figure 9.3.

3.4.2 Blocks, Factors, Variables and Indicators

In order to understand the meaning of the concept of *factors*, it is necessary to regard it as part of a measurement process which defines the numbers to objects or events involving relationships which specify *concepts* and translate them into *variables* which can be measured. These measurement techniques are then translated into the units of *indicators* and *categories*. The various ‘sets’ of variables or ‘blocks’ in the study of wild plant use behaviour in Meru composed of independent predisposing, enabling, environmental, conservation, intervening factors, and dependent plant use behaviour factors are further formulated in the Tables 3.3 - 3.10 according to the steps in the measurement process, mentioned above. The relationships which exist among data, ranging from the *phenomenon* to the *conception* the measurement process in the study of wild plant use behaviour in Meru are represented in Figure 3.2.

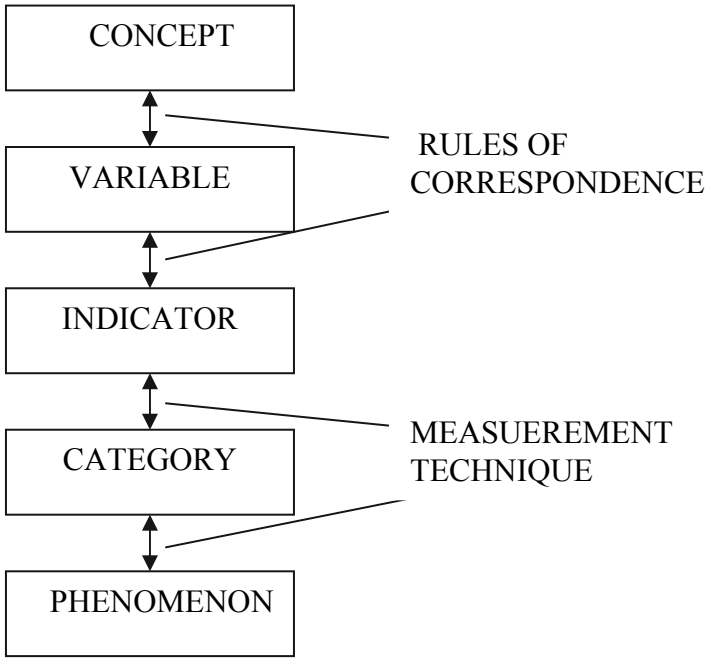


Figure 3.2 Links in the measurement process of wild plants use behaviour in Meru, Kenya.
(*Source*: Kohn & White 1976: 25).

The multivariate model of the study presented in Figure 3.1 is built on eight categories or 'blocks' of factors as follows:

Block 1 Predisposing factors (socio-demographic factors);
Block 2 Predisposing factors (psycho-social factors);
Block 3 Enabling factors (socio-economic status factors);
Block 4 Environmental factors (environmental factors on the respondents' location);
Block 5 Conservation factors (plant cutting and planting factors);
Block 6 Intervening factors (policies and regulations factors);
Block 7 Medicinal plant use factors (behaviour factors); and
Block 8 Non-medicinal plant use factors (behaviour factors).

The composition of these various factors and blocks of the analytical model is explained as follows:

Block 1 and Block 2: Predisposing Factors
These factors include socio-demographic factors of the household head at the individual level and composed of *household size*, *sex*, *age*, *formal education*, *marital status*, and *profession*. The qualitative survey intimated that the composition of the households, sex, formal education, marital status and profession of respondents are expected to influence the use behaviour differentially. Each factor is documented and analysed in order to assess its determinant role in the reported process of wild plants use behaviour in Meru (*cf.* Table 3.3).

Table 3.3: Block 1: Predisposing factors: concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
Socio-demographic characteristics at the individual level	household size	number of household members	1-3 members; 4-6 members; 7-9 members; 10 + members.
	sex	sex	male; female
	age	number of years	21-30; 31-40; 41-50; 51-60; 61-70; 70 +.
	formal education	level of schooling	none; primary; secondary; tertiary.
	marital status	marital status	single; married (mg); married (pg); divorced; widowed.
	profession	profession of hh head	farmer; herdsman; civil servant; entrepreneur; pensioner; landlord/lady; house servant.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Household size

Theoretically, as has been found elsewhere, in an area in which most people earn less than one dollar a day, families with larger households will depend more on any available resource to cater for their daily needs (*cf.* District Development Plan 2002-2008). The number of members could influence the way of use of wild plants, rendering the factor of *household size* an interesting variable in the analysis of use behaviour.

Sex and Age

In Africa, in Kenya and Meru in particular, the roles of women and men are clearly defined. Usually, women only wander into the forest to collect dead wood for fuel or young branches to sweep the homestead. Men collect wood and plants for such purposes as building or medicine. Therefore, it may be expected that gender plays an important role in the use behaviour of the wild vegetation, and therefore special attention is paid to the 'sex' of the respondents in relation to this in the study. In the Meru tradition, children tend to comb the bush, looking for berries, but adolescents resort to this sort of behaviour only in times of famine and droughts. Sometimes, age and experience complement each other in the level of knowledge and use of wild plants, where older, more

experienced people tend to know exactly which plants are used for what purpose, and in what kind of habitat they grow.

Formal education
Literacy levels as the result of formal education in Meru are above 60 per cent, indicating that more than half of the Meru population is 'educated' or has formal education at least to the end of primary school . The qualitative study indicated that knowledge acquired from formal education included the various characteristics of plants, trees and related vegetation types. Consequently, the inhabitants' use of plant resources was influenced by their level of knowledge, obtained from formal education. The higher the level of education attained by the inhabitants of Meru, the greater the assumption that they would have higher levels of knowledge of the environment and its resources, including indigenous wild plants. Similarly, local forms of informal education in the communities influenced the practical knowledge of wild plant use to meet local needs for medicine, food and fuel.

Religion
The people of Kenya, and indeed Meru are deeply religious with 78 per cent of the population adhering to Christianity, 10 per cent to Islam, 10 per cent to traditional religions and the remaining 2 per cent are affiliated with Hinduism, Jainism and the Bahai faith (*cf.* Wikipedia 2007). In the past, Christian missions put enormous effort into discouraging their followers in the use of herbal medicine, as they told the people that the use of these medicines was a heathen practice and as such regarded as a sin. In the past, this attitude led some followers to abandon such practices or perform them only in secret.

Marital status
The qualitative study also indicated that married polygynous households could be expected to use wild plants to meet their medicinal and nutritional needs more than a monogamous family and hence exert influence on the use behaviour, while widowed, single and divorced household heads would use more or less the same depending on their needs. These are issues which had to be looked into in order to understand the behaviour of the Meru towards their wild flora. Assessment of the influence exerted by marital status was therefore included among the variables.

Profession
On the basis of knowledge accumulated in a number of studies on human behaviour, it is assumed that profession would be a significant determinant in the overall analysis of utilization of natural resources, including wild plants. Various groups of people in the community are engaged in farming, the herding of cattle, formal employment as civil servants, entrepreneurs and land and property owners, while others depend on monthly pensions for their livelihood after their retirement from formal employment. As the various categories of professions in the local communities was expected to influence the use of wild plants in a differential way, the analysis embarked on a sub-division including the following professions: farmers; herdsmen; civil servants; entrepreneurs; pensioners; landlords/ladies; house servants.

Block 2: Psycho-social factors
The psycho-social factors relevant to the Meru people included in the study encompass such fields as *knowledge*, *belief*, *attitude, environmental awareness, preparedness to pay*, and desire to improve it, and the *experience* of the household head with wild plants use. Table 3.4 presents the concepts, variables, indicators and categories in Block 2 of the analytical model. As the assessment of the

factors in this Block of the model includes the documentation of 'soft' factors during the household surveys, their measurement requires special techniques in order to reach a non-normative but fairly realistic validation. Therefore, the qualitative part of the study will also be used was to identify the margins of such cognitive phenomena of knowledge within the domain of the communities concerned, followed by the execution of a nominal distribution. The advantage of this technique is that the knowledge level of participants is measured on the basis of local parameters operational within the target group itself - and not on the basis of external parameters. Similarly, such measurements of these factors in the context of the community also benefited from the assessment of the interviewer/researcher who happens to belong to the local Meru population group represented in the study area.

Knowledge of wild plants
Knowledge of useful wild plants is a significant factor since it is quite out of the question simply to pluck a plant blindly and use it. From local plant experts it was possible to learn such *knowledge* as where the plant could be found (habitat), when it was in season, and the parts which are useful, all vital clues to its ultimate use. Knowledge is therefore a significant requirement to use wild plants properly and efficiently, thereby influencing the behaviour of the respondents. Furthermore, factors related to the knowledge of plant names, classification and use have been included in the variable of *knowledge of wild plants*.

Knowledge of wild plants among children
If the use of wild plants was to be sustained beyond the living generations, then the transfer of knowledge to children would be of significance as this has been the mode of passing down knowledge among the Meru since the times of *Mbwaa*. Oral traditions indicate that knowledge passed down to children, and children's children, is preserved for generations. The factor on *knowledge of wild plants among children* is therefore meant to assess the extent to which respondents imparted knowledge of useful wild plants to tie future generation. It is clear that there will be variation on this factor, depending on the specific use and the opportunity of the children to learn from parents and other household members. The factor has to measure which parents did teach their children the use of wild medicine, food, materials, social, fuel, environmental, non-vertebrate poisons and bee plants. Although this factor indirectly relates to the process of non-formal education within the household group, the measurement is taken of the actual level of such knowledge among the children in the household group.

Belief in wild plant use
Despite the difficulty presented by quantitative measurement, belief plays a very significant role in the use of wild plants as part of the overall belief system among the Meru. If respondents reported they did not believe in the efficacy of wild plants for medicine, food, materials and such like, there was a high probability they would not use them. If they also believed that these plants were poisonous or that their use was outdated and no longer fashionable, they would not use them either. It was important therefore to acquire information about what the people believed about wild plants, and how this could be related to the practice of wild plant use. As most Meru people reported they were Christian, it was necessary to find out whether their faith did have any influence on their use of wild plants. The Christianization of the Meru community under colonial rule in the early nineteenth century resulted in the condemnation of indigenous herbalists who were stigmatized as *witch doctors* and *sinners* by the missionaries and colonial rulers*;* indeed some of them were even jailed or

heavily fined for encouraging the local people to use herbal medicine instead of the modern drugs which were provided by the colonial Government and Christian mission clinics.

Attitude towards wild plant use

As in the case of the factors of knowledge and belief, in other studies on human behaviour the factor of attitude towards the use of wild plants has been shown to exert a strong influence on the reported patterns of behaviour in several contexts. The measurement of this factor encompasses a scale from low to high, representing the level of the respondents reported attitude in the final analysis.

Table 3.4: Block 2: Predisposing factors: Concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
Psycho-social characteristics at the individual level	knowledge of wild plants	level of knowledge	low; average; high;
	knowledge of wild plants among children	level of knowledge	N/A; no; partly; fully.
	belief in wild plant use	level of belief	low; average; high.
	attitude towards wild wild plant use	level of attitude	low; average; high.
	awareness of plant environment	awareness of quality of environment	low; average; high.
	preparedness to pay for wild plants	preparedness	no; yes.
	perceived need of wild plant resources	need for wild plant resources	yes; no.
	experience in use of wild plants	level of experience	low; average; high.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Awareness of wild plant environment

It was important to measure whether the Meru people were actually aware of the position of their plant environment, affected by the availability of fresh air, environmental sustainability, a climate with sufficient rainwater, the prevention of soil erosion, natural protection from strong winds, and fodder for wildlife. The measurement was based on the respondents' awareness of current state of their wild plant environment.

Preparedness to pay for wild plants

The documentation of the factor regarding a respondent's preparedness to pay for useful wild plants was meant to assess the value which the respondent gave to wild plants. The value attached to wild plants also indicated the efforts spent on using wild plants in the area.

Perceived need of wild plant resources

The factor of perceived need of wild plant resources indicated the personal need of the respondent for a specific wild plant as the natural product for medicine, food or another local commodity, and also revealed the need among the community for wild plants as part of the indigenous system of use and conservation of the plant resources, an important section of the overall culture in Meru.

Experience in use of wild plants

As in many other utilization-based researches, the factor of experience with human behaviour played a significant role in current practices. Consequently, the respondent's experience with the use of wild plants for various categories of use was measured as a major factor influencing plant use behaviour in the study area.

Table 3.5: Block 3: Enabling factors: concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
Socio-economic characteristics at the individual level	socio-economic status (SES)	level of SES	very poor; poor; average; rich; very rich.
	income of hh head	monthly income	poor; average; rich.
	type of house	wall structure, mud, wood, stone	poor; average; rich.
	type of roof	roofing material, tiles, *mabati*, grass	poor; average; rich.
	sleeping rooms	number of sleeping rooms	poor; average; rich.
	rural land	size of rural land	poor; average; rich.
	urban land	size of urban land	poor; average; rich.
	owning *kimeru* cattle	number of *kimeru* cattle	poor; average; rich.
	owning Grade cattle	number of Grade cattle	poor; average; rich.
	owning poultry-chickens	number of chickens	poor; average; rich.
	owning a car	number of cars	poor; average; rich.
	owning a television	number of cars	poor; average; rich.
	owning a telephone line	number of telephone lines	poor; average; rich.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Block 3: Enabling factors

The methodological considerations concerning the analysis of human-plant relations generally refer to a significant role of the socio-economic factors involved in the process. In Meru, as elsewhere in Kenya, cattle is generally regarded as an indicator of wealth among pastoralists, In addition, such other factors as income, type of house, the materials used for roofing and the number of rooms were also factors which contributed to the socio-economic status (SES) of the family. Moreover, naturally the possession of the area of land for farming and building served as an important factor. Although farming is a major occupation in Meru, the recent process of urbanization has caused the cost of land near the municipality to rise, and it can only be owned by people with ancestral land titles. Apart from cattle, other animals, including goats, sheep, and chickens also indicated the socio-economic status of the family. Family homes with luxury goods such as cars, television sets and telephones were generally also regarded a factor revealing the family status. Together, these factors indicated the socio-economic status of a household, which, in turn influenced the wild plant use behaviour of the respondents in the sample surveys (cf. Table 3.5).

Table 3.6: Block 4: Environmental factors: concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
environmental characteristics at the system level	environment	ecological location of village	rural; semi-rural; urban.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Block 4: Environmental factors

As the greater Meru region is administratively divided into three Districts, in the study each one of them was regarded within its own environment because each has unique characteristics and considerable diversity in vegetation. The Meru North District is relatively drier than the Meru Central and Meru South Districts, with a prevailing temperature of over 30ºC, while parts of Meru South are also relatively dry (*cf.* District Development Plan 2002-2008). This, of course, influences the vegetation type. Therefore Meru Central and Meru South Districts, which are located on the slopes of Mount Kenya, have denser, mountain vegetation. Moreover, there is a substantial variety in the development of the infrastructure. Meru Central District indubitably takes the prize, in contrast to Meru South District which is characterized as a more rural environment with the most farming communities of all three Districts. Therefore, the geographical location of the households in the three sample survey villages in relation to their environment is regarded an important factor in the plant use behaviour of the respondents. Table 3.6 presents the variables, concepts, indicators and categories in the environmental factors of Block 4 in the analytical model.

Block 5: Conservation factors

As described in the theoretical orientation to the study in Meru, the ongoing discourse on 'indigenous conservation ethic', the management and use of resources among indigenous peoples, is closely related to their conservation methods and practices. Consequently, the 'indigenous management systems' are a major interest of anthropologists and conservationists. The issue of local use and conservation of wild plants in the study area was included in the research, in which factors of conservation were measured on the basis of various indicators. Questions were asked about whether the local people cut down trees and harvested plants observing such conservation methods as restriction in use, replanting seedlings and the like. Similarly, it was intriguing to measure to what

degree wild plants were collected from the same village environment or from elsewhere. Here, the possible commercial purposes of wild plant collecting for the local market were also an indicator of wild plant conservation behaviour. Another important issue related to the measurement of the respondents' commitment to future use and conservation of particular wild plants resources which are under threat of extinction. Table 3.7 shows the factors in Block 5 on conservation factors including concepts, variables, indicators and categories.

Table 3.7: Block 5: Conservation factors: concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
Conservation factors	felling a tree	cut one last year	low; average; high.
	planting a tree	planted one last year	low; average; high.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Block 6: Intervening factors

As in similar studies on human use behaviour, the intervening factors represent characteristics which are related to outside forces, intervening at the local community level. These forces are generally regarded as the external 'agents of change', which influence or change behaviour patterns, or sometimes create a new behaviour deviating from traditional ways of life.

Table 3.8: Block 6: Intervening factors: concepts, variables, indicators and categories

Concept	Variable	Indicator	Category
Intervening characteristics at the system level	intervening awareness	knowledge of their existence	don't know; no; yes.
	encouraging policies and regulations	knowledge of their existence	don't know; no; yes.
	discouraging policies and regulations	knowledge of their existence	don't know no; yes.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

In Meru, the intervening factors include national and local policies and regulations of Government and non-Government institutions pertaining to issues of the conservation of culture and nature, as well as the imposition of national laws and regulations. These are just two of the intervening factors which are assumed to affect the traditional way of life, including the use of wild plants. Certain institutions which may encourage or discourage the use of wild plants are also expected to affect the people's use behaviour. For instance, fear of being punished by the authorities might possibly intimidate users, but the learning institutions encourage the teaching of the values of natural food, nutrition and medicine prepared from wild plants. Table 3.8 shows the composition of intervening factors in Block 6 in terms of variables, indicators and categories of the model. They include the Government and non-Government policies, plans, regulations and laws, which might possibly have been imposed, operational in the study area.

Blocks 7 & 8: Dependent factors:
In order to provide an in-depth analysis and explanation of the overall patterns of reported wild plant use behaviour for medicinal and non-medicinal plants, the dependent variables were formulated on the basis of data assembled during the preliminary pilot study indicating that in general, more than 50 per cent of the wild plants in Meru are used for medicinal purposes. This formed the basis of the construction of the first dependent variable: *wild plants use* in two sub-categories or blocks - *medicinal plant use behaviour* and *non-medicinal plant use behaviour* - as reported by respondents over the preceding twelve-month period of time in the research area. Table 3.9 shows the composition of the dependent factors of *medicinal plant use behaviour* in Block 7 in terms of variables, indicators and categories of the model. Table 3.10 shows the comparable composition of *non-medicinal plant use behaviour* in terms of variables, indicators and categories of the model. The composition of the variable of use of wild plants is based on the various categories of uses, as mentioned in the theoretical orientation of the study, including the use for medicine, food, material, social, environmental, non-vertebrate poisons and use as bee plants. Tables 3.9 and 3.10 represent the two related dependent factors of respectively medicinal and non-medicinal use behaviour, including concepts, variables, indicators and categories.

Table 3.9: Block 7: Dependent factors of wild medicinal plant use behaviour: concepts, variables, and categories.

Concept	Variable	Indicator	Category
Dependent characteristics of non-medicinal plant use behaviour at the individual level	medicinal plant use	medicinal plant use	very low; low average; high; very high.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

Table 3.10: Block 8: Dependent factors of wild non-medicinal plant use behaviour: concepts, variables, indicators and categories.

Concept	Variable	Indicator	Category
Dependent characteristics of non-medicinal plant use behaviour at the individual level	non-medicinal plant use	non-medicinal plant use	very low; low; average; high; very high.

(*Source:* Adapted from Slikkerveer 1990; Kohn & White 1996; Agung 2005).

So far, the considerations underlying the choice of the appropriate research methods and techniques to be implemented in the study in Meru Kenya, encompassing the specific ethno-methodologies and the Ethnosystems approach which includes the Participants View (PV), the Field of Ethnological Study (FES) and the Historical Dimension (HD) as well as the formulation of both the qualitative and the quantitative surveys have been presented. The qualitative methods include both the ethnobotanical and botanical surveys encompassing Meru knowledge and practices, plus the collection, documentation and preservation of useful wild plants. Meanwhile, the quantitative methods have revealed elaborate details on the selection of the sample survey as well as the construction of the questionnaire. Finally, the steps followed in the construction of the conceptual model have been listed to give details of the composition of the model blocks, factors, variables and

indicators. The next chapter therefore will provide an overview of the background to the *research setting* in Kenya and Meru. The geography and climate of Kenya will be presented in addition to its history, followed by a description of Kenyan society before and after independence. Thereafter, the origins of the Meru people, their historical immigration and eventual settlement in the larger Meru region will also be presented so as to provide the socio-cultural context to the study of their wild plant use behaviour.



Map 4.1 Kenya and the central location of Meru.
Source: © www.Maps.com

IV Research Setting: Kenya and Meru

This chapter provides a short overview of the wider context of the research, placing the sociography of Greater Meru region against the socio-historical background of Kenya as a newly-developing nation, addressing Kenya's geography and climate, as well as its history. The *first part* highlights, the current socio-economic development of the country in the light of its prominent position in East Africa. The *second part* describes the origin of the Meru population and its subsequent distribution over the Greater Meru region. The geography, climate, landscape and natural resources of Meru are described in more detail, and the history and culture of the pre-Meru is described followed by a brief overview of the present-day Meru people after their settlements in the Greater Meru region. In this context, the emergence of the *Ngaa*, the pre-Meru people who lived on an island in the Indian Ocean, their migration to the mainland, and their eventual settlement on the north-eastern slopes of Mount Kenya is highlighted. The settlement pattern of the Meru people is presented, covering details of their communities in the various Districts, Divisions, Locations and sub-Locations.

4.1 The Republic of Kenya

4.1.1 Geography and Climate of Kenya

Kenya is located in East Africa. It borders the Indian Ocean in the east, Ethiopia and Sudan in the north and Somalia in the north-east, Uganda in the west and Tanzania in the south. It is located between geographical co-ordinates 1°00" N, and 38°00" E, and covers a total area of 582,650 km² of which 569,250 km² is land. Nairobi is the country's capital city, and Mombasa and Kisumu are the second and third largest cities respectively. It has a coastline with a length of 536 kilometres. The Kenyan climate varies from tropical along the coast to arid in the north and north-eastern interior. The terrain consists of low plains and rises to Central Highlands which are bisected by the Great Rift Valley, and the fertile plateau in the west. The altitude is lowest at zero on the coast and highest on Mount Kenya, which rises 5,199 m above sea level. Altitudes which range from 3,000 - 5,199 m. above sea level influence atmospheric pressures which cause a wide variety of micro-climates and agro-ecological zones. There are several inland lakes including Lake Victoria, Lake Turkana, Lake Nakuru, Lake Naivasha and Lake Natron. Kenya enjoys a tropical climate as it is hot and humid on the coast, temperate inland and very dry in the north and north-east parts of the country. Nairobi has temperatures ranging from 12-28, Mombasa 22-35, Kisumu 20–30, Eldoret 9-23 and Mandera 25-35 degrees centigrade. There is plenty of sunshine all year round, although it can be quite cool at night and in the morning. The long rains come from April - June (*Uthima*), while the short rains occur from October - December (*Urugura*). The hottest times of the year are from January - March (*Thano mucheke*), and August - September (*Thano mukungugu),* while the coldest are in June - August (*Julai*). Map 4.1 shows the Map of Kenya and the location of the study area of Meru.

4.1.2 The History of Kenya before Independence

The Portuguese were the first Europeans to invade and explore Kenya, when Vasco da Gama came to Mombasa in 1498. Their rule was centred mainly on the coastal strip from Malindi to Mombasa. The Portuguese colonial presence in East Africa officially began in 1505, when warships under the command of Don Francisco De Almeida bombarded and plundered Kilwa, an island located in what is now southern Tanzania. Thereupon, the Portuguese took Mombasa following the refusal to pay

tribute by the town's leaders. Attacks on Hoja - now known as Ungwana, located at the mouth of the Tana River - Barawa, Angoche, Pate and other coastal towns followed until the western Indian Ocean was a safe haven for Portuguese commercial interests and tribute was paid to the Portuguese Crown by all the city-states along the East African coast. The Portuguese colonial presence served two primary purposes: the extraction of tribute and the control of trade in the Indian Ocean region by pursuing a sort of regulated piracy. The first objective was only partly successful by all accounts as local East African rulers frequently rebelled against them. However, the depredations of their naval vessels were very disruptive to the trade on the western Indian Ocean and they were able to demand high tariffs on items transported by sea due because of their strategic control of ports and shipping lanes. The construction of Fort Jesus in Mombasa in 1593 was meant to solidify Portuguese control in the region, but their influence was brought to an end by the British, Dutch and Omani Arab incursions into the region during the seventeenth century. The Omani Arabs posed the most direct challenge to the Portuguese influence in East Africa and besieged their fortresses openly attacking naval vessels and finally expelling them from the Kenyan and Tanzanian coasts by 1730 (*cf*. Government of Kenya 2007; Magickenya.com 2007; Wikipedia 2006; Wikipedia 2007).

The colonization of the Kenyan and Tanzanian coasts by Omani Arab brought the once independent city-states under closer foreign scrutiny and domination than that which had been experienced during the Portuguese period. Just as their predecessors, the Omani Arabs were primarily able to control only the coastal areas, not the interior. However, the creation of clove plantations, the intensification of the slave trade and the relocation of the Omani capital to Zanzibar by Seyyid Said in 1839 had the effect of consolidating the Omani power in the region. Arab Government in all the major ports along the East African coast continued until the British interests - aimed particularly at ending the slave trade and the creation of a wage-labour system - began to put pressure on Omani rule. By the late nineteenth century, the slave trade on the open seas had been completely outlawed by the British, and the Omani Arabs had little ability to resist the British navy's capability to enforce the new rule. The Omani presence continued in Zanzibar and Pemba until the revolution of 1964, but the official Omani Arab presence in Kenya was curbed by German and British seizure of key ports and the creation of powerful trade alliances with influential local leaders in the 1880s. Even so, the Omani Arab legacy in East Africa is currently still found in their numerous descendants who settled along the coast. Their lines of descent are directly traceable to their Omani ancestors, typically remaining the wealthiest and most politically influential members of the Kenyan coastal communities.

The building of the Kenya-Uganda railway was begun near Mombasa about 1899. However, most historians consider that the colonial history of Kenya dates back to the establishment of a German protectorate over coastal possessions of the Sultan of Zanzibar in 1885, followed by the arrival of the Imperial British East Africa Company in 1888. Incipient imperial rivalry was forestalled when Germany handed its coastal holdings to Britain in 1890. Soon thereafter the Kenya-Uganda railway was built, passing through the country. Although this was also resisted by some local ethnic groups, notably the *Nandi* led by *Orkoiyot Koitalel Arap Samoei* for ten years from 1895 to 1905, it did not stop the British pursuing its construction. The *Nandi* were the first tribe to be put in a native reserve to preclude them from further disrupting the building of the railway. At the outbreak of the First World War in August 1914, the Governors of British East Africa - the name by which the Protectorate was known - and German East Africa agreed on a truce in an attempt to keep the young colonies out of direct hostilities. However, Lieutenant- Colonel Paul von Lettow-Vorbeck took command of the German Military Forces, determined to tie down as many British resources as possible. Completely cut off from Germany by the British Navy, Von Lettow conducted an effective guerrilla warfare campaign, living off the land and successfully capturing British supplies.

Eventually, Von Lettow surrendered in Zambia eleven days after the Armistice was signed in 1918. In its pursuit of Von Lettow, the British deployed Indian Army troops from India for which undertaking they needed large numbers of porters to overcome the formidable logistics of transporting the supplies far into the interior on foot. The Carrier Corps was formed, and ultimately over 400,000 Africans were mobilized, contributing to their long-term politicization.

During the early part of the twentieth century, British and other European farmers settled in the interior central highlands. They soon became wealthy farmers and coffee and tea growers. By the 1930s, approximately 30,000 white settlers lived in the area, and they were offered disproportional political powers because of their influence on the economy. The fact that this area was already home to over one million members of the *Kikuyu* tribe, most of whom lived as itinerant farmers as they had no land claims in European terms, despite the fact that the land belonged to this tribe, was conveniently overlooked. In order to protect their interests, the settlers banned the growing of coffee, introduced a hut tax, and the landless people were granted less land in exchange for their labour. A massive exodus to the cities ensued as there a living was to be found away from their dwindling land. In 1951, Sir Horace Hector Hearne became Chief Justice in Kenya. He arrived there from Ceylon, where he had been Chief Justice. He held his position in Kenya until 1954 when he became an Appeal Justice of the West African Court of Appeal. On the night of the death of George VI, 5 February 1952, Hearne escorted Princess Elizabeth, at that moment visiting the Treetops Hotel which is now a popular tourist attraction. Apprised of her father's death, Princess Elizabeth, who. 'went up a Princess and came down a Queen' returned immediately to England to be crowned as Queen Elisabeth II (*cf.* Government of Kenya 2007; Magickenya.com 2007; Wikipedia 2006; Wikipedia 2007).

From October 1952 to December 1959, Kenya was placed under a state of emergency as the result of the *Mau Mau* rebellion against British rule. The Governor requested and obtained British and African troops, including the King's African Rifles (KAR). In January 1953, Major- General Hinde was appointed Director of Counter-insurgency Operations, but as the political situation did not improve, General Sir George Erskine was appointed Commander-in-Chief of the colony's armed forces in May 1953, with the personal backing of Winston Churchill. The capture of *Warŭhiŭ Itote* (also known as General China) in 1954 and his subsequent interrogation brought a better understanding of the *Mau Mau* command structure. In 1954, 'Operation Anvil' was launched, and many *Mau Mau* supporters were taken to detention camps. In 1953, the *Home Guard* was officially recognized as a branch of the Security Forces. It was composed of loyalist Africans, not foreign forces such as the British Army and King's African Rifles, and formed the core of the Government's anti-*Mau Mau* strategy. By the end of the campaign, the Home Guard had killed no fewer than 4,686 *Mau Mau* members, amounting to 42.0 per cent of the total insurgents. The capture of *Dedan Kimathi* in Nyeri on 21 October 1956 signified the ultimate defeat of the *Mau Mau* and essentially ended the military offensive

4.1.3 Kenya after Independence

The politics of Kenya are conducted in the framework of a presidential representative democratic republic, in which the President of Kenya is both Head of State and Head of Government of a plural multi-party system. Executive power is exercised by the Government, and legislative power is vested in both the Government and the National Assembly. The Judiciary is independent of the Executive and the Legislature. Since independence in 1963, Kenya has maintained remarkable stability, despite drastic changes in its political system and the various crises in neighbouring countries. Particularly since the re-emergence of multiparty democracy, Kenyans have enjoyed an

increased degree of freedom. A cross-party parliamentary reform initiative in the autumn of 1997 revised some oppressive laws limiting freedom of speech and assembly which were inherited from the colonial era. The improved public freedom contributed to the generally credible national elections in December 1997. In December 2002, Kenyans held democratic, open elections which were judged free and fair by international observers. The 2002 elections marked an important turning point in Kenya's democratic history in which power was transferred peacefully from the single party which had ruled the country since independence to a new coalition of parties.

Under the present presidency of Mwai Kibaki, the new ruling coalition promised to focus its efforts on generating economic growth, combating corruption, improving education, and rewriting its constitution. These promises have only been partially met, however, as the new Government has been preoccupied with internal power disputes. In November 2005, the Kenyan electorate resoundingly rejected a new draft Constitution which had been supported by Parliament and President Kibaki. The President responded by dismissing his entire cabinet, and eventually appointed a new group of ministers. The next general elections are set to be held in December 2007. President Kibaki is likely to face Orange Democratic Movement-Kenya (ODM-K) presidential candidate Kalonzo Musyoka and his counterparts in Orange Democratic Movement (ODM), Raila Odinga. Orange Democratic Movement (ODM) is a name derived from the symbol which symbolized the no-vote (orange) during the 2005 constitutional review referendum.

After independence, Kenya promoted a rapid economic growth through public investment, encouragement of smallholder agricultural production, and incentives for private, albeit often foreign, industrial investment. Gross Domestic Product (GDP) grew at an annual average of 6.6 per cent from 1963 to 1973. Agricultural production grew by 4.7 per cent annually during the same period, stimulated by redistributing estates, disseminating new crop strains, and opening new areas to cultivation (*cf.* Wikipedia 2006). Between 1974 and 1990, however, Kenya's economic performance declined, especially in agriculture, largely as the result of inappropriate agricultural policies, inadequate credit, and poor international terms of trade. Kenya's inward-looking policy of import substitution and rising oil prices made its manufacturing sector rather uncompetitive. The Government launched a massive intrusion into the private sector, but the lack of export incentives, tight import rules, and foreign exchange controls made the domestic environment for investment even less attractive.

From 1991 to 1993, Kenya went through its worst economic performance since independence. Growth in GDP stagnated, and agricultural production shrank at an annual rate of 3.9 per cent. Inflation reached a record 100.0 per cent in August 1993, and the Government's budget deficit was over 10.0 per cent of GDP. As a result of these combined problems, bilateral and multilateral donors suspended programme aid to Kenya in 1991. In 1993, the Government of Kenya began a major programme of economic reform and liberalization. A new Minister of Finance and a new Governor of the Central Bank of Kenya undertook a series of economic measures with the assistance of the World Bank and the International Monetary Fund (IMF). As part of this programme, the Government eliminated price controls and import licensing, removed foreign exchange controls, privatized a range of publicly owned companies, reduced the number of civil servants, and introduced conservative fiscal and monetary policies. From 1994-96, Kenya's real GDP growth rate averaged just over 4.0 per cent a year. Despite these promising signs, in 1997 the economy entered a period of slowing or stagnant growth, in part attributable to adverse weather conditions and reduced economic activity prior to general elections in December 1997. In July 1997, the Government of Kenya refused to meet commitments made earlier to IMF on governance reforms. Consequently, IMF suspended lending for three years, and the World Bank also put a $90-million structural adjustment credit on hold. Although many economic reforms put in place in 1993-94 remained,

conservative economists believed that Kenya needed further reforms, particularly in governance, in order to increase GDP growth and combat the poverty which afflicted more than 57.0 per cent of its population. In 2000, GDP growth was negative, but improved slightly in 2001 as rainfall returned closer to normal levels. Economic growth continued to improve slightly in 2002 and reached 1.4 per cent in 2003; it was 4.3 per cent in 2004, 5.8 per cent in 2005 and 6.1 per cent in 2006 and 7.0 per cent in 2007 (*cf*. Government of Kenya 2007; Magickenya.com 2007; Wikipedia 2006; Wikipedia 2007).

The Government of Kenya took some positive steps towards reform, including the 1999 establishment of the Kenya Anti-Corruption Authority (KACA), and measures to improve the transparency of Government procurements and to reduce the Government payroll. In July 2000, IMF signed a $150 million Poverty Reduction and Growth Facility (PRGF), and the World Bank followed suit shortly after with a $157 million Economic and Public Sector Reform credit. The Anti-Corruption Authority was declared unconstitutional in December 2000, and other parts of the reform effort faltered in 2001. The IMF and World Bank again suspended their programmes. Various efforts to restart these in the middle of 2002 were unsuccessful. Under the leadership of President Kibaki, who took over in December 2002, the Government of Kenya launched an ambitious economic reform programme and resumed its co-operation with the World Bank and IMF. The new National Rainbow Coalition (NARC) of the Government enacted the Anti-Corruption and Economic Crimes Act and Public Officers Ethics Act in May 2003, which was aimed at fighting graft in public offices. Other reforms especially in the judiciary, public procurement and other such fields have led to the unlocking of donor aid and a renewed hope in an economic revival. In November 2003, following the adoption of key anti-corruption laws and other reforms by the new Government, donors re-engaged as IMF approved a three-year $250 million Poverty Reduction and Growth Facility and donors committed $4.2 billion in support over four years. The renewal of donor involvement has provided a much-needed boost to investor confidence.

In spite of its best efforts, the Government's ability to stimulate economic demand through fiscal and monetary policy remains fairly limited, and the pace at which the Government is pursuing reforms in other key areas remains slow. The Privatization Bill is yet to be enacted and civil service reform has been limited, despite the Government's assertion that reforms would be undertaken. The main challenges include building consensus within the loosely bound NARC Government, taking unequivocal action against corruption, enacting anti-terrorism and money- laundering laws, bridging budget deficits, rehabilitating and building infrastructure, maintaining sound macroeconomic policies, and addressing structural reforms needed to reverse slow economic growth. Nairobi continues to be the prime communication and financial hub of East Africa. It enjoys the region's best transportation linkages, communications infrastructure, and trained personnel, although these advantages are less prominent than they once were. A wide range of foreign firms maintain regional branch or representative offices in the city. In March 1996, the Presidents of Kenya, Tanzania, and Uganda re-established the East African Community (EAC). The EAC's objectives include harmonizing tariffs and customs regimes, free movement of people, and improving regional infrastructures. In March 2004, the three East African countries signed a Customs Union Agreement (*cf*. Government of Kenya 2007; Magickenya.com 2007; Wikipedia 2006; Wikipedia 2007)

Kenya's education system consists of early childhood, primary, secondary and tertiary education. Early childhood education takes at least three years, primary eight years, secondary four and university four to six years depending on the course. Pre-schooling, which targets children from ages three to five, is an integral component of the education system and is a key requirement for admission to Standard One (First Grade). At the end of primary education, pupils sit the Kenya Certificate of Primary Education (KCPE), which determines those who will proceed to secondary

school or to vocational training. Primary school age is 6/7-13/14years. For those who proceed to secondary level, there is a national examination at the end of Form Four – the Kenya Certificate of Secondary Education (KCSE), which determines those who will proceed to the universities, other professional training or employment. The Joint Admission Board (JAB) is responsible for selecting students to be admitted to the public universities. The minimum university entry grade is C+ at KCSE. However, because of the stiff competition, only those with higher grades such as B+ and above are guaranteed admission. Private universities admit students at their own discretion but are guided by the rules and regulations provided by the Commission for Higher Education. Besides the public schools, there are many private schools in the country, mainly in urban areas. Similarly, there are a number of international schools catering for various educational systems such as American, British, French, German, Japanese and Swedish. The various ethnic groups in Kenya include; Kikuyu 18.0 per cent, Luhya 15.0 per cent, Luo 14.0 per cent, Kalenjin 12.0 per cent, Kamba 11.0 per cent, Kisii 7.0 per cent, Meru 6.0 per cent, Somali 3.0 per cent, other African (including Swahili people, Pokomo, Giriama, Rabai, Duruma, Chonyi, Digo, Kauma, Taita, Turkana, Orma (Oromo), Wasanye, Wanyoyaya, Borana, Rendille, El Moran, Malakote, Embu, Teso, Gabra, Ndorobo, Maasai) 13.0 per cent, non-African (Asian/Desi, Anglo-African/European, and Arab) 1.0 per cent (*cf.* Wikipedia 2006; Government of Kenya 2007; Magickenya.com 2007; Wikipedia 2007).
The religious affiliation in the country is composed mainly of Protestant 45.0 per cent, Roman Catholic 33.0 per cent, Muslim 10.0 per cent, and Traditional Religions 10.0 per cent. Other religions include Hinduism, Jainism and the Bahai Faith.

The boundless nature and the wildlife of Kenya have long attracted adventure-seekers from all over the globe. No other African country can boast such an incredible range of landscapes, unique geographical features and species. Kenya offers the visitor a chance to experience a natural world unchanged by the passage of time. The Kenyan nature is home to an endless array of ecosystems, the staging ground for natural cycles of life, death and regeneration since time immemorial. The great range of natural habitats means there is plenty to explore, and plenty of species to encounter. This is a land of endless potential for the wildlife enthusiast. From great migratory herds of the open savannah to an incredible abundance of birdlife, from the depths of a tropical rainforest to the depths of the Indian Ocean teeming with fish; this is a world of natural wonders. A safari into the natural parks of Kenya is a journey into nature and its unique floral and faunal resources

Kenya has a culture born of countless sources. This region has been crossed by the paths of a long and complex history. From the prehistoric records of early man to the present day, Kenya has been a land of unending change, contrasts and diversity. The early tribal states saw cycles of migration and shifting power, with Kenya as a meeting place for peoples from the plain lands of the south, the forests of the West and the deserts of the North. The sea brought influences from the outside world, and the passage of the spice trade created the unique coastal culture, where lines between Africa and Arabia blurred. The open coast brought European influences into this world of change and began a turbulent struggle for control, whose exotic history lingers today. The first explorers discovered a land of great peril and greater beauty, and their great adventures created the most unique colony in the British Empire. This was a meeting place of cultures, where adventurers and soldiers of fortune mingled with complex tribal societies, and the arrival of labourers and merchants from India brought new and pervasive influences. The colonial legacy lives on in the traditions of the great safari, and the pursuit of adventure and freedom. Kenya has drawn on all of these influences to develop its own unique culture. This is the nation's greatest strength - the ability to blend the best of many worlds into a strong, singular identity. Today, Kenya welcomes the world to its shores and continues to evolve a modern culture which is born of endless variety, and yet purely, proudly Kenyan.

4.2 Greater Meru Region: Its Origin and Population

4.2.1 Geography, Climate, Landscape and Natural Resources

The word *Meru*, which is pronounced as *Miiru*, was not known among the inhabitants of the north-eastern side of Mount Kenya in the early seventeenth century. The Greater Meru Region was occupied by some hunter/gatherer groups whose languages varied in both accent and in dialect. The immigration of a population group who were known as the *Ngaa* to this place from an island in the Indian Ocean brought a people who were eventually referred to as the Meru. The word *Meru* today is used to refer to the region on the north-eastern slopes of Mount Kenya according to the boundaries which will be defined in the body of this section, and the people who live here are sometimes referred to as the *Amiiru*, often written as *Ameru.* The language spoken is referred to as *Kimiiru* (sometimes written as *Kimeru*) can also be said to be *Meru*. This is because the suffix *Ki* is descriptive and is translated as; *of the*. The word *Meru* therefore can be used interchangeable to mean the *language*, the *place* and the *people*. It is only necessary to understand the context in which it is used. In this dissertation therefore, the name *Meru* is used as such and the reader is asked to determine the context for which it is used. For example: - the People on the north-eastern slopes of Mount Kenya are known as the Meru, they live in Meru and they speak the Meru language.

The Nyambene Range dominates Meru North District, and creates great diversity in the physical landscape which affects the entire environment. The Itiene Peak on the surrounding plateau rises to 2, 414m above sea level. The slopes of these ranges are steep and rocky with crests in the lower areas. The plateau runs from north to south from Mount Kenya to the Nyambene Range. Its altitude ranges from 914m - 1,067m above sea level. The Escarpment rises between 15 – 100 metres and has several permanent springs to the east draining into Tana River. From the Nyambene Range to the north, rivers drain into the Uaso Nyiro River. These include: - the Thangatha, Thanantu, Thiiri, Ura, Thungu and Kanjoo. The main determinant of the climate in Meru North District is its altitude. The highlands reduce the effects of high temperatures and the rate of evaporation. Annual mean temperatures are 24.7ºC where altitudes are low (610 – 700 m) and 13.7ºC where altitudes are high, especially on the western slopes of the Nyambene Range. Less rainfall is received on the lowlands on the leeward side. Temperatures there usually range from 30ºC in September and 13ºC in July. Rainfall ranges from 1,250 – 2,514 mm in the Eastern and Southern slopes of the range to 380 – 1,000mm on the leeward side on the western and lowlands to the north and to the east. The highlands have clay soils, which are deep and suitable to the growing of coffee and tea. The lower area soils are sandy and of poor quality, but suitable for the cultivation of cotton, maize beans and provides fields for ranching. Frequent dry spells affect agricultural production resulting in poverty largely exposed in the lack of food as can be commonly seen in Divisions of Mutuati, Akithi and Tigania North.

In Meru Central District the highlands include Mount Kenya, the second highest mountain in Africa, which is 5,199m above sea level; an altitude which influences the natural conditions in Meru. The lowest altitude is 3,000m above sea level. The higher zones are heavily forested and are the main catchments areas of rivers in the District. There are five small lakes which include: Lakes Ellis, Michaelson and Alice, situated inside Mount Kenya National Park. Lake Rutundu is located in Mount Kenya Forest, while Sacred Lake is located in the Kibirichia Location in Abothuguchi West Division. The lakes keep the ecological balance and sustain the species of the flora and fauna. High altitudes force rain-bearing winds to deposit moisture on the windward side on the east of Mount Kenya where the Meru Central District is located. Rainfall here ranges from 1,250–2,500mm on the southern slopes, of Mount Kenya and 380-1,000mm annually on the lowlands to the north and to

east. Rain comes in two seasons; the short rains from October to December and the long rains from March to May. There have been changes occurring in rainfall patterns in recent years. The lowest point in Meru Central District is 3,000m at Meru town station. Rainfall comes by seasons in which the long rains bring approximately 385.4mm and the short rains 760.8mm. Temperatures range from the highest at 24.5ºC in February to the lowest of 12.4ºC in July. In the past few years, temperatures of below 100C have been observed in the month of July. Average temperatures are normally around 18.45ºC.

Altitudes in Meru South District range from 5,200m on Mount Kenya Peak to the hot, dry and dusty lowlands of Igambang'ombe at 400m above sea level. There are several ridges and hills namely the Kiera, Manuguni and Njuguni Hills. Because of its hilly terrain, the District experiences soil erosion and degradation. Road maintenance and construction is a major problem in the District, which is notorious for the most dangerous bridges in the country. The main rivers in the District include the *Nithi*, *Tungu*, *Mara*, *Mutong*a, *Thingithu*, *Naka*, *Ruguti* and *Thuci*; six of the ten are the largest rivers of the Greater Meru Region. These rivers form the drainage pattern which flows off into the Indian Ocean through the Tana River. The rivers have cut deep V-shaped valleys on the higher altitudes which decrease in depth towards the lowlands to the east. Nithi Bridge located over the River Nithi is one of the most dangerous bridges in the District. Many lives have been lost here, and the casualties place a great strain on the health facilities in the District. In fact, it has the dubious privilege of being one of the major disaster zones not only in the District, but also in the country as a whole. The bridge built with donations from the United Kingdom is located on a snake-like meandering road which manoeuvres itself around one of the many hilly slopes in the District. Re-location of this bridge has been agreed upon, but funds have yet to become available for the execution of this massive project. As they are characterized by falls and cataracts, the rivers cannot be used for transport. One major purpose of a hydro-power generating project in progress is to provide jobs for o the unemployed in this poverty-stricken District. There are irrigation plans under way farther south in the drier areas, which may go a long way towards raising the standards of living by increasing horticulture production sales, and income earned by those employed by this project.

Mount Kenya is a tourist attraction placed under the management of the Kenya Wildlife Service (KWS). It is the main water catchments area of the Tana River. Exploitation of the indigenous forests has been banned, with the exception of providing fuel-wood for the local who gather the dead wood and are allowed to take away the amount they can carry on their backs. It is the home of the most feared wild animals including the African buffalo and the elephant. As in the rest of the country, rains are bi-modal coming in from March to May and from October to December. The highest amounts range from 220mm in Chogoria to 500mm in the lower areas of Igambang'ombe Division. The residents here grow tea and coffee, which are the main cash crops, and maize, beans, cowpeas, pigeon peas and cassava form the main staple food of the District. Cotton is also cultivated.Rainfall in the lower areas is unreliable and unevenly distributed, its uncertainty being a major reason for the high incidence of poverty in Igambang'ombe and its environs. Highland temperatures range from 14ºC - 17ºC and 22ºC - 27ºC in the lowlands. The Greater Meru region proved highly attractive to the Europeans during the early nineteenth century. The early Methodist missionaries who settled in Meru Central for instance, referred to it as *a land of hills, valleys, and innumerable streams unlike any other area in Africa. A land where the hills were covered with ferns, hedges thick with blackberry bushes, streams where water was plenty* and a better country where English men and women would *labour and reap*. The Scottish missionaries also found Meru fascinating and described it, as Fadiman (1982) documents: *'a little earthly paradise…rich with forests and streams… fertile with regular rains.'* It was in this earthly paradise that the people earlier known as the *Ngaa* settled and developed a unique history and culture, described in the next Section.

4.2.2 The History and Culture of the Pre-Meru (*Ngaa*)

The history and traditions of the Meru People are shrouded in mystery since there are no written records available. What information there is according to Fadiman (1982) covers slightly over a century before present and is built up from oral stories. His research in the early 1970s discusses the problems the Europeans (English, Scottish, Italian, Dutch and Irish) encountered in imposing colonial rule in Meru, where Africans play the role of shadows haunting the fringes of European play. He documents the part played by Africans (the Meru) as far as the Europeans were concerned: - supportive roles (carriers, servants, and unpaid labour), comic relief (alcoholics, witchdoctors) and loyal subordinates (converted Christians, tribal police), non co-operators and finally *Mau Mau* rebels fleeing British justice into forests. This and other dribs and drabs of information are documented by individual scholars, who interviewed people who could remember the history of the Meru as far back as the 1700s. Among them are Fadiman (1982) who wrote on, '*An Oral History of Tribal Warfare: the Meru of Mt. Kenya;* Maitai (1988), *The Njuri Nceke*; and Ng'unyura (2000) *Mituurire Ya Ameru*.

The documentation of the oral stories collected by these three scholars indicates that the Meru originated from an island in the Indian Ocean which they all refer to as *Mbwaa*. Fadiman suggests this could have been *Manda* Island which is situated south of the island of Pate, a few kilometres off Lamu. His study, which was conducted in the early 1970s, reveals that men of that time, who were by then elderly (seventies, eighties and nineties) could vividly remember stories of the long flight from *Mbwaa* told to them by their grandparents. The story recounted how their descendants lived peacefully on Manda until a group of people wearing red clothes *'Nguu Ntune'* came and colonized them, thereby disrupting their peaceful life by introducing compulsory hard labour which eventually forced them to flee. These people, who are known as the *Ngaa*, fled inland making their way along the Tana River from the Kenyan coast.

The *Ngaa* left Manda Island and moved inland encountering many hardships in their flight. They crossed large rivers and suffered droughts which affected themselves and their animals. Despite their hardships, they kept their traditions, government and spiritual ways of life throughout the entire journey. They were composed of three groups: - the cultivators/herders, the hunters (*Athi*) and the ironsmiths (*Aturi*), and as the resources became the more and more scarce, they were eventually forced to part company on their way inland. Curses and witchcraft would be used as means of preventing an enemy group from encroaching on the others' resources – land, hunting grounds and iron dust. These sanctions were known to send so much fear into the hearts of the people that none dared to infringe on them. On the way, the *Ngaa* expelled the inhabitants of the lands through which they passed, among them the *Masai* (the *Maa*- speaking people) who later turned out to be a redoubtable enemy, and would raid them to steal their cattle and women for many years to come. The others were such *Ogiek* groups as the *II Tiriki* and the *Mumunyot* (1826-1774), as well as the Oromo and the Galla. These too were expelled alongside the *Maa*-speaking groups before the *Ngaa* settled on the eastern slopes of Mount Kenya.

The *Ngaa* travelled westwards during their flight over the *Masai* land, entering the present larger Meru region from the south at *Mbere*. Here they discovered that their presence was unwelcome, forcing them to withdraw farther southward towards the people of *Tharaka*. These received them and even intermarried with some of the *Ngaa* tribes. Since the Tharaka region was arid, they proceeded north-west towards *Kirimara* – (the dazzling mountain - the mountain now known as Mount Kenya). Their march inwards brought them to the slopes of Mount Kenya, whose thick forest hindered further migration for most of the mainstream *Ngaa*; the cultivators/herders were also content with the good land which was suitable for cultivation, while the lower plains had grass

enough for their animals to graze. The *Athi* had ample supplies of game to hunt for their meat. Figure 4.1 show the ecological Zones of Mount Kenya Region.

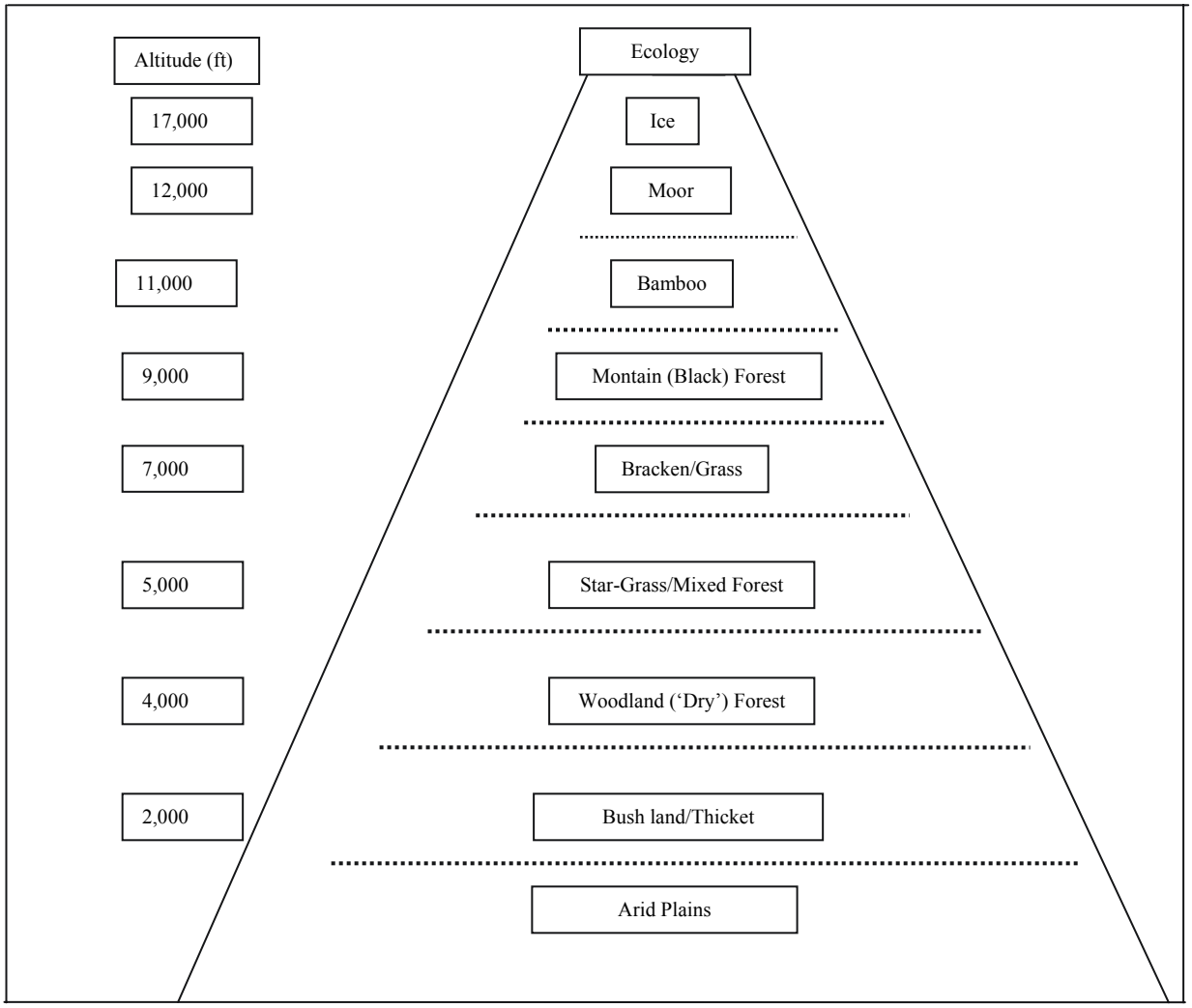


Figure 4.1 Ecological zones of Mount Kenya region.
(*Source:* Adapted from Fadiman 1982).

Although the *Ngaa* had lived in clans in *Mbwaa*, the shape of their settlements in their new location were dictated by their ability to cross the large rivers rising on Mount Kenya and eroding gorges which were many feet deep. Such gorges separated clan members, forcing individual families to settle between the ridges, and dictated that their only option was to progress upwards in search of new cultivation. Meanwhile the Athi were being pushed further into the forests. The word, 'Meru' was not known throughout the immigration history of the *Ngaa* and could possibly have been adopted after long contacts with the Masai who also lived on the slopes of Mount Kenya. These people regarded the eastern slopes to be inhabited by *Ngaa* people known as the *Meiru*, which was a word for *black* referring to the black or dark forest, and probably later to the people who lived there (*cf.* Fadiman 1982).

The written records fail to make it clear whether this is where the name Meru was derived from, but it could well have been its origin and hence the name which was subsequently to be used to refer to the *Ngaa* or the settlers on the north-eastern side of Mt. Kenya. The Meru people made major divisions after Tharaka. Those who had intermarried with the Tharaka progressed westwards, some settling in present- day Tigania, while the rest split off and settled in Mwimbi; up to the present time the Tigania and Mwimbi regard each other as blood brothers (*gichiaro*). The other group which did not intermarry with the Tharaka proceeded towards the Nyambene plains, Igembe and the forested areas of Mount Kenya. These are currently the Igembe and the Igoji who included the Abogeta and the Abothuguchi. Another group went south and settled in present-day Chuka (Cuka). The Imenti, Igoji, Igembe and Muthambi therefore claim a common ancestry. These groups of people who now compose the Meru community were later to be subjected to the oppressive rule of colonization.

The first British colonizers who included Edward Butler Horn (1907-1917), nicknamed *Kangangi* because of his miniature stature (*ka*) and his wanderlust (*anganga*) which impelled him from place to place, H. E. Chambert (1919), Frank M. Lamb (1927-1928), Gerald H. Hopkins (1929-1933), H. E Lambert (1933-1935, 1939-1942, 1942-1945) and Victor M. Mckeag (1937-1939) found the Meru deeply rooted in their traditions: religion, age-sets, rituals and councils of elders. By the end of 1945, they had succeeded in doing and undoing the core structure of the two-hundred year old Meru traditions, leaving the people 'hanging in the air' with nothing to hold on to, with the exception of seeking solace in alcoholism and loose morals, in a desperate search for oblivion in order to forget the conditions to which they had been reduced. After the invasion of Meru by the British (1906), nine sub-tribes constituted what was then known as the Meru District. These were, Chuka (Cuka), Tharaka, Miutine, Muthambi, Mwimbi, Igoji, Igembe, Tigania and Imenti.

After Kenya's independence, these sub-tribes were again subjected to a series of name changes. At one time Tharaka was removed from the District, but later joined with Chuka, Muthambi and Mwimbi to form the Tharaka-Nithi District, an unpopular move among it residents who wished to have their headquarters at Meru Town, since it was more developed. Tharaka currently has been given the status of an individual District, and Meru has been divided into three major Districts, namely Meru North District, which includes the Igembe and the Tigania; Meru Central District which includes the Imenti and the Igoji; and Meru South District which includes Mwimbi, Muthambi and Chuka. Miutine is now included in Igoji. These sub-tribes speak their own dialect of the Meru language. More recently, in mid- 2007, Meru North District was divided up to form the Tigania and Igembe Districts, but the two new Districts are covered under Meru North District in this dissertation. Similar sub-divisions have lately occurred in Meru Central District as well.

4.2.3 Administrative Structure of the Three Districts

So far Meru has been described as formally being one large District which now is composed of the three Districts of Meru North, Meru Central and Meru South. These Districts have their administrative headquarters in the towns of Maua, Meru and Chuka respectively. Districts are divided into Divisions and Divisions into Locations, while Locations are further sub-divided into sub-Locations. A District Commissioner (DC) administers a District, and a District Officers (DO), Chiefs and Sub-Chiefs administer Divisions, Locations and sub-Locations respectively. In Meru North, the regions which were Tigania and Igembe have been sub-divided into sixteen Divisions. These are, Igembe North, Igembe Central, Igembe South, Igembe Southwest, Igembe East, Igembe Southeast, Laare, Ndoleli, Mutuati, Tigania Central, Uringu, Tigania North, Tigania West, Tigania

East, Akithi, and Meru National Park forming the Meru North District which was known as Nyambene between 1992 and 1997 (*cf*. Map 4.2 and Table 4.1

Table 4.1 Meru North District Areas, number of Locations and sub-Locations

Division	Area km²	Locations	Sub-Locations
Igembe North	280.0	6	13
Igembe Central	47.6	6	14
Igembe South	74.1	3	8
Igembe South West	77.6	4	8
Igembe East	71.8	3	9
Igembe South East	60.4	3	6
Laare	415.0	3	6
Ndoleli	238.3	4	10
Mutuati	674.1	2	4
Tigania Central	119.4	4	9
Uringu	104.4	4	13
Tigania North	495.4	4	11
Tigania West	135.2	3	7
Tigania East	108.6	2	5
Akithi	162.2	5	16
(Meru National Park)	878.2	-	-
Total	3942.3	56	139

(*Source:* District Statistics Office, Maua in DDP (2002-2008).

Meru North District is one of the thirteen Districts in the Eastern province. The other twelve Districts are Moyale, Marsabit, Isiolo, Meru Central, Meru South, Tharaka, Embu, Mbere, Machakos, Mwingi, Makueni and Kitui. It borders Meru Central to the west, Tharaka to the south, Isiolo to the north-east, Tana and Mwingi Districts to the south-east. It lies within latitudes 0º 00′ and 0º 40′ North and on longitude 37º 50′ East. The southern boundary lies on the equator. It has fifteen administrative Divisions, fifty-six Locations and 139 sub-Locations, which include the Meru National Park. The total area of Meru North District is 3,942.3 km². Mutuati Division is the largest with an area of 674.1 km², while Igembe South-East Division is the smallest with an area of 60.4 km². The District has two local authorities. These are Maua Municipal Council and Nyambene County Council. Maua municipality is growing at a very fast rate and is a business hub for most Meru North District business people. Recently, more business centres have been springing up and these attract many business men and women from various parts of the country. This growth has been chiefly associated with money generated by the *miraa* business in the District.

Meru Central District shares its borders with Laikipia District in the west, Nyeri and Kirinyaga Districts in the south-west, Meru South and Tharaka Districts in the east and Meru North and Isiolo Districts on the north. The equator cuts through the District at latitudes 0º 3′ 45′ North and 0º 2′ 30′ south. It is situated between 37º and 38º east longitudes. The total area of Meru Central District is 2,982 km². The two forests found in the District, are the Mount Kenya and Imenti Forests which cover 1, 030 km². The area under human settlement covers 1,952 km². Meru Central District is divided into ten administrative Divisions, which are Abogeta, Abothuguchi Central, Abothuguchi East, Abothuguchi West, Buuri, Igoji, Mirigamieru East, Mirigamieru West, Nkuene, and Timau. The greater south-west part of Meru Central District is covered by the Gitoro Forest, which is an

extension of the Mount Kenya Forest which stretches all the way to the Nyambene Hills in Meru North District (*cf.* Map 4.3 and Table 4.2).

Table 4.2 Meru Central District administrative Divisions, Area, Locations and sub-Locations

No.	Division	Area (km²)	Location	Sub-Location
1.	Igoji	113.1	5	15
2.	Abogeta	148.5	6	12
3.	Nkuene	131.4	3	6
4.	Abothuguchi West	147.1	11	32
5.	Abothuguchi Central	57.8	3	9
6.	Abothuguchi East	213.1	3	10
7.	Mirigamieru West	53.2	5	16
8.	Mirigamieru East	168.7	6	19
9.	Buuri	238.4	4	14
10.	Timau	680.7	4	11
*	Forest	1.030	-	-
Total		2,282	50	144

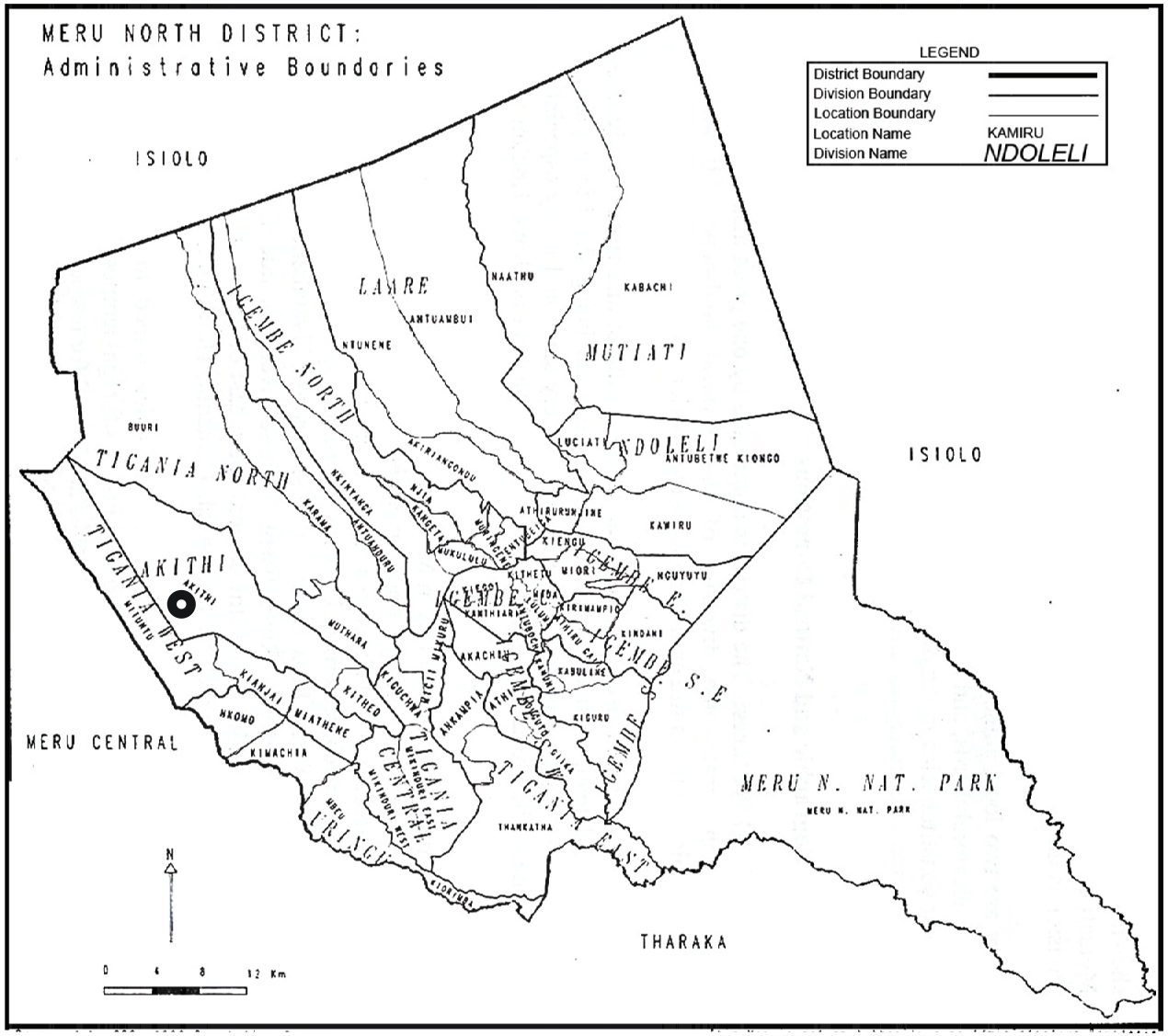
(*Source:* District Statistics Office, Meru Central District 2001).

Table 4.3 Meru South District administrative Divisions and Area

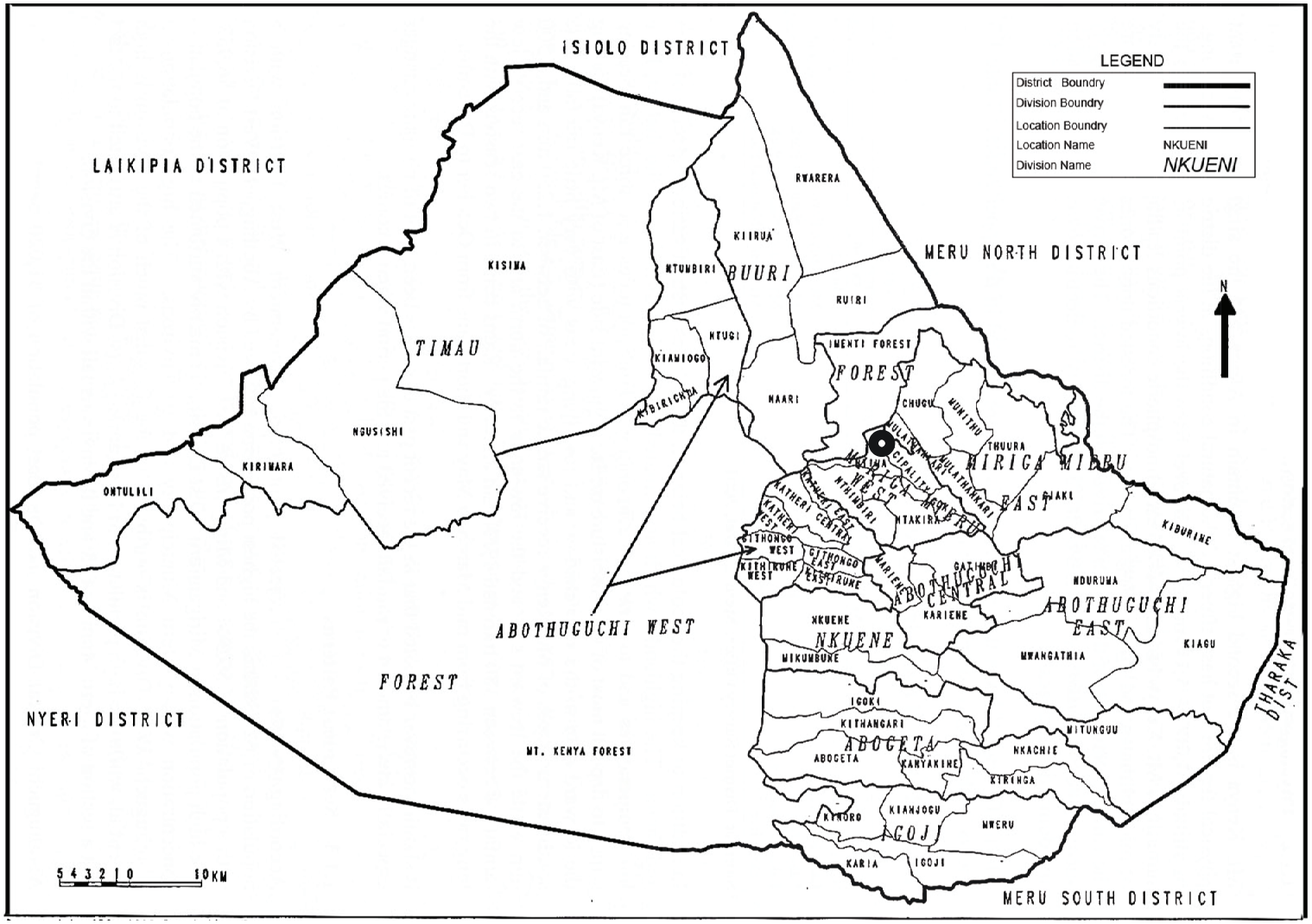
Division	Area (km²)	No of Locations	Sub-Locations
Chuka	169.6	6	19
Igambang'ombe	210.9	5	12
Magumoni	64.2	6	14
Muthambi	84.8	3	10
Mwimbi	203.4	5	21
Total	732.9	25	76

(*Source:* District Statistical Office, Chuka, 2001, in DDP - 2002-2008).

Meru South District just as the sister Districts was carved out of the larger Meru District in 1992. At that time it was known as Tharaka/Nithi. In 1997, Tharaka was again hived off the Greater Meru region to form its own District. Meru South District is therefore one of the thirteen Districts of the Eastern Province of Kenya, which have been named above. To the north, it borders Meru Central, Tharaka to the north-east, Embu and Mbere to the south and Kirinyaga and Nyeri Districts to the south-west. The peak of Mount Kenya is also situated in the south-west. Meru South District has an area of 1,092.9 km² which include 360 km² of the Mount Kenya Forest. It is the smallest of the three Districts, while Meru North District is the largest. The District is administered from five administrative centres. These are Chuka, Igambang'ombe, Magumoni, Muthambi and Mwimbi (*cf.* Map 4.4; Table 4.3). Igambang'ombe occupies the largest region in the District followed by Mwimbi and Chuka in that order. Magumoni covers the smallest, followed by Muthambi. Meru South District has three local authorities namely Chuka Municipal Council, Chogoria Town Council and Meru South County Council.

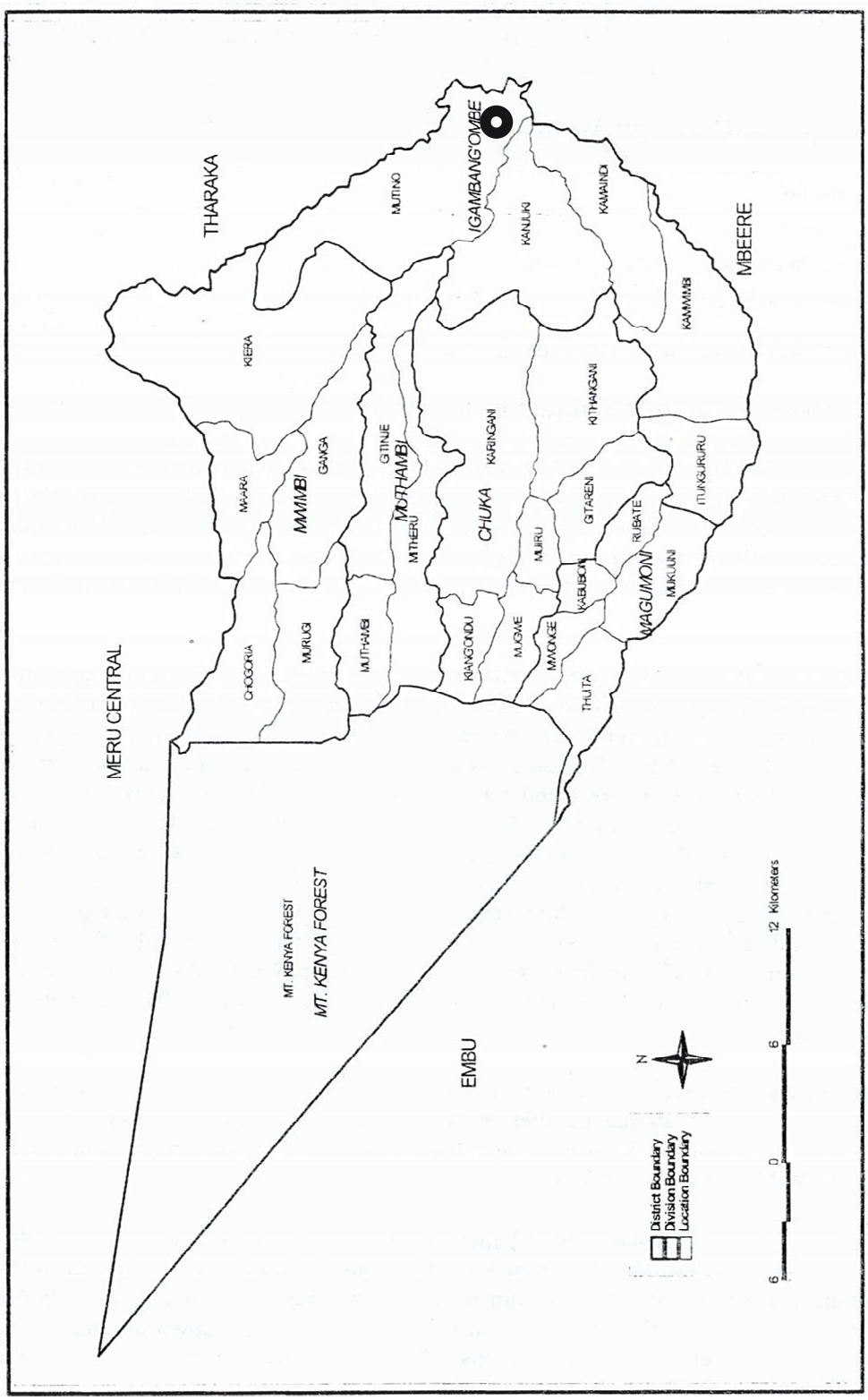


Map 4.2 Administrative Divisions in Meru North District. The dark circle represents KK Lumbi village where the study survey was carried out.
Source: Meru North District Development Plan (2002-2008)



Map 4.3 Administrative Divisions in Meru Central District. The dark circle represents Kinoru village where the study survey was carried out.

Source: Meru Central District Development Plan (2002-2008)



Map 4.4 Administrative Divisions in Meru South District. The dark circle represents Kagera village where the study survey was carried out.
Source: Meru South District Development Plan (2002-2008)

Having elaborated on the sociography of Kenya and the larger Meru Region, chapter V will examine the life in the three villages of *KK Lumbi*, *Kinoru* and *Kagera* as revealed by data collected through qualitative and quantitative surveys in 2002 and 2003.

V Life in the Three Meru Villages

In this chapter, data are presented on the people and cultures in the three selected sample villages in the three Meru Districts. Initial information was traced in public records, and this was then supplemented by the results of the surveys in the three villages. The *first part* describes general information about the study population living in the area and the sample survey of the household heads who were interviewed. The *second part* examines the environmental context of the surveys in terms of the geography, landscape and location of the three villages, and housing, farms and forests in which the Meru are living. The *third part* presents the socio-demographic and economic structures in the sample including, data on household composition, age, gender and kinship, and the socio-economic status (SES) of the respondents, including occupation and wealth. Here, detailed information includes monthly income, area of land, type of housing, and the ownership of domestic animals. The *forth part* provides more general data on Meru culture and their use, management and conservation of wild plants. The last section presents data on traditional institutions, elaborating on Meru administration, marriage and land inheritance customs. The *fifth part* of the chapter concludes with a short overview of traditional religious beliefs and practices, which the Meru originally inherited from the *Ngaa* in *Mbwaa* up to the present, and their recent changes.

5.1 Study Population and the Sample Surveys

5.1.1 Population Data of Greater Meru Region

The quantitative survey is based on the initial collection of socio-demographic material which has been retrieved from the scarce official statistical sources and reports concerning the Greater Meru Region, later onwards supplemented by field observations and data from the household surveys. The quantitative data related to the complex relationships between indigenous knowledge, beliefs and practices of wild plant use behaviour were collected using existing institution-based data from statistical reports at local institutions, and community-based research via observations, discussions and household interviews in the three selected sample survey villages, using structured, pre-coded questionnaires. Using such a combined fieldwork research approach, the following types of surveys were used to collect the various categories of data, on the basis of the analytical model of the study in Meru:

- the *household survey:* background data of respondents, categorised into predisposing, socio-demographic and psycho social factors; and enabling factors;
  the *base-line survey:* environmental data on the three sample survey villages;
- the *conservation survey:* data on intervening policies and regulations;
- the *intervening survey:* data concerning the various local institutions and organizations.
- wild plant use *behaviour survey:* collecting retrospective data concerning patterns of behaviour, as reported by the respondents of the sample;

Population Distribution in the Three Districts
The highest and the lowest number of people in Meru North District are 71,076 and 19,781 persons per km² which is found in Laare and Igembe South Divisions. The most densely populated Division is Igembe Central Division with 957 persons / km², while Mutuati has the lowest density of 91

persons / km². The District headquarters is the town of Maua in Igembe Central Division, which is a factor contributing to the high number of people in the Division. Grazing areas are less populated in Tigania North, Igembe North, Laare and Mutuati as much of the land is required for the stock. These Divisions are drought prone. Table 5.1 shows Meru North Divisions and Projected Population Density (1999 – 2008).

Table 5.1 Meru North Divisions and Projected Population Density (1999 – 2008)

Division	1999	2002	2004	2006	2008
Igembe North	58,046	63,057	66,635	70,417	74,413
Igembe Central	41,944	45,565	48,151	50,883	53,771
Igembe South	18,209	19,781	20,903	22,090	23,344
Igembe South West	21,791	23,672	25,016	26,435	27,935
Igembe East	28,575	31,042	32,803	34,665	36,632
Igembe South East	18,700	20,314	21,467	22,685	23,973
Laare	65,428	71,076	75,110	79,372	83,877
Ndoleli	54,730	59,455	62,829	66,394	70,163
Mutuati	56,751	61,650	65,149	68,846	72,753
Tigania Central	45,061	48,951	51,729	54,665	57,767
Uringu	39,003	42,370	44,775	47,316	50,001
Tigania North	49,098	53,336	56,363	59,562	62,942
Tigania West	32,266	35,051	37,041	39,143	41,364
Tigania East	30,944	33,615	35,523	37,539	39,669
Akithi	43,096	46,816	49,473	52,281	55,248
(Meru National Park)	408	443	468	495	523
Total	604,050	656,194	693,435	732,788	774,376

(*Source:* District Statistics Office, Maua – 2001: in DDP 2002-2008).

The economy of Igembe East, Tigania Central, Tigania East and Uringu is characterized by sustainable farming activities, explaining their high population densities. However, farms are small ranging from 1 – 1.5 acres. This contrasts with low density areas in which farm areas may be from 10 – 15 acres. Arable land in Meru North District encompasses a total area of 1,832 km². Non-arable land is 2,110.3 km² and rangeland, which includes the northern grazing areas, occupies 1,002 km². The Meru National Park covers an area of 878 km² of land and the gazetted forest occupies 110 km². Swamps and marshland occupy 120.3 km², and urban areas swallow up to 44.6 km². Land which has yet to be demarcated covers 70,059.33 acres. Poor and destitute people, who include orphans and street children, are found in the urban slums of Maua, Laare, Kianjai, Mikinduri and Mutuati. Child labour persists in the *miraa* growing areas and in towns.

In Meru Central District, 1,302 km² is arable land. Water mass covers 1.4 km² and gazetted forest totals 870 km². The urban area covers 68 km². Mirigamieru West Division has the highest population of 62,539 according to the 2001 projected population, while Abothuguchi West Division follows with 59,544 and then Mirigamieru East Division with 56,958 persons per km². The municipality is situated in Mirigamieru West Division and its environs, hence the reason for the high population in this region. Abothuguchi West Division is high density as well, and part of the municipality extends into Mirigamieru East Division and its environs, explaining the fairly high population density there. Abothuguchi Central Division has the lowest population of 31,020, followed by Abothuguchi East Division with 38,700, even though it has the highest density of 537.

It is also the smallest in size with a total area of 57.8 km². The other two Divisions of Abothuguchi East and Buuri Division have low population numbers because they are classified as Arid and Semi-Arid Lands (ASAL). Table 5.2 shows projected population density from 1999-2008 for Meru Central District's Divisions.

Table 5.2 Population Density by Division in Meru Central District (1999 – 2008)

	1999	2002	2004	2006	2008
Timau	72	75	78	80	82
Abothuguchi West	407	425	438	451	465
Buuri	170	178	183	189	194
Mirigamieru East	338	353	364	375	386
Mirigamieru West	1,306	1,365	1,406	1,448	1,492
Abothuguchi Central	513	536	552	569	586
Abothuguchi East	174	182	187	193	199
Nkuene	415	439	447	460	474
Abogeta	381	398	410	423	435
Igoji	399	417	430	443	456
Meru Central (Town)	167	175	180	185	191

(*Source:* District Statistics Office, Meru Central District – 2001: in DDP 2002-2008).

The remaining four Divisions of Nkuene, Abogeta, Igoji and Timau are each noticeably large, but have a total population of approximately 47,000 people. Mirigamieru West is the most densely populated Division with 1,306 persons / km² constituting 13.9 per cent of the total population in the District. Timau Division constitutes 22.8 per cent of the District's total size, yet it has only 9.8 per cent of the population. It also has the lowest density of 72 persons / km². Other Divisions have population densities ranging from 513 persons / km² in Abothuguchi Central to 170 in Buuri. On average, these Divisions have 343 persons / km² which puts increased pressure on land. Population increase threatens the sustainable way in which the people there have so far provided for their livelihood. The District Development Plan (2002 – 2008), shows that the scope for further expansion will lead to the sub-divisions of land into un-economic units which will cause soil erosion eventually resulting in declining yields. Consequently, the District is facing deforestation, depletion of water resources and loss of natural habitat. The increased population is now even encroaching on the forests and marginal areas which are as yet unsettled. Poverty is observed among population groups in the ASAL areas and in town slums, particularly in Meru, Nkubu and Mitunguu towns.

In Meru South District, the most densely populated Location (2002 est.) is Magumoni with 528 persons / km², while Igambang'ombe has the least densely populated with 114 persons / km². Muthambi, Mwimbi and Chuka have 385, 328 and 327 persons / km² in that order. The amount of arable land in the District is 550 km², while non-arable land is 176.6 km². Gazetted forest occupies 360 km², while urban land occupies 53.3 km². Such agriculturally potential areas as Mwimbi, Chuka, Magumoni and Muthambi are highly populated, while Igambang'ombe, the bulk of which lies in an arid area, has the least population. Poverty is experienced throughout the entire District, but is worst in Igambang'ombe and the fringes of the other bordering Districts. Table 5.3 shows the population density distributed over the Divisions in Meru South District (1999-2008).

Table 5.3 Population density distributed over the Divisions in Meru South District (1999-2008)

Division	1999	2002	2004	2006	2008
Mwimbi	317	328	335	343	351
Chuka	316	327	334	342	350
Magumoni	510	528	540	553	566
Muthambi	327	385	394	403	413
Igambang'ombe	110	114	117	120	123
District	188	195	199	204	209

(*Source:* District Statistics Office, Chuka 2001, in DDP, 2002-2008).

Age and Gender Composition

Of the 129,994 people in Meru North District, a total of 318,711 are male and 337,483 are female with a male/female ratio of 100:94. The youthful population (15-25) has a total of 156,407, while that of the primary-school age (6-13) totals 158,092. The High School age, (14-17) is composed of 66,478. The total labour force (14-64) total is 326,045 providing a dependency ratio of 100:101 and a population growth rate is 2.76 per cent and the population density is 166 persons / km². The rural population which currently totals 630,765 is expected to grow to 720,640 in 2008. The total urban population is 25,459 for Laare and 53,739 for Maua, and these are expected to grow to 774,376 by 2008. Life expectancy is 68.8 years and the total fertility rate is 6.1. Table 5.4 presents the projection of age and gender composition in Meru North and District as projected for 2004-2008.

Table 5.4 Projection of age and gender composition in Meru North District (2004-2008)

	2004		2006		2008	
Age groups	M	F	M	F	M	F
0-4	59,180	58,972	62,539	62,318	66,088	65,855
5-9	52,673	52,497	55,662	55,476	58,821	58,625
10-14	49,350	50,584	52,151	53,455	55,111	56,489
15-19	39,315	44,738	41,546	47,277	43,904	49,960
20-24	29,019	36,470	30,665	38,540	32,406	40,727
25-29	22,955	25,632	24,258	27,087	25,634	28,624
30-34	16,742	17,117	17,692	18,089	18,696	19,115
35-39	15,229	16,432	16,093	17,366	17,007	18,351
40-44	11,171	12,425	11,805	13,130	12,475	13,875
45-49	10,142	9,813	10,718	10,370	11,326	10,958
50-54	8,222	8,151	8,688	8,613	9,182	9,102
55-59	5,294	4,950	5,595	5,231	5,112	5,528
60-64	5,053	5,674	5,340	6,001	5,643	6,341
65-69	3,493	3,764	3,692	3,978	3,901	4,204
70-74	3,217	3,554	3,399	3,756	3,592	3,969
75-79	2,032	1,875	2,147	1,981	2,269	2,093
80+	2,784	2,953	2,942	3,120	3,109	3,297
AgeNS	928	1,030	980	1,088	1,036	1,150
Total	336,799	356,636	355,912	376,876	376,112	398,264

(*Source:* District Planning Unit, Maua, 2001 in: Meru North District DDP, 2002-2008
(Note: AgeNS = Age Not shown).

The population by age and sex in Meru North District reveals that there are more males than females in the age-groups between 0-9 and 45-49, while age-groups between 15-44 and 50-80+ has more females than males indicating a longer lifespan for females than for males. Population projections also reveal that there are very high percentages, estimated at 47.0 per cent, of young people in the District, exerting pressure on the limited learning facilities, hospitals and employment opportunities. The low percentage of the aged, estimated at 5.0 per cent, also lacks planned care and financial support.

Table 5.5 Projection of age and gender composition in Meru Central District (2004-2008)

Year	2004		2006		2008	
Age Group	M	F	M	F	M	F
0-4	36,246	35,105	32,246	35,105	37,952	36,758
5-9	31,601	31,208	31,208	33,089	34,646	34,216
10-14	37,496	36,478	39,261	38,195	41,110	39,993
15-19	35,904	35,653	37,595	37,332	39,364	39,089
20-24	29,725	31,664	31,124	33,154	32,590	34,715
25-29	23,851	25,666	24,974	26,874	26,149	28,139
30-34	18,325	18,197	19,187	19,054	20,091	19,951
35-39	16,309	16,735	17,076	17,523	17,880	18,348
40-44	11,276	1,082	11,807	11,603	12,363	12,149
45-49	9,710	9,938	10,167	10,406	10,645	10,896
50-54	7,984	7,872	8,360	8,243	8,754	8,631
55-59	5,292	5,088	5,541	5,328	5,802	5,578
60-64	5,069	5,653	5,307	5,919	5,557	6,197
65-69	3,314	3,581	3,470	3,750	3,633	3,927
70-74	2,974	3,594	3,114	3,763	3,261	3,940
75-79	2,266	1,987	2,373	2,080	2,485	2,178
80+	2,542	3,503	2,662	3,668	2,787	3,840
Total	278,255	281,425	291,354	294,673	305,069	308,545

(*Source:* District Statistics Office, 2001 in: Meru Central District DDP, 2002-2008).

Meru Central District statistics also reveal that there are fewer males than females, with a male/female ratio of 100:101 (*cf.* Meru Central DDP 2002-2008). The youthful population (15 – 25) is 134,407, and that of the primary school age children (6 – 13 yrs) are 101,370, and high school age children (14 – 17 yrs) is 53,561. Labour force proportion of males against females is 100:103 and the population growth rate is 1.48 per cent. Mirigamieru has the highest density with 1,365 persons / km², while Timau has the lowest with 75 persons / km², resulting in an average density of 175 Persons / km². The rural population in 2002 was 458,195 and is expected to rise to 500,722 in 2008. In 2003 urban population was 63,323. Infant mortality rate currently is 74 / 1000, and the fertility rate is 4.2. Meru Central District has three urban centres namely Meru, Nkubu and Mitunguu. The population structure of the District given in Table 5.5 below reveals a population of more males than females in the age brackets of 0-19, 30-34, 40-44, 50-59. In the age category of 20-29, females dominate, a trend which is seen in age-groups of 35-39, 45-49, 60-80+ also reveals longer life spans among females than among males, a general indication that there are more females than males in the District among the aged; a worrying situation which tends to create a high proportion of widows in the District. The highest population density lies in the age-group of 0-34 which composes of more

than 50.0 per cent of the population in the District with similar trends which vary insignificantly from those witnessed in Meru South District. Although a statistical Table for Meru South was not documented, records revealed that the composition on age and gender structure as 103,900 males and 109,082 females. The female/male ratio is 100:95. The youthful population (15-25) totals 49,277 persons, and the total labour force (14-64) is 117,457. Dependency ratio in the District is 100:81, and the population growth is estimated at 1.2 per cent. Life expectancy is sixty-nine, and the fertility rate is three.

5.1.2 Selection of Three Sample Survey Villages

Observing the qualitative information about a number of different characteristics of the respondents living in the study area in combination with the above-mentioned statistical information from the District Statistics Offices, it was decided to take a stratified random sample of the study population of the Greater Meru Region. After the division of the entire population into sub-populations on the basis of the criterion of ecozone-location - rural, semi-urban and urban environments - stratified into three communities representing the three Meru Districts, the elements for the sample were then chosen at random from the sub-populations (or strata) to secure optimal representation of the sample.

With a view to reaching a fairly equal basis for comparison of the data, collected in the three village communities, the sample strategy focuses on a random selection of twenty-five households in each village (*cf.* Map 4.2 – 4.4). Following an overview of the general profile of Greater Meru region, sub-divided into the three Meru Districts, the three sample survey villages are described comparatively using the model-related characteristics and factors, encapsulated in the *predisposing* socio-demographic and psycho-social factors (Blocks 1 and 2), the *enabling* socio-economic factors (Block 3), the *environmental* factors (Block 4), the *conservation* factors (Block 5) and the *intervening* factors (Block 6) contributing to the compilation of data on the different variables of the model.

The population structure in the three Districts of Meru varies from one District to another. Meru North District has a population of 656,194 persons, of whom 318,711 are male and 337,483 are female. Meru Central District has an overall population of 521,518 people, of whom 259,282 are male and 262,236 are female. The total population in Meru South District is 212, 982 persons: 103,900 male and 109,082 female. In Meru North District, there are a total of 129,994 households, and 481,060 in Meru Central and 49,984 in Meru South Districts respectively. The three villages being studied are located in the Akithi, Mirigamieru West and Igambang'ombe Divisions respectively. The composition of the population in the three Divisions is shown in Table 5.6. The sample villages where the household surveys were conducted in the three Districts of Meru are:

- *KK Lumbi,* the semi-urban village located in Akithi Division, Akithi Location, *KK Lumbi* sub-Location in Meru North District (*cf.* Map 4.2),
- *Kinoru,* the urban village located in Mirigamieru Division, Ntima Location, Upper Igoki sub-Location in Meru Central District (*cf.* MAP 4.3); and
- *Kagera,* the rural village located in Igambang'ombe Division, Rubati Location, Rubati sub-Location in Meru South District (*cf*. Map 4.4).

The Akithi Division, in which *KK Lumbi* village is located, has a population of 46,416 persons, and the density of the occupied area is 289 persons / km². *Kinoru* village which is located in Upper Igoki Sub-Location, Ntima Location, Mirigamieru Division, is as densely populated as the Division itself.

Although there are no official statistics recorded for the village, its location within the municipality shows a population density of approximately 1,306 persons/ km². *Kagera* village in Rubati sub-Location, Rubati Location, Igambang'ombe Division, has a comparatively low population of about 24,042 persons and a density of approximately 114 persons/ km².

Table 5.6 Population composition in the three Divisions of Akithi, Mirigamieru and Igambang'ombe

Division	Population	Area (km²)	Density
Akithi	46,416	162.2	289
Mirigamieru West	62,539	53.2	1,306
Igambang'ombe	24,042	210.9	114

(*Source:* District Statistical Office, Chuka 2001 in: DDP Meru North District 2002-2008).

KK Lumbi is characterized as a semi-urban community, while *Kinoru* is more urban. *Kagera* is the relatively rural. The assessment on whether a region was rural, urban or in between - semi-urban - was determined as follows: - (i) *presence of a major town in the vicinity*, (ii) *a shopping centre or market,* (iii) *distribution of permanent homes*, (iv*) access to mains water,* (v) *access to electricity.* All seventy-five respondents who were household heads from the three Meru villages were asked the same questions in order to control the input in a bid to gather pertinent information, which was analysed by use of the Statistical Program for Social Sciences (SPSS). According to the personal assessment of the researcher in charge, the region which qualified as such in all five was placed under *urban*, while that which scored three out of five was placed under *rural-urban* and that which scored one or none was categorized as *rural*. *Kinoru* scored highest while *KK Lumbi* scored second and *Kagera* third in that order.

5.2 Geography, Landscape and Location

5.2.1 Rural, Semi-Urban and Urban Locations

Kagera: A Rural Village

Rural *Kagera* village is located in Rubati sub-Location, Rubati Location, Igambang'ombe Division, Meru South District. Igambang'ombe is at the southernmost extremity of Meru South District (*cf.* Map 4.4). The village is situated at quite a distance from its administrative headquarters, which is located forty kilometres to the west. It is an area which is served by dusty dirt roads making transportation difficult. Farmers here practise mixed farming with wild plants growing alongside other food crops and are weeded accordingly. Igambang'ombe, the Division in which *Kagera* is located, is the least densely populated of all the Divisions in Meru South District, a phenomenon which is also reflected at the village levels. The village lies at the low altitude of 400m above sea level where temperatures are hot and dry. The general terrain in the region is characterized by rivers and streams which drain into the Tana River and then into the Indian Ocean. The long rains here come in the months of March - May, while the short ones come from October - December. The amount of rainfall received in the village as in all parts of the Division is 500mm, and is unreliable and at times poorly distributed. Temperatures range from 22 – 27 ºC.

KK Lumbi: A Semi-Urban Village

KK Lumbi is a semi-urban village located on the southern slopes of the Nyambene Hills in Akithi Division, Akithi Location, Ncooro sub-Location, Meru North District. Just as in the rest of the District, the climate here is determined by its topography since the highlands counteract the effects of high temperatures and the rate of evaporation. The annual mean temperatures are around 24.7 ºC on the lowlands and 13.7 ºC on the higher grounds which represent hills and smallish mountains, which are part of the Nyambene Hills. The rainfall pattern in this village is similar to that of the rest of the District, with long rains from March - May and the short rains, from October - December. Annual rainfall ranges from 1,250 – 2,514mm, although frequent dry spells are experienced from time to time. These affect food production adding to the already high poverty levels in the village. The nearest shopping centre of the village is *Ngundune*, which is located about three kilometres to the north. The village is bordered by *ncooro* - a seasonal river on the north-east. The main administrative centre is located in the town of Maua, nearly twenty kilometres away. The village is almost entirely agricultural although a few animals which include goats, cows and sheep are kept. The region is more arid than the other two villages studied and the vegetation consists mainly of shrubland and grass. In this village too, farmers allow wild plants to grow alongside their crops because the herbs are sometimes useful as food or for preparing home remedies for minor illnesses.

Kinoru: An Urban Village

Kinoru village is located within the Meru Municipality and experiences a wide range of microclimates and agro-ecological zones. The higher zones of the village have a frequent water supply from a few rivers and wells (*mpuri* and *gatobora* among others), although the volume of these has been tremendously reduced as a consequence of irrigation by residents living on the fringes of the forest, which is the extension of Mount Kenya Forest. The village is composed of two smaller villages namely, *Kigure* and *Kaithe*. Kigure is located on the border of the Gitoro Forest, while Kaithe lies at the southern end of Kigure. These two villages fall within the boundaries of the Meru Municipality and consequently enjoy a more urban environment than seen in the villages of *KK Lumbi* of Meru North and *Kagera* of Meru South Districts respectively. The village is very densely populated which means that there is less land to support wild vegetation. However, the inhabitants have gardens in which several types of wild herbs are left to grow alongside other crops. Small patches of wild vegetation grow along the forest edges and these also provide a lasting supply of herbs for the inhabitants. Interviews carried out here show that there were plant experts who were well versed in valuable information about wild plants use. These included several elderly men and women. Indeed the second and the fourth most elderly respondents in the survey were from this village and were aged one hundred and three and seventy-seven respectively.

The major administrative centre in this region is Meru Town, which is located about two kilometres from the village. As in the other two villages, long rains come from March – May and short rains come from October - December. In fact, the term ‘long’ or ‘short’ are confusing since the rainy months are the same length, only those from March - May are heavier and stormier than those from October - December. Rains received range from 380 - 1,000 mm annually. *Kinoru* lies within Mirigamieru West Division, which is the most densely populated among all the Divisions in Meru Central District (*cf.* Table 5.6). This is associated with its proximity to the urban municipal centre in Meru town.

5.2.2 Housing, Farms and Forests

The Meru people as explained in Chapter IV settled in villages and in clans on the eastern slopes of Mount Kenya. Even today a clan consists of individual families who live in single units known as *Nja* (households), and several households constitute a *mwiriga* (greater family), which extends to form *ntariba* (sub-clan). *Nja* is a word which has also been used to refer to a home, whereas *muchii* is a more commonly used term in Meru North District. *Nja*, although used to refer to a household, can also mean the piece of land on which the homestead is built, and formally would consist of a *gaaru* (man's hut), *kiuru* (wife's hut), *muthimbeere* (a girls' hut) and *ncuku* (store for foodstuffs). If a man had more than one wife, each wife would have her own *kiuru*. The young boys would be left to sleep next to the fireplace which would be located in the middle of the wives' huts, sharing the space with young calves, goats and sheep (*cf* Kirigia 2007).

A Meru homestead is traditionally fenced off with locally domesticated wild plants or branches cut from trees, and providing a dry enclosure. Such enclosures normally consist of an empty middle space where visitors can be entertained. Outside the enclosures are farms and grazing fields which can extend several hundred acres depending on the 'wealth' of the individual. Some families could, and even now can, be found possessing land in the direct vicinity of the *muchii* or at quite a distance depending on how much the family has dispersed since the initial settlements. Initially, before the invasion by the colonial powers, land belonged to the clan and any decisions made either to demarcate or sell had to be made by the council of elders who were known as the *njuri*. As a result, the natural resources were managed at the community level. Land for cultivation, water points and water catchments were managed at the community level as well. The *miunda* (farms) where crops were and are grown could be near homes or quite far away. Every homestead in the present settlements in Meru and especially in the villages in the survey possesses some land adjacent to their houses which is largely under heavy cultivation. Pieces of land which are located on drier grounds are set apart for the grazing of domestic animals. Some land, for example that is in *Kinoru* village is bordered by forests which are extensions of the Mount Kenya Forest. These forests are normally out-of-bounds to the villagers. Nowadays, forests which used to be managed by the *njuri* are now managed by the Forestry Department Services (FDS) under the Ministry of Natural Resources.

Besides housing, farms and forests which are characteristic of most villages, schools and churches complete the scene which may be expected in any village. As a dominantly Christian nation, Kenya has many Protestant churches mushrooming in every corner of the village. A considerable majority among these profess the Roman Catholic faith. Pockets of Muslim people have recently begun to take up residence in the villages, allowing residents a choice in what faith they wish to follow. Schools in the villages range from Government to missionary to parent- aided institutions, and can be found within walking distance of the homesteads. More will be discussed about houses and farms in the next section since procession of land and farms are regarded as part of an individual's wealth by the Meru people.

5.3 Socio-Demographic and Economic Structure

5.3.1 Household Size and Composition, Gender and Age

Household Size and Composition

The household surveys conducted in 2003 indicate that Meru households have family units which tend to have a prevalence of children and grandparents the grim legacy of deaths caused by the

HIV/AIDS virus pandemic. Grandparents therefore take care of orphaned grandchildren, the offspring of their sons and daughters in addition to their own brood, resulting in large families. Until very recently, family planning methods were not very popular in Kenya and particularly in Meru where weird myths about primary health care were passed down orally from mother to mother. Rumours relating to children born maimed or paralysed or having some weird abnormalities as a result of mothers using birth control methods can easily run rife. Such beliefs result in unwanted pregnancies as well as unnecessary births. This behaviour is now changing as more positive information about family planning is given in awareness programmes and in girl-child education in formal schooling. It is not uncommon to find Meru households with a composition of ten or more family members. Besides their nuclear families, nearly all the household heads who were interviewed had relatives for whom they were caring. There were some respondents, for instance, who although they live on their own, were being taken care of by distant relatives. These included the two oldest respondents in the survey, who were a widower aged one hundred and seven and has since passed away (2005) and a widow aged seventy-five. The distribution of household size, gender and age of household heads from the three selected villages is given in Table 5.7.

Table 5.7 Distribution of household size, gender and age of household heads in the sample survey over the 3 selected villages (N=75)

Variables	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
	N	%	N	%	N	%	N	%
household size								
1 - 3 members	6	24.0	4	16.0	6	24.0	16	21.3
4 - 6 members	3	12.0	13	52.0	11	44.0	27	36.0
7 - 9 members	12	48.0	7	28.0	6	24.0	25	33.3
10 + members	4	16.0	1	4.0	2	8.0	7	9.3
sex of household head								
male	15	60.0	19	76.0	20	80.0	54	72.0
female	10	40.0	6	24.0	5	20.0	21	28.0
age in years								
21 - 30	2	8.0	-	-	4	16.0	6	8.0
31 - 40	3	12.0	4	16.0	3	12.0	10	13.3
41 - 50	9	36.0	3	12.0	5	20.0	17	22.7
51 - 60	7	28.0	4	16.0	2	8.0	13	17.3
61 - 70	3	12.0	8	32.0	7	28.0	18	24.0
70 +	1	4.0	6	24.0	4	16.0	11	14.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

The data gathered also show that smaller *household* of 1 - 3 members form relatively low percentages in the communities. For instance, of household heads nearly a quarter (24.0%) in *KK Lumbi*, more than one-tenth (16.0%) in *Kinoru* and slightly less than one-quarter (24.0%) in *Kagera* respectively can be placed in this category. Considering household sizes of 4 - 6 members, this applied to about one-tenth (12.0%) in *KK Lumbi*, more than half (52.0%) in *Kinoru* and nearly half (44.0%) in *Kagera*. *KK Lumbi* village had the highest percentages (64.0%) of respondents with 7 - 9 members, while *Kinoru* and *Kagera* scored more than a quarter (28.0%) and slightly less than a quarter (24.0%) respectively. Most of the largest households of seven and over family members were in *KK Lumbi* (64.0%), and *Kinoru* and *Kagera* has slightly above a quarter (32.0%) each. The data from the surveys reveal that more *KK Lumbi* households have larger families than those from

the other two villages, with members ranging from 7 - 9 and 10 + categories. *KK Lumbi*, for instance, had more than one-tenth (16.0%) of the total respondents with household sizes of 10 + members, *Kagera* had fewer (8.0%), while *Kinoru* had only a small (4.0%) percentage. The larger family sizes of household members seen in *KK Lumbi* might possibly be linked to the fact that the region is poorer and family planning services were not appreciated by the majority of male and female population. Family planning awareness campaigns may also not have reached everyone, and where they had, many may have chosen not to use them. Strange rumours such as, falling ill if they were used or the notion that breast milk would dry up in nursing mothers, abounded. Many mothers also believe that family planning pills in particular changed the taste of breast milk and would lead to its rejection by new born babies, hence causing premature deaths. All this is exacerbated as the doctor/patient ratio which was recorded as being completely out of proportion in Chapter IV did actually mean minimal access to a doctor for most women, and consequently limited family planning facilities.

Household Composition

One noticeable phenomenon in *Kagera* and *Kinoru* was the fact that most households had more grandchildren than those from *KK Lumbi* villages. It was revealed earlier during the qualitative study that several young girls had born children while still at school, forcing parents or relatives to raise them when the mothers eventually, either married or resumed their school education. For *Kinoru* residents the distance to Meru town, which had been the regional headquarters for a long time, attracted many girls to sample town-life and premarital sex, bringing with this a rise in the HIV/AIDS infected and affected people and several children orphaned, adding the burden of caring for them to the other problems of parents and relatives. In *Kagera*, it was also possible to find households with children and grandchildren living together and being supported by their elderly parents or grandparents. In one particular incident, a man aged thirty-nine, who had lost his breadwinning wife, had settled back at his parent's home with his three children aged nine, three and nine months and was being taken care of by his elderly parents. Table 5.8 shows household composition of 429 members of the seventy-five sample households

Table 5.8 Household composition of 429 members of the 75 sample households (N=429)

Household	*KK Lumbi*		*Kinoru*		*Kagera*		Total	
Members	N	%	N	%	N	%	N	%
Household head	25	15.7	25	18.4	25	18.7	75	17.5
Partner	19	11.9	20	14.7	23	17.2	62	14.5
Child	108	67.9	46	33.8	75	56.0	229	53.4
Brother/Sister	0	0.0	1	0.7	1	0.7	2	0.5
Grandchild	6	3.8	31	22.8	9	6.7	46	10.7
Other family	1	0.6	6	4.4	1	0.7	8	1.9
Non-family	0	0.0	7	5.1	0	0.0	7	1.6
Total	159	100.0	136	100.0	134	100.0	429	100.0

Source: Household Survey (2003)

Age and Gender

Household survey data collected in 2003 relating to the *sex of household heads* showed that there were more males (72.0%) willing to give information on wild plant use than females (28.0%), in which over half (60.0%) of the respondents from *KK Lumbi* are males, those from *Kinoru* are slightly more than three-quarters (76.0%), while *Kagera* males make up four-fifths (80.0%) of the

total interviewed (*cf*. Table 5.4). Most female respondents came from *KK Lumbi* where women appear to be more competitive, especially in such outdoor activities as operating market kiosks and other businesses, jobs which are chiefly regarded as a male prerogative. Men in general appeared more responsive to accepting to be interviewed than females who were often shy or felt less knowledgeable about the use of wild plants. Useful wild plant knowledge, especially with regard to their use for medicine, material, environmental, and bee-keeping, was regarded as a domain of men in all three villages. Conversely women are known to specialize in the knowledge of wild food plants and others such as social use. Both sexes proved knowledgeable on wild plant use for non-vertebrate poisons and fuels. On fuel plant use, women were more knowledgeable about wood for firewood while men possessed more knowledge about selecting the best wood for charcoal. Traditionally women are never allowed to log trees for fear that they might hurt themselves. It is averred that they can never tell the direction in which a tree would fall, since they tended to 'shield themselves on the direction of the falling tree'. The implications in what is discussed here, confirms that the roles of men and women are socially defined and therefore influence day-to-day behaviour.

Life expectancy in the three Districts of Meru (DDP) ranges between sixty-nine in Meru South to sixty-two in Meru North Districts. Recent statistics indicate life expectancy ranging at fifty-six in women and fifty-four among men. Although this is the general trend in many countries of the world for women to live longer than men, the research in Meru indicated that the oldest respondents in the sample survey in all the three villages were men including one aged one hundred and seven (died two years after the survey) from *KK Lumbi* and another aged one hundred and three from *Kinoru*. The oldest of the female respondents was from *Kagera* and she was aged eighty-five. These three were among the respondents included in the category of seventy plus. The majority of respondents in all age categories were between sixty-one and seventy, being slightly below a quarter (24.0%) of the total.

In the former days, it was unheard of for a man to start a family before he was twenty-nine because of the various prescribed responsibilities he held in his the age-set, but currently the trend is changing. In *Kagera* for instance, over one-tenth (16.0%) of the respondents falls into the age category of younger than thirty-one and some ages as low as twenty-five, have been recorded. However, in *Kinoru* there are no household heads found in this category. Most respondents in this age-group had found jobs in towns and migrated with their families. It was also possible to find households of elderly married men who settled down to town life and left their households in the care of their spouses. Generally, there were no major variations in ages of respondents from the three villages, although *Kinoru* seemed to have the majority (56.0%) of the older respondents in the age category of sixty-one and above. It was closely followed by *Kagera* (44.0%) and *KK Lumbi* (18.0%).

Formal Education

It was noted at the beginning that Kenya's current *formal education* system does not offer an education which enables its scholars to gain knowledge and experience from parents and the reason is parents have less and less interaction with their children who spend most of their time in school. When these children are finally at home, they are burdened with large amount of homework because the subject load in schools is so heavy. It is literally impossible for them to find a spare moment to spend with their parents. In the former times, parents gave children guidance on good behaviour and the proper way to live, but this has now gone by the board resulting in several generations of young people who have a low opinion of their parents and assume them to be illiterate and incapable of teaching them anything. For this reason, old traditions on the use of wild plants, for instance, escape their attention and may continue to do so for generations to come, if the trend is not reversed. All the

same, it might be expected that people of higher formal education would use wild plants more than those with less, since they are assumed to know more, especially about the nutritional value of medicinal values of food plants and the best quality woods for material for various uses, good trees for the environment which act as wind and dust breakers as well as ornamentals.

In the three villages of Meru just as in the country as a whole, children attend pre-primary at the age of two years. They join primary education when they are six and secondary education at the age of fourteen. The primary education system in Kenya is referred to as an 8.4.4 system, consisting of eight years in primary, four years in secondary and four years at the university. To get into high school, a pupil has to qualify by gaining an acceptable number of points in the Kenya Certificate of Primary Education (KCPE) examination. Similarly to qualify for university a pupil has to pass the Kenya Certificate of Secondary (KCSE) examination. Those who do not gain entry into the universities may attend tertiary education in colleges and polytechnics. Adult education classes are also provided.

In Meru Central District for instance there are 380 pre-primary schools whose enrolment for boys is 50.4 per cent, while for girls is 49.6 per cent. The teacher pupil ratio is 1:30. The District has nearly 400 primary schools with enrolment rates of 48.4 per cent for boys and 51.6 per cent for girls. The average number of years of school attendance is eight. The teacher/student ratio is 1:16. In tertiary schooling, the number of such training institutions as colleges and polytechnics is five. The main types of institutions are primary, technical and teacher training. There is only one university in all the three Districts and also in the eastern province of Kenya which is located in Meru Central District - the Kenya Methodist University. The number of adult literacy classes is 122, of which 22.0 per cent of the pupils enrolled are men, while the rest (78.0%) are women. The drop-out rate by sex is 80.0 per cent. Literacy levels are 67.0 per cent.

There are five levels of education as well in Meru South District, which conforms to the education structure of the country as a whole and in the other two Meru Districts. Although the education system is referred to as the 8.4.4, the structure begins with nursery school (two years) at two to three years, pre-primary education (two years) at the age of four, followed by basic primary education (eight years) from the age of six, high school education (four years) is for the age-group between fourteen and seventeen after which, pupils either proceed to tertiary colleges or to the university (four years). Adult education is provided for those adults who have never had the opportunity to attend basic education. There are 352 pre-primary schools in the District with a total enrolment of nearly half (43.0%) representing 7,158 pupils. The teacher/pupil ratio in pre-primary education is 1:20. Pupils join primary school education at the age of six and leave at the age of fourteen. There are 256 primary Schools in the District with an enrolment of boys to girls rating at 89.6per cent: 95.5 per cent. The dropout rate of boys to girls is 9.9:6.1, probably attributable to poverty and the need for boys in the arid areas to herd cattle. The teacher/pupil ratio in primary school is 1:18. There are 144 secondary schools in the District, with enrolment percentages of boys to girls at 48.0 per cent: 51.0 per cent, while the total drop-out percentages are 0.9 per cent: 8.8 per cent. Most girls drop out in high school as the result of early marriages or pregnancies. The teacher/pupil ratio in high school is 1:14. In tertiary education (there are no universities) in Meru South District, there are nineteen colleges which include training colleges, polytechnics, teachers and nursing schools. In adult literacy, there are fifty-three literacy classes in the District. Enrolment rate by sex is 178 males to 386 females. The dropout rates of males to females in percentages are 93.0 per cent and 85.5 per cent respectively.

An interesting behavioural trait to do with the use of wild plants was observed among the young ‘educated’ people during the field surveys. When assistants were required to volunteer and help in the research on use of wild plants, university graduates who were approached jibed at the mere

thought of being asked to go collecting leaves and branches from bushes! In their eyes this was a job which could better be given to house servants, women and children who collect fodder for domestic animals. These are the 'uneducated' and 'dirty'-looking fellows who have never 'seen' the doors of a classroom, and not 'sophisticated' and 'clean' university graduates! A sister of such a graduate commented once, 'My brother to go and collect *makamba* in the bushes!' *Makamba* is a Meru name which in this context means 'plant rubbish'. The same word was also used to refer to shrubs. Such behaviour reveals an attitude which was inherited from the colonial masters whose servant-master relations were openly despised.

Table 5.9 shows that less than a quarter (16.0%) of all household heads from all three villages had had no education and could neither read nor write, and were normally dependent on their children or friends for these services. In *KK Lumbi*, for instance, more than a quarter (32.0%) of its respondents fell into this category, whereas the majority, which is less than half (48.0%) had basic primary education, with 12.0 per cent having attended high school, and 8.0 per cent being graduates. *Kinoru* had no respondents who lacked education ('no education'), but had slightly over a quarter (28.0%) of those who had had 'basic primary', while more than half (56.0%) of the total number had high School ('Secondary') level and less than a fifth (16.0%) were at degree ('tertiary') level. The two elderly respondents in *Kinoru* had enjoyed some degree of education from the very first mission schools which initially began in the District and therefore could read and write ('basic primary'). In *Kagera*, more than a tenth (16.0%) of the respondents had had 'no education' at all, more than a quarter (32.0%) had had 'secondary', less than one tenth (8.0%) had 'tertiary'. The majority composed of more than two-fifths (44.0%) fell in the 'basic primary' category. Table 5.9 presents the distribution of formal education and marital status of household heads in the sample from the three selected villages.

Table 5.9 Distribution of formal education and marital status of household heads in the sample survey over the 3 selected villages (N=75)

Variables	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
formal education								
none	8	32.0	-	-	4	16.0	12	16.0
primary	12	48.0	7	28.0	11	44.0	30	40.0
secondary	3	12.0	14	56.0	8	32.0	25	33.3
tertiary	2	8.0	4	16.0	2	8.0	8	10.7
marital status								
married mg	12	48.0	18	72.0	21	84.0	51	68.0
married pg	4	16.0	1	4.0	1	4.0	6	24.0
divorced	2	8.0	-	-	1	4.0	3	4.0
widowed	7	28.0	6	24.0	2	8.0	15	20.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

Two-fifths (40.0%) of the respondents from all three villages had had basic or primary education meaning that they had either followed the normal education programmes offered by the Government from pre-primary level to the highest level in primary, which would be standard 8 for those who started school in the mid-1990s, before the system changed to the 8.4.4 system currently in place. Those who went to school earlier should have gone as far as standard 7, since the education system

then was the 7.4.2.3, which is; seven years of primary, four years of secondary, two years of higher level and three years of university or college education. Some of those who had had basic education in this category may also have attended the 'read and write' adult classes which were referred to as *kaminchuria metho* (eye-openers). *Kaminchuria Metho* was an education system which offered reading lessons to individuals during the colonial era of the 1920s or 1930s (exact dates not known because of lack of records). The next group which had a higher number of respondents in all three villages was that with 'secondary' education. These made up one-third (33.3%) of all the respondents interviewed and was composed of those who had done various courses (vocational) and had acquired some type of certificate (not a college diploma) which enabled them to become junior Government employees. A total of about one-tenth (10.7%) of the respondents interviewed had managed to attend 'tertiary' education from either the national polytechnics or the universities, and had obtained a diploma or a degree respectively. *KK Lumbi* and *Kagera* had less than one-tenth (8.0%) of these among their respondents, while *Kinoru* had twice the number (16.0%).

Marital Status

The life histories of the Meru generally depict a community which had been predominantly polygynous, except in the very rare occasions where a man would be content with only one wife. Any disagreement between couples, for instance, would never have presented reason enough to ask for divorce, but would often have been used as a reason for a man to take an additional wife, but he would still continue to take care of the other spouse and her children. According to the frame of reference of the culture, there never used to be children born out-of-wedlock, but currently everyone has adopted 'modern' life and become 'civilized'. This has heralded the birth of a new culture, in which some community members no longer care what society thinks. Polygyny as well has continued to be regarded as a practice of the past as is indicated by the household survey data on the marital status of the household heads in which more than two- thirds (68.0%) of the respondents in the sample were married monogamously, while slightly less than a quarter (24.0%) of them were married polygynously. In *Kagera* alone, more than three quarters (84.0%) of the respondents were married and monogamous. There is more prestige involved in monogamous marriage nowadays, hence the large number of respondents who fell into this category. Most young men and women in the community marry when they are between twenty and thirty after which, if unmarried, 'people start to talk'. At this point parents and relatives begin to worry, and since marriages take place on the basis of free choice, all they can do is to wait impatiently. There are no longer forced or arranged marriages which used to occur before the coming of the Europeans, when parents decided on the spouses their children had to marry.

Young people nowadays are more independent in making choices although there are noticeably more stresses in current marriages than there once were, since the problems encountered are no longer solved communally. The age-groups in the survey therefore represent households which have families, since no single respondent had a home. It was not possible to find households composed of entirely single persons living on their own since this is still considered a taboo. After all, most young people with jobs immigrate to the city of Nairobi or to any other such places as Mombasa, Kisumu, Eldoret and Nakuru and here it is possible to find single unmarried persons with children heading households. The household survey data showed that one-fifth (20.0%) of the total number of respondents were widowed women, but the divorced category was quite a small percentage (4.0%). *KK Lumbi* had less than one-tenth (8.0%) of divorced respondents but *Kagera* had the smallest percentage (4.0%). *Kinoru* did not have any respondents in this category, probably because there is relatively less poverty in this village. A fifth (20.0%) of all the respondents in the three villages were widowed, and among them females dominated as *KK Lumbi* topped (28.0%) in this category.

Women normally remained unmarried once their husbands had died, while men tended to remarry quite fast.

Married women in Meru as a whole do not own property or children, nor do they exercise any authority over family matters at all. They live under the authority of their male partners who are also heads of the households, unless their spouses are deceased. As such, women are viewed as part of a husband's property, like land and other assets. They live to serve and care for their husbands, children and extended families. Should the husband die, women hesitate to remarry before they allow themselves to be 'enslaved' again. Considering the advantages marriage brings them, for men, it is the best way to live. The household survey data show that there are smaller percentages of the widowed males than females. Gender inequality has been a major setback to women's development in the three villages of Meru and has been viewed as a stumbling block to economic development. The percentage (4.0%) of divorced people in all the three villages was small.

5.3.2 Socio-Economic Status (SES): Profession and Wealth

Most people in the three villages, which applies equally to the larger Meru region, live below the poverty line mainly the victims of inexpert agricultural production which cause food shortages; poor infrastructure; idleness; ignorance; disease; insecurity; lack of Title Deeds; retrogressive cultural practices and environmental degradation. About 50.0 per cent of the population in the Buuri, Timau and Nkuene Divisions can be classified as poor. Forty-five per cent of all other Divisions in Meru Central District seem to fall in relatively similar categories. There are people in these Divisions who cannot afford to have three meals a day, among whom are the women, the young people, the aged and the small-scale farmers. Poverty tends to have been on the increase in the last ten years. Other factors which contribute to indigence include: inadequate and unreliable rains, lack of water for irrigation in dry areas, lack of employment opportunities, poor extension services, landlessness, collapse of the cotton and coffee sectors, low prices and lack of organized markets for agricultural products, high costs of agricultural input, poor infrastructure, high rates of school dropouts because of inability to pay school fees, inaccessibility to credit facilities which might enable them to buy farm inputs among others, high consumption of illegal brews, drug-taking by youths leading low working capacity.

In *KK Lumbi*, the majority of females are involved in agricultural production and taking care of families. Men are away in towns working or are in the *miraa* business. Consequently the heavy burden of searching for firewood, water and food weighs heavily on the women, leaving them very little time to engage in economic activities. Ownership of land is a preserve of men, and women have no access to Title Deeds to enable them to access credits. Female Genital Mutilation, a preference to educate boys rather than girls, domestic violence and neglect of families by men, are the main causes of poverty among women. Insecurity and cattle rustling from neighbouring Districts is also a major problem in this village since most of its domestic animals are reared in the drier northern borders of the District. Low food production is often experienced in the wake of the prolonged dry spells, which often result on the community relying on relief food from the Government. Other disasters which plague the village are occasional strikes by students in schools, HIV/AIDS, long spells of droughts and general food shortages. Meru residents are wholly dependent on seasonal rains for the growth of their crops. The failure of any crop afflicted by droughts can be very devastating. During the household survey exercise conducted in 2003, the socio-economic life of the villagers was viewed from several dimensions. Varying professions indicated what the

residents received in terms of monthly income, and possession of property in form of houses (homes), land, animals, poultry and assets dictated the well-being of an individual.

Profession

During the household surveys carried out in 2003, more than half (54.7%) of the respondents interviewed said that farming was their main occupation. More than half (56.0%) of the respondents in *KK Lumbi* village fell into this category, while there is less than a quarter (24.0%) in m the more urban village of *Kinoru*. The majority or more than four-fifths (84.0%) of the inhabitants of rural *Kagera* village are farmers. In general, over half (54.7%) of the respondents in the three communities were farmers. There were very few herdsmen (4.0%) and civil servants (5.3%) among the respondents in the three villages. In total, less than one-tenth (4.0%) of respondents in the three communities were herdsmen. *KK Lumbi* had less than a tenth (8.0%) of its respondents in this category; the same percentage for the category 'civil servant'. As a matter of fact, most farmers also kept some animals but did not regard this as their main source of livelihood. The civil servants who made up less than one tenth each (8.0% for both) were found in *KK Lumbi* and *Kagera* villages. All three villages had less than one quarter (18.7%) of respondents who were pensioners; in *Kinoru* more than half (52.0%) its respondents fell into this category. *Kagera* had less than one-tenth (4.0%), simply because they could not acquire jobs to eke out their pensions as respondents from the other two villages did as their environment was predominantly rural with farming as the main occupation.

There is a total of about a tenth (12.0%) of entrepreneurs from the three villages who run their own small businesses, including shop-keeping or selling in the market. Of these, *KK Lumbi* had one fifth (20.0%), while *Kinoru* also registered less than a quarter (16.0%) of its respondents. Now, more people than ever before showed signs of venturing into entrepreneurship, especially among the women folk in *KK Lumbi*, and also in Meru North District as a whole. The realization had dawned on such women that they needed to support themselves. Action was needed and they could no longer keep borrowing money and depending on the meagre incomes of their husbands. The awakening of such awareness has taken root strongly in *KK Lumbi* and *Kinoru*, but had yet to be embraced in rural *Kagera*. In all three villages, less than one-tenth (2.7%) of the respondents were landlords/ladies; all from *Kinoru*. The distribution of the main professions of the household heads in the sample from the three villages is shown in Table 5.10.

Table 5.10 Distribution of the main profession of the household heads in the sample survey Over the 3 selected villages (N=75)

Variables	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
	N	%	N	%	N	%	N	%
Profession								
farmer	14	56.0	6	24.0	21	84.0	41	54.7
herdsman	2	8.0	-	-	1	4.0	3	4.0
civil Servant	2	8.0	-	-	2	8.0	4	5.3
entrepreneur	5	20.0	4	16.0	-	-	9	12.0
pensioner	-	-	13	52.0	1	4.0	14	18.7
landlord	-	-	2	8.0	-	-	2	2.7
house Servant	2	8.0	-	-	-	-	2	2.7
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

The only servants in the survey (2.7%) were from *KK Lumbi*, which contributed a small percentage (8.0%) of its respondents who worked on farms or in the houses of their employers. In general, most respondents from the three communities explained that it was possible to hold one or more jobs simultaneously since the monthly incomes for most of them were very low. Nothing stood in the way of being a farmer as well as a landlord or an entrepreneur and a civil servant at the same time!

Socio-Economic Status (SES)

Monthly income was assessed in many different forms which included earnings from a salaried job, income from the sale of farm products or business earnings and so on. According to the survey, respondents who earned a monthly income of less than Kenya Shillings five thousand (Ksh 5,000) were regarded as 'poor', whereas those earning amounts ranging from above Ksh. 5,000 and below 10,000 were categorized as 'average' and amounts above Ksh. 10,000 as 'rich'. The results indicate a general trend of poverty among the respondents in the three villages. More than two-thirds (68.0%) of all the respondents were to be found among those in the 'poor' category, the majority of whom come from *Kagera*, more than four-fifths (92.0%) of its respondents. *KK Lumbi* was the second in the category of the 'poor' to which nearly three-quarters (72.0%) of its respondents belonged, and none there could be classified among the 'rich'. *KK Lumbi* has less than one-tenth (8.0%) of its respondents in the 'rich' category, while *Kinoru* had slightly more than a quarter (28.0%).

More than half (60.0%) of the respondents from *Kinoru* reported monthly incomes of 'average' and above, meaning that they were relatively well off compared to the other two villages. No single respondent in all three villages earned no income at all according to the surveys. The least earners, those grouped as 'poor', who earned monthly incomes of less than Kenya Shillings five thousand had either chickens from which they got eggs to sell or had some other farm produce which they sold to earn a living. *Kinoru* emerged as the richest village as far as monthly income was concerned with more than a quarter (28.0%) being found in the 'rich' category. Additional factors which contributed to the overall assessment of the socio-economic status of the household head, other than monthly income, are examined here below.

Type of House

At a glance, any member of Meru society can almost guess the socio-economic status of an individual in the community the moment they enter the compound. Before the colonial invasion houses were predominantly built of mud walls, grass-thatched roofs and earth floors. Until the beginning of the twentieth century, these houses were not just typical of Meru, but of other parts of the country as well. When the colonial masters settled in Kenya, they started building wooden houses, which required biting deep into the already culturally protected forests. The houses would then be finished with cement floors and roofed with corrugated iron sheets. The authorities realized that this did not augur well for the conservation of trees and forests, and began quarrying bricks; eventually building homes built with walls of this material, cement floors and corrugated iron sheets or tiled roofing. The first group of the 'educated' Kenyans consisting of the young Meru men also began to construct similar types of houses.

However, such houses were not readily accepted by the elderly, since they were regarded as cold and the floors assumed to be slippery. They were said to have had several 'holes' (ventilations, windows and doors) in contrast to the one-roomed, single windowed hut which was shared with calves, poultry and goats. Such a hut would have a fireplace in the middle of the room to warm 'everyone' inside. To-date, it is not uncommon to find a family of the 'educated' to 'tertiary' or those at equivalent level, resident in brick houses, while their elderly parents live quite happily in a

'warm' grass-thatched, dirt floored, mud hut, in the same compound! The type of house the respondents lived in was classified in relation to the material which made the wall; 'poor' for mud huts, 'average' for wooden/brick walled and foundations of brick and brick/brick walled and tiled or corrugated iron roofing, categorized as 'rich'.

Data collected, show that the majority of respondents, namely more than four-fifths (88.0%) of the total from *Kagera*, have mud-walled dwellings, *KK Lumbi* following closely (84.0%), while *Kinoru* had less than a quarter (16.0%) in this 'poor' category. *Kinoru* had respondents among whom more than four-fifths (84.0%) had wooden or brick-walled houses with slightly less than half (40.0%) of them owning brick-walled houses, thereby falling into the 'rich' category. In this category, *KK Lumbi* and *Kagera* both had less than a tenth (respectively 8.0%, 4.0%), scoring even fewer among the rich of their respondents. The 'riches' of *Kinoru* respondents can be explained by the fact that this area is in the Municipality, which has served the larger Meru region as its headquarters for many years. Most of its inhabitants therefore worked as civil servants for quite a while either there or in other major towns in the country.

Type of Roof

It was not uncommon to hear the question,' what type of roof does so-and-so have on their house'. There are three types of roofing known amongst the inhabitants of Kenya and indeed the larger Meru region. These are grass, corrugated iron sheets and tiles. It is more expensive to build 'modern' types of houses, which have wooden walls, cement floors and corrugated iron sheet roofs or brick walls, cement floors and tile roofing. Naturally, the Meru would classify a person depending on their type of houses. Therefore a person whose walls were made of mud (clay) would be seen as 'poor', of wood as 'average' and brick as 'rich', respectively. As such, these considerations had to be taken into account in classifying respondents. Anyone with a grass-thatched house in the community was categorized as 'poor'. Those with a corrugated iron roof houses were considered 'average' and those with *tiled* roofs 'rich'. The 'poor' category was less than one-tenth (8.0%) of the total number of respondents interviewed. Less than one-fifth (16.0%) of the *KK Lumbi* and less than one-tenth (4.0%) of *Kagera* respondents were categorized as 'poor'. At the same time, those who were regarded as 'average' made up more than three-quarters (84.0%) of all the respondents in all the three villages. These were chiefly those respondents who had houses roofed with galvanized iron sheets. *Kinoru* and *Kagera* had more than four-fifths (88.0%) of respondents in this category, while *KK Lumbi* had slightly over three quarters (76.0%) in total. The 'rich' who had houses with tiled roofs represented less than one-tenth (8.0%) of the respondents from all the three villages in the survey. The category of the 'rich' also showed the same percentage. It is easy to note from the data collected that the majority of the respondents in all three villages had their houses roofed with galvanized iron sheets, a conspicuous phenomenon seen from one end of the larger Meru region to another.

Recently coloured galvanized iron sheets have been introduced, a kaleidoscope of blue, green, red and maroon and residents tend to opt for these much more than before. It is not common to find mud houses roofed with tiles or brick houses thatched with grass (in this survey none of these were found), but it is common to find brick houses roofed with corrugated iron sheets since these last longer than tiles in the hot equatorial climate, and can also withstand the torrential rains of the tropical storms. Some people with houses which had tiled roofs at one time or other removed the tiles in favour of iron sheets since the former had been found to fall apart in the hot sun, allowing rainwater to seep through. Table 5.11 shows the distribution of SES of the respondents in the three selected villages.

Table 5.11 Distribution of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages (N=75)

Variable	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
	N	%	N	%	N	%	N	%
monthly income								
poor	18	72.0	10	40.0	23	92.0	51	68.0
average	5	20.0	8	32.0	2	8.0	15	60.0
rich	2	8.0	7	28.0	-	-	9	36.0
type of house								
poor	21	84.0	4	16.0	22	88.0	47	62.7
average	2	8.0	11	44.0	2	8.0	15	20.0
rich	2	8.0	10	40.0	1	4.0	13	17.3
type of roof								
poor	4	16.0	-	-	2	8.0	6	8.0
average	19	76.0	22	88.0	22	88.0	63	84.0
rich	2	8.0	3	12.0	1	4.0	6	8.0
number of sleeping rooms								
poor	21	84.0	6	24.0	13	52.0	40	53.3
average	4	16.0	15	60.0	12	4.0	31	41.3
rich	-	-	4	12.0	-	-	4	5.3
size of rural land								
poor	16	64.0	17	68.0	14	56.0	47	62.7
average	7	28.0	1	4.0	8	32.0	16	21.3
rich	2	8.0	7	28.0	3	12.0	12	16.0
size of urban land								
poor	25	100.0	21	28.0	25	100.0	71	94.7
average	-	-	3	12.0	-	-	3	4.0
rich	-	-	1	4.0	-	-	1	1.3
number of cattle								
poor	14	56.0	24	96.0	20	80.0	58	77.3
average	10	40.0	1	4.0	3	12.0	14	18.7
rich	1	4.0	-	-	2	8.0	3	4.0
number of goats/sheep								
poor	10	40.0	6	24.0	7	28.0	23	30.6
average	10	40.0	3	12.0	13	52.0	26	34.7
rich	5	20.0	16	64.0	5	20.0	26	34.7
number of chickens								
poor	13	52.0	14	56.0	6	24.0	33	44.0
average	10	40.0	7	28.0	19	76.0	36	48.0
rich	2	8.0	4	16.0	-	-	6	8.0
own a car								
poor	24	96.0	18	72.0	25	100.0	67	89.3
average	-	-	6	24.0	-	-	6	8.0
rich	1	4.0	1	4.0	-	-	2	2.7
own a television set								
poor	22	88.0	12	48.0	25	100.0	59	78.7
average	2	8.0	13	52.0	-	-	15	20.0
rich	1	4.0	-	-	-	-	1	1.3
own a telephone								
poor	23	92.0	8	32.0	25	100.0	56	74.7
average	2	8.0	15	60.0	-	-	17	22.7
rich	-	-	2	8.0	-	-	2	2.7
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

Currently, several people who wished to use tiles have had to put corrugated iron sheets on their roofs first covered with a waterproof polythene sheet before they lay the tiles. The number of bedrooms in a house is seized upon by the Meru community as a way of assessing a person's

economic status, albeit in addition to others factors already discussed or elaborated. Figure 5.1 shows a warm respondent's house with a sheep enjoying the shade from the mid-day sun.



Figure 5.1 A sheep seeks the shade under a 70 year old respondents' grass-thatched, mud-walled hut. *Photograph:* A.K Ibui, *KK Lumbi* (2005).

Number of Bedrooms

'How many bedrooms does the house have?' is a common question asked when inquiries are made about the size of a house in Meru. The number of bedrooms in a house is associated with the degree of wealth of the owner. Most respondents had houses whose bedrooms ranged from one to six and with the help of the three key informants from each of the three villages, those with one to two bedrooms were categorized as 'poor', those with three to four as 'average', and five to six as 'rich'. All the seventy-five respondents interviewed had at least one bedroom. On the above qualification twenty-one respondents or more than four-fifths (84.0%) of the total number of *KK Lumbi* were found to be 'poor'. *Kinoru* had slightly less than a quarter (24.0%) of all its respondents in this category, while *Kagera* had slightly over half (54.0%). Consequently, *KK Lumbi* transpired to be the poorest in this category. Less than one-fifth (16.0%) of the respondents from this village had three to four bedrooms, ('average'), *Kinoru* had nearly two-thirds (60.0%), while *Kagera* has a very small percentage (4.0%) of respondents in this category. In all three villages less than one-tenth (5.3%) of respondents had five to six bedrooms and were incidentally all from *Kinoru*, where there were slightly more than one-tenth (12.0%) of the total from the village.

Among the Meru it is the custom not to share the same door or sometimes even the same house with adolescent or older sons and daughters. A household head with such children will build extra bedrooms for them with separate entrances or build them separate houses/huts in which to sleep, a custom which is slowly dying out, especially for families living in towns and those which own the 'modern' types of houses with brick walls and tiled roofs described above. A cement floored, wooden walled, corrugated iron roofed house of one of the respondents in the survey is shown Figure 5.2



Figure 5.2 A 78 year old respondent standing in front of her cement-floored, wooden-walled, corrugated iron roofed house.
Photograph: A.K.Ibui, *Kinoru* (2003).

Land Ownership

The Greater Meru region is situated on the north-eastern slopes of Mount Kenya in a region which enjoys a relatively cool climate and land which supports agriculture. It is one of those parts of Kenya in which white settlers chose to settle and farm during the colonial era of the 1920s to the 1960s, particularly the Timau area in Meru Central District, which they then named the 'White Highlands'. Kenyans have bitter memories of this invasion which initiated the struggle for independence in attempts to seize back their land from the 'intruder'. Land to a Meru is wealth, an asset which may even be purchased and kept for later, when they are not using it, as being landless is tantamount to being homeless. Land provides a place to farm and to build a home, and if inherited from one's parent, it is regarded as sacred and cannot be sold. Anyone who knows the Meru will be aware that to interfere with their land or to belittle it in any way is an unwelcome form of mockery. In fact, it is famed that when the first president of the Republic of Kenya, Mzee Jomo Kenyatta, was told by the British to bet for what he would like to be given from Kenya as his country, he bet soil which meant, land or the nation – the most sacred heritage. In certain parts of the country, land clashes have been reported. Newcomers to a place are evicted by those who first settled there. Evicting someone from their land is comparable to throwing a person out of their home which they have owned – a sacred possession, and can have serious consequences for the intruder. It is regarded as the main inheritance of anybody, and the larger the size, the wealthier the owner feels. The land located in the rural setting is regarded as being of less value than in town.

Rural Land Ownership

Most Meru people have lived on rural land at some time or another before the current urban centres were developed. The land most recognizably urban in all three Districts lies within the Meru Central District municipality (*Mutindwa*) or in Maua and Chuka towns and is more expensive than land in

other smaller towns. Most respondents therefore lived on such land which was regarded as being relatively cheaper depending on how far away it was from town. If a respondent had rural land the equivalent of an acre, this was valued as owning half-an-acre of urban land. Of course, the value fluctuates from town to town and was unsurprisingly found to be higher in Meru town and the areas close to the municipality. To ensure equality, land in the towns is valued at twice the price of the same area in a rural setting and since respondents lived on the urban or rural land or even possessed both, those with zero to two acres of rural land were said to be 'poor'. Those with more than two to four acres were labelled 'average' and those with more than four acres were said to be 'rich'. Figure 5.3 shows a cemented-floored, brick-walled, tile-roofed house of a respondent in the survey.



Figure 5.3 A respondent pose for a photograph with his grandchildren in front of his brick-walled, tile-roofed, several bedroomed house.
Photograph: A.K. Ibui., *Kinoru* (2005).

Respondents from *Kinoru* were poorer in rural land than those from the other two villages with a two-thirds (68.0%) majority emerging as 'poor'. Those from *KK Lumbi* (64.0%) and *Kagera* (56.0%) villages fell equally into the same category. The general overview shows that more than half of the respondents in each village owned two or fewer acres of rural land, and there were some respondents who had larger pieces of land ranging from five acres and above. More than a quarter (28.0%) of the respondents in *KK Lumbi* had between two and four acres of rural land, whereas less than a tenth (4.0%) from *Kinoru,* and more than a quarter (32.0%) from *Kagera* respectively fell into this 'average' category. Less than one-tenth (8.0%) of the respondents from *KK Lumbi* owned more than four acres of land, while more than a quarter (28.0%) from *Kinoru* and slightly above one-tenth (12.0%) of those from *Kagera* owned similar areas of land, thereby falling into the category of the 'rich'. The disparity between land ownership was quite glaring and the gap between the rich and the poor very large. For instance, one respondent had 39 acres of rural land, whereas another had 26, another 24 and so on. There were those with less than an acre also living together in the same village.

Rural land is usually inherited from parents and a child whose parent's lacks land can be as poor as its parents, since their landlessness and consequently their poverty is inherited. A parent who has no land hopes that their children would have the opportunity to acquire an education and subsequently find employment so that they would be able to buy land; otherwise they would live 'poor' in this sense. For many generations land has been the major wealth which children could inherit from their parents. Nowadays most parents bank more on education than land, since they have realized money can buy much more. Until recently, only boys could inherit land, the tradition is changing, albeit slowly, and parents are allowing their daughters to inherit land as well. However, this is causing intense controversy among many tribes and religious groups in Kenya, as witnessed in 2006 where a great controversy arose which led to the rejection of the proposed constitution.

Urban Land Ownership

Urban land in the municipality which was owned by some of the Meru respondents did not amount to one acre, and some people had none at all, and lived in rented homes, hence falling into the category of the 'poor' in this sense. Those who were in the 'average' category had land amounting to between one and two acres, while the 'rich' had more than two acres of urban land. Most *Kinoru* respondents who lived in the municipality owned very little land and confessed that this was the main reason they had not thought of planting trees in the previous year. The majority of the respondents did not own any urban land at all. A statement especially true of those from *KK Lumbi* and *Kagera* is revealed from the data shown in Table 5.11. Over one-tenth (16.0%) of the respondents from *Kinoru* possessed urban land ranging from one acre and above. In total over four-fifths (94.7%) of all the respondents from all the three villages did not own urban land.

Ownership of Domestic Animals

Domestic animals represent riches and wealth to a Meru family, a notion which has been passed down for generations, even from the very origins and settlements on the island of *Mbwaa*. Animals have been used in exchange for food, as bride wealth, and for meat at social functions which include weddings, initiations, births and funerals. These practices transcend many generations over the whole region of the larger Meru, even down to the present. Animals also provide mental and psychological satisfaction to many a Meru and hence can be found bred as a hobby even when the land or the returns do not meet the cost of rearing the beast or support environmental conservation. In terms of wealth in cattle therefore, a respondent with two indigenous cows is regarded as being as wealthy as one with one grade milk cow, and hence categorized as 'poor'. A respondent with two grade cows, which is the equivalent of four Meru cows, is categorized as 'average' and anyone with more animals than these as 'rich'. More than three quarters (77.3%) of all the respondents were categorized as 'poor' in cattle. *Kinoru* respondents transpired to be the poorest in cattle as indicated in the data. Over nine-tenths (96.0%) was noted in the 'poor' category. *KK Lumbi* respondents had four or more *Kimeru* (indigenous) cattle or the equivalent as shown in the distribution table, on which nearly half (44.0%) of the respondents appear. *KK Lumbi* is the most arid of the three villages and respondents had more Kimeru cattle than in the other two villages. It is important to note here that Kimeru cattle have the same value whether male or female. Heifers are favoured more than the bulls among grade cattle, since their value is seen in terms milk production and the birth of female calves. Kimeru cattle are kept chiefly for their meat, although they also provide some milk for most families. They are easier to keep, can withstand hash environments and are less prone to killer tropical diseases.

Looking at sheep or goat ownership, the respondents who owned fewer than five goats or sheep were regarded as 'poor', and those with six to ten goats/sheep were grouped at 'average'. One with

more than ten was accounted among the 'rich'. Among the respondents from *KK Lumbi*, two-fifths (40.0%) were 'poor', and only a fifth (20.0%) were regarded as 'rich'. In *Kinoru* on the other hand, nearly two-thirds (64.0%) of the respondents were 'rich' in sheep/goats, and less than a quarter (24.0%) of those remaining were regarded as 'poor'. Data for *Kagera* respondents show that more than half (52.0%) of the respondents owned more than five to ten goats/sheep, falling in the 'average' category, and one-fifth (20.0%) of those remaining were 'rich' in goats/sheep. *Kinoru* respondents tended to be quite 'rich' therefore in goats/sheep compared to the other two villages. It is not common in Meru as a whole to find cattle slaughtered during a family function, unless it is at community level, such as is the case in weddings and funerals. In such instances, bulls are slaughtered and the community gather to celebrate or to mourn, although in some cases the type of animal slaughtered depends on the financial capability of the host. Meat is roasted, boiled or grilled and made into *mitura* (sausages) in addition to making stews for traditional foods. Lately feasts at funerals have been discouraged.

Ownership of Poultry

It is very rare to find a Meru homestead without a hen loitering around with its chicks on the look out for food to the joy of eagles, which take cover in trees and bushes making it difficult for many farmers to raise the required number of chickens at any one time. Hens provide eggs for the family ensuring most needed protein. For centuries, the crowing of the cock has been used as the clock/watch by the people, and the times of crowing are known to most Meru housewives. Time to wake in the early morning, times for lunch, school breaks, the setting of the sun, and the preceding darkness are known by the crowing of the cock. The Meru housewife observes the chickens and listens to the cock crow. As the Western clock is to Western people so is the cock crow to the Meru.

Chickens are slaughtered whenever an unexpected visitor comes to visit a family and stays overnight. Depending on the importance placed on their friendship, a chicken can be slaughtered in a matter of minutes. Traditionally it is said that *Kukukukoooo*---- (the cock's crow) *Mugeni nejeeeeee, nturume ithinjueee*--- (let there be a visitor and a goat be slaughtered), a cry which is supposed to distract the owner from thinking of slaughtering a cock to slaughtering another animal, thereby drawing attention away from itself. At such times it would be the cock's hope that the family would slaughter a goat or a sheep; normally hens are not slaughtered unless there is no cock available. To be 'poor' in chicken in the Meru community as indicated by the data of the respondents, a person had to have one to ten chickens, and on 'average' eleven to twenty and twenty-one and above were regarded as 'rich'. From the distribution table therefore, more than three-quarters (76.0%) of the respondents from *Kagera* village were 'average' in chickens. More than half (56.0%) of the respondents from *KK Lumbi* were 'poor' in chickens. Two household members in *Kinoru* actually had over 1000 chickens which were being reared for commercial meat production.

Other Possessions: Cars, Television and Telephone

Assets such as a television, telephone and ownership of a car are some of the other indications which the local Meru people associate with riches and therefore are some of the factors which might be used to assess a respondent, contributing to a better understanding of the life in the three communities. Ownership of a television meant that a person could afford solar power or they had electricity connected to their houses. To have electricity connected to a house or to afford solar panels for energy in Meru, it is necessary to be a person of means. The same can be said about the ownership of a telephone in the house and a car. Anyone without a television, a telephone or car among the respondents was viewed as being 'poor'. Anyone with one of each of these assets was

regarded as 'average' and 'rich' if they had more than each of these. Examining car ownership, all the respondents from *Kagera* did not own any cars, and only one respondent from *KK Lumbi* owned a vehicle (two in fact). In *Kinoru*, six respondents owned one car each and a seventh one had two. It is interesting to note the disparity in 'wealth' among respondents of one community in which some appeared so rich while others displayed immense poverty. Except for a few local inhabitants as seen with the respondents of *Kinoru* and *KK Lumbi*, the majority of the population of these communities did not own cars and often depended on public transport to travel from place to place.

Likewise, no respondents in *Kagera* owned a television set, less than a tenth (8.0%) from *KK Lumbi* had one each, while one individual had two. In *Kinoru*, more than half (52.0%) of the respondents had one set each. There was no electricity in the homes of the respondents of most of the *KK Lumbi* homes, with the exception of solar power which charged batteries and produced energy to run the televisions. In contrast, every respondent in *Kinoru* who had a television set had electric power connected to their houses. Every evening in Meru, unlike people in cities where people depended on television and newspaper news, most men and women flock into the nearest towns to meet and to hear the news of the day.

The majority in these groups are the young people. News is therefore passed from one person to another and within hours it spreads to the villages. It is not uncommon to find most Meru youths and men in towns and markets centres waiting to hear 'of the latest developments/news of the day', a culture which encourages idleness. In the past, such behaviour could be observed only in the evenings but at present most youths spend days on end idling in towns and markets places. Of late, more and more youthful females have also started to flock into these same spots after the day's work to 'catch-up with the news'. Any information communicated by such a person whether male or female spreads to the other very fast. In these forums therefore, people get to know about the days assigned for chiefs' *baraza* (meetings), parents' days in schools, deaths, births, initiations, weddings which have been or are to be conducted and disasters or calamities which may have occurred locally nationally or internationally.

Household surveys carried out in the three villages of Meru among seventy-five household heads in 2003 show that nearly three-quarters (74.7%) of them did not own a telephone. In *KK Lumbi* for instance, less than one-tenth (8.0%) owned a telephone, and none had any in *Kagera*. Three-fifths (60.0%) of the respondents from *Kinoru* had at least one telephone each, and less than a tenth (8.0%) of the total population in this village had two. The main method of communication in Meru is by word of mouth as earlier explained. When this survey was being conducted, mobile phones had not entered the scene in the Greater Meru region. To-date (November 2007), literally every one owns a mobile telephone ranging from those with jobs to those in school and as yet to find employment. At present, most clothing stalls have been transformed into handset shops. It is amazing how this transformation has taken place within a very short period!

Having assembled the data about the respondents in the three villages of Meru, it was possible to assess the overall Socio-Economic Status (SES) of the household heads. This was initially given in a three category distribution by the research team on the basis of the assessment made on entering the compound of a respondent. The categories 'poor, 'average' and 'rich' were given to each of the respondents as the team unanimously agreed depending on what they could see as the wealth of that particular respondent. The team's assessment data show that more than two-thirds (68.0%) of the respondents from *KK Lumbi* are categorized as 'poor', with *Kagera* also showing a relatively high percentage (60.0%) in the same category. Table 5.12 shows the distribution of the Socio-Economic Status (SES) of the respondents in the three selected villages as visualized by the research team.

Table 5.12 Distribution of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages as assessed by the research team (N=75)

Socio-economic	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
Status	N	%	N	%	N	%	N	%
poor	17	68.0	4	16.0	15	60.0	36	48.0
average	7	28.0	10	40.0	10	40.0	27	36.0
rich	1	4.0	11	44.0	-	-	12	16.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

According to the research team, nearly four-fifths (84.0%) of all the respondents living in the three villages were living either at an 'average' or below SES. *Kinoru* respondents appeared relatively well-to-do with only less than a quarter (16.0%) categorized as 'poor'. No respondent could be classified as 'rich' in *Kagera*, but in *Kinoru* slightly less than half (44.0%) appeared in this category and those from *KK Lumbi* registered less than one-tenth (4.0%). In general, the research team assessment of the three villages, confirmed what had been documented earlier in the District Developments Plan records (DDP), in which poverty levels were said to contribute a substantial percentage to the overall national figures. Table 5.13 presents the spread of the distribution of the later overall assessment of socio-economic status (SES) of the household heads according to the data in the sample survey in the three selected villages.

Table 5.13 Distribution of the overall assessment of the socio-economic status (SES) of the household heads in the sample survey over the 3 selected villages (N=75)

Socio-economic	Village						Total	
Status (SES)	*KK Lumbi*		*Kinoru*		*Kagera*		*N*	*%*
	N	%	N	%	N	%		
very poor	7	28.0	-	-	4	16.0	11	14.7
poor	12	48.0	5	20.0	16	64.0	33	44.0
average	4	16.0	8	32.0	4	16.0	16	21.3
rich	1	4.0	6	24.0	1	4.0	8	10.7
very rich	1	4.0	6	24.0	-	-	7	9.3
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

After the initial assessment by the research team, it was apparent that there were respondents who were overwhelmingly 'rich', while others were languishing in utter poverty. Through statistical computation on the analysed SES data, a re-calculation was made using the Statistical Program for Social Sciences (SPSS) which allowed five categories to be formulated from the original three. With the re-calculated data therefore, it was possible to show that some respondents were in the 'very rich' category. These were the ones who owned many acres of both rural and urban land; two cars; two television sets; two telephone lines; hundreds of grade cattle; beautifully lawned compounds in with brick-walled, multi-roomed, tile-roofed, cement-floored houses. Conversely their antipodes categorized as 'very poor', owned almost nothing. These did not only own the minimum number of animals, land or enjoy a monthly income, but had virtually no assets and depended on the little incomes which they could obtain by working on peoples' farms. The data show that more than one-tenth (14.7%) of the respondents in the three villages were 'very poor'. The majority of these came from *KK Lumbi* (28.0%) and *Kagera* (16.0%), but none from *Kinoru* were found in this category.

The poverty levels of these respondents were a reflection of the DDP report cited earlier. Among the 'poor' category were most of the respondents from *Kagera* who constituted more than half (64.0%) of all the respondents in that village, followed closely by *KK Lumbi* where nearly half (48.0%) of the respondents were found to be poverty-stricken. A considerable number of the respondents from *Kinoru* were either in the 'rich' (24.0%) or 'very rich' (24.0%) category. There was no single respondent among the *Kagera* respondents who was recorded as being 'very rich', while in *KK Lumbi*, nearly one-tenth (8.0%) fell into the categories of the 'rich' (4.0%) and 'very rich' (4.0%). *Kagera* respondents appeared to be the poorest of all from the three villages with four fifths (80.0%) of the respondents being categorised in the 'poor' and 'very poor' , followed by *KK Lumbi* (76.0%), but there seemed to be an even spread from the 'poor' to the 'very rich' categories in *Kinoru*. The fact previously noted in Chapter IV that most Meru households lived below the poverty line and contributed 2.1% 1.32% and 1.59% of the *national poverty* 2002-2008), were confirmed.

5.4 Meru Culture, Wild Plants and Conservation

5.4.1 Traditional Plant Knowledge and Use

Following the recent re-orientation towards local people's knowledge and practice in Kenya, the significant factors have been highlighted in a number of recent studies (Leakey & Slikkerveer 1991; Meyerhoff 1991; Nufuna Wamalwa 1991; Slikkerveer 1995; Kabuye 1995; Warren *et al* (1995; Maundu *et al.* 1999). Indubitably in rural areas, where the traditional farming systems have persisted despite the influx of modern agriculture, most farmers still successfully employ their knowledge and skills to use and manage their indigenous plants and crops to supply their needs for food and medicine. Unfortunately, the implicit economic value and genetic variability of these indigenous plants and their wild relatives, as well as the related potential for breeding and production, have so far been studied only in a few cases (*cf.* Maundu, Kabuye & Chweya 1993).

As was documented earlier, the Meru people had built up an immense fund of knowledge of the use of plant resources since these provided the raw material for building bridges during the plight from *Mbwaa*, not to mention providing food, firewood and cover from enemies and wild life. There were individuals who were local experts in identifying wood for the construction of beehives, still a major art even to-date. What wood should be used for the construction of towers from which to keep a look out for enemies or when scaring birds away from crops is common knowledge. Clothing could be made from selected plant leaves, while storage barns could be made to store grain and other food products for long periods of time. Such grain was used for planting in the coming seasons or to make the most sought after local brews.

The Meru, including the respondents living in the selected villages which were surveyed, reveal great accumulated skill in making *iikabu* (baskets), *miuuru* (storage baskets), *iikiri* (gourds) and *ijuga* (traditional plates) as well as many such farming implements as digging sticks, ploughs and carts. Household items which include *ntiiri na mutiiri* (mortar and pestle), *gakiri ka mbaki* (snuff boxes), handles for fly whisks, *mikinyi* (tooth brushes; *cf.* Figure 5.4); *mikanda* (ropes), *iikuri na iichanuri* (combs), *iichiko* (wooden spoons) and *iikombe* (cups) and the like are made from plant products. During times of combat against enemies, items such as *nchuguma* (a piece of stick with a rounded head), *uta* (bows) and *migwi* (arrows), would be used as weapons of war, while some plant saps provided the lethal poison used to smear on arrow-heads. Besides making tools and clothing, *dawa* (medicine), *marachi* (perfumes) and *sabuni* (soap) would be made from plants, and in leisure time *kiuthi* (games) would be played on boards made from wood. In the preparation of food, grains

would be ground using the *iiga ria gukia* (traditional grinding stone) to make the flour used in the preparation of meals, porridge or beer.



Figure 5.4 A Meru girl demonstrates the use of a *mukuma* (*Hibiscus fuscus*) toothbrush. *Muthaara* (*Indigofera erecta*), *muoru* (*Plectranthus sp*.) and *mwatha* (*Vernonia lasiopus*) are commonly used for this purpose.
Photograph: A.K Ibui (2007).

Indeed over 50.0 per cent of the respondents from *Kinoru* and *Kagera* revealed an above 'average' knowledge in making such items. Those from *KK Lumbi* showed themselves relatively ignorant (64.7%). Over half of the respondents in the three villages showed a total of 'average' and above (77.3%) knowledge on use of wild plants in general. Meanwhile, green herbs which included *terere* (*Amaranthus*), *managu* (*Gynandropis gynandra*), *thaa ya njogu* (*Urtica massaica*) and *muko-uri-iuu* (*Asystasia gangetica*), some of which are a delicacy even to-date, would be cooked and eaten as vegetables. Special skills in making tools, food, medicine, beehives and other crafts were left to local experts among the Meru who originally learned them from their elderly relatives who passed down the knowledge to their children and to their children's children. It is noticeable that very few Meru people know how to cook such herbs as *thaa ya njogu* let alone understand the art of plucking it from the parent plant. For this reason many have abandoned cooking it, not because they dislike it, but because they simply no longer know how to go about preparing it. *Managu* is a traditional delicacy which only a few families know how to cook so as to eliminate its bitter taste. Fortunately, a new herb which is in all aspects similar but not bitter has been introduced to the modern market.

For centuries, areas which are now natural forests, including Mount Kenya, Gitoro and Nyambene Hills, have yielded plants whose leaves, barks, roots and buds have been used by the local population to prepare medicine. Though not openly accepted by the authorities, this medicine

is used by over 80.0 per cent of the larger Meru population. These herbs are also sources of plenty of leafy vegetables which are consumed by the people as *food*. Sometimes it is difficult to determine the difference between certain food and medicinal plants except by observing the way each is prepared. Table 5.14 shows the distribution of the level of wild plant knowledge of household heads in the sample survey over the three selected villages.

Table 5.14 Distribution of the level of wild plant knowledge of household heads in the sample survey over the 3 selected villages (N=75)

Wild plant knowledge	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*		N	%
	N	%	N	%	N	%		
Very low	10	40.0	2	8.0	6	24.4	18	24.0
low	8	32.0	5	20.0	6	24.4	19	25.3
average	4	16.0	8	32.0	7	28.0	19	25.3
high	3	12.0	7	28.0	2	8.0	12	16.0
Very high	-	-	3	12.0	4	16.0	7	9.3
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

Most plants parts though boiled and eaten as soups as remedies against certain diseases can also be used as food by those who are well. They believe they will be kept them healthy warding off any chance diseases. Fruits, seeds and tubers are gathered from the bushes and eaten as snacks by most people, especially the children who normally cannot wait for meal times which may sometimes be twelve or more hours apart. It is also known that in the past wild vegetation provided all the cosmetic and hygienic requirements of the community. Moreover, ritual and religious functions would be performed in acts which required the use of certain parts of some of these plants; another reason which made the conservation of wild vegetation essential in Meru culture. *Mujuthi* (*Caesesalpinia volkensi*), *murao* (*Senna didimobotrya*), *ndago* (*Cyperus articulatus*) and *muriiru* (*Zyzgium cordatum*) are four commonly known plants which played major roles in the socio-cultural life of the society.

Fuel consumption in form of firewood and charcoal is still very important in Meru. Dead wood is used primarily for the former but several trees have to be felled to make the alternative fuel - charcoal. As the indigenous forests which provide dead wood for fuel are diminishing, people have turned to growing exotic trees, among them the *Eucalyptus*. To provide wood for firewood, the people have grown the *Grevillea* tree extensively to ensure themselves of a continuous supply. During the current study, it was possible to see that Meru has become a forest of *Grevillea robusta*, a fact which caused the researcher a mixture of joy, sadness and jealousy all at the same time. Joy, because the people were very enthusiastic about replanting this tree; sadness because the people had grown estranged from their indigenous plants and had succumbed to the belief that indigenous trees took much longer to mature, consequently giving up efforts to replant them; jealousy because if these trees (*Grevillea*) had been indigenous, they could have been used to cater for multiple functions for the local population for generations.

Most Meru homesteads are surrounded by beautifully manicured hedges, which are composed of indigenous wild plants. Several trees are also planted to provide windbreaks, shade and general environmental beauty around farms and compounds. Others which grow naturally on farms provide compost and prevent soil erosion, which is a lurking curse just waiting to devastate those parts of Meru which are hilly and criss-crossed by gorges. Among such trees and shrubs are the *mutunguu* (*Commiphora eminii*), *mujara* (*Plectranthus barbatus*) and *mwaraka* (*Tetradenia riparia*).

Mutunguu is popularly used as a marker to indicate the boundaries of individual farms. *Mujara* and *mwaraka* are used by most locals to make hedges around homesteads. These plants have been conserved through time because of the important functions which they have performed since most people cannot afford the barbed wire and the exotic poles which are used as boundary markers by the well-to-do.

Of great importance are those plant products which provide insecticides which kill non-vertebrates and include chiggers, fleas and ticks. Among these *mutongu* (*Solanum incanum*) whose sap, which is found in mature fruits, kills chiggers and heals the horrible wounds these inflict on the skin. Chiggers discourage tourists from visiting Africa who refer to them as 'worms which bury themselves in the skin'. Although chiggers are really difficult to find these days because of the improved hygiene standards in most of Meru, they love to burrow themselves between toes of individuals who walk bare foot and are lazy about keeping their bodies and feet clean. Since most Meru homesteads are in rural areas, branches and leaves of *muthiriti* (*Lippia ukambaensis*) are still used to sweep and disinfect huts and homesteads in order to keep such chiggers, fleas and ticks at bay. The shrub grows profusely in the wild, so far making it easy for the community to conserve it, although expanding settlements are making an unrelenting encroachment on vegetation. Everybody knows that such trees as *muringa* (*Cordia africana*) provide the best wood for beehives, and that *Muthiriti* leaves are used to smoke bees out of beehives so that the honey may be harvested. The scent released from the smoked branches and leaves of this same plant is also known to attract bees to the beehive. Most Meru households prefer to conserve these plants among their other crops, since they are part of the resources which provide their livelihoods, and have been part of their culture for centuries.

5.4.2 Local Management and Conservation of Wild Plants

Conservation factors in the overall assessment of the Meru emphasize that the major impact on this variable is felt especially when trees are felled for use and not replanted. It was also noticeable that the cutting down of trees was gender discriminative; felling was men's work, women refused to do it, prompting the quest to investigate how this affected conservation. This examination showed that there was a *first* group of respondents who planted trees only and had not felled any; the *second* felled and replaced those which they had cut down; while the *third* simply chopped down. In this investigation it was important to note that, although conservation was measured by the cutting and planting trees, the Meru people took great care to protect plants whose parts they used especially for medicine and food and did not fell trees for this purpose. Felling was done when material was required for furniture or construction.

The reason it was felt necessary to focus on the major issue of cutting down trees was because this sort of act threatens the survival of the local vegetation. Other than material plant use which required trees to be felled, other uses of trees did not involve deforestation. For instance, barks would be collected for medicinal use and the wound on the tree would be treated by applying soil to it, therefore preventing the loss of the plant sap and protecting the tree against infection and from drying. Roots would be cut at some distance from the main plant in order not to injure it unnecessarily. A good garden knife proved very handy and having been scrupulously cleaned can cut into branches, allowing the plant to flourish afterwards; a fact which also indicates the tender care taken by the local experts in protecting their plants. During field walks it was amazing to hear children being admonished not to break or twist plants as this might damage them. Local plant

experts always encouraged sharp smooth cuts, which sometimes could be done by using sharp pocket knives or secateurs which the children unfortunately did not have.

Throughout Meru history, there has never been a time when tree cutting was allowed in the forests or anywhere else. During their flight journey from *Mbwaa*, there were times when certain wood and shrubs would be harvested to make shelters or temporary bridges, but never was there a time which required the cutting down of large trees for the construction of houses. Traditions also forbid cutting or clearing forests since these were regarded the dwelling places of the spirits of their ancestors which no one dared to enter, except those people who were known in the community as *Aga*. The *Aga* would enter the forests to collect herbs which could be used to make medicine, and which would be put to psychological to use remove a curse or guilt from an offender after they had confessed any wrongdoing so they would not fall sick or die. The evil spirits were known to skulk in secluded groves and marshlands, so members of the community were not allowed to go to such areas or to clear them. The spirits could be heard singing in the night, badly frightening the children who would grow up fearing to venture into such places.

While the Meru had a reputation for being mobile and leaving their land fallow for a long time allowing it to rejuvenate, immigrants into the community, especially the Kikuyu who wished to cultivate when they first arrived, would settle in such parts of the District as Tigania and Igembe on the forest fringes and begin to cultivate because eventually they wanted to own the land. In the process, they would clear forests indiscriminately to the horror of the community. Within a limited period of time after their settlement, forest trees would disappear, leaving the Meru communities wondering; whether these were cultivators or tree eaters. This earned them the pejorative nickname of the *'tree eaters'*. About the same time the colonial administration also grew alarmed at the rate at which forests were being cleared. It was therefore pleased that the *Njuri Nceke* (Meru Elders) resented this, and supported the latter's efforts to expel the intruders from the District. The forest rims had indeed been traditionally protected from cultivation, wood-cutting, grazing, or any other activity which might harm trees' by the *Njuri* proclamation (*cf.* Fadiman 1982).

Sacred Forests, Colonizers and the Christian Missions

Forests which were revered and kept sacred by the Meru were the first to fall victim of colonization. Edward Butler Horn was the first to attack these in search of wood to build his station built at what is now the location of Meru Town. Huge logs of wood of 4-6 feet in diameter could be loaded onto carts and ferried to his site. When money started flowing in for the locals who brought in the logs cut from the forests, women (such jobs were considered women's work) would bring log after log with song and dance, enjoying the dragging and rolling of these huge trunks. Finally, trees could be converted into money! During the construction of roads which brought in supplies for Horne, huge amounts of wild vegetation were cleared. In the same period, Fadiman (1982) documents that the arrival of the missionaries among them, the United Methodist Mission (1912), saw more swathes of forests cleared. At first the Meru were hesitant to give the white men land since their presence threatened the Meru way of life and hence their imminent survival, but when *Kangangi* pushed elders of *Murathankari* (place in Meru Central) to give their land to the Methodist Mission, under pressure, they agreed to release the part they thought would be the most dangerous: the *Ka-Aga* Forest, believed to be home to spirits who could at times be heard singing at night. The *Aga* would meet at night in the forest and sing, but what they sang was not understood by the ordinary Meru, especially the women, the young people and the children who were not privy to men's secrets. The forest was cleared quickly to the great consternation of the Meru communities. Astoundingly no *Muchunku* (white man) died, which was a big blow to the beliefs of the Meru. Trees therefore

continued to be felled in various parts of Meru to build mission stations for the Roman Catholic and the Presbyterian Churches as these spread steadily, making deeper bites into the Meru forests.

Meru has the longest history of preserving living indigenous trees in the country. The Meru Oak (*King Muuru* or the King Oak), which is still found at *Gitoro* Forest in Meru Central District for instance, has lived for many centuries and has been declared a 'National Monument' and attracts many locals and tourists to its location. Meru oak (*Vitex doniana*) trees are known to provide some of the best building material in the world. Several of these trees are found growing on private farms and are in danger of being felled and becoming extinct as building wood is now a very scarce commodity. Not only is the Meru Oak on the verge of extinction, the *Muringa (Cordia africana)*, *Mukongolo juria Mwiru* (*Triclia roka*), *Mukwego* (*Bridelia micrantha*) and *Mwangua* (*Senna siemea*) among others run the same risk.

Generally speaking, the Meru are conservationists by nature. In their use of plants for medicine or food, for instance, great care is taken of the plant in order not to kill it during and after harvesting. Trees from which the bark is peeled for medicinal use are carefully smeared with soil to dry and heal the wood, thereby preventing the plant from losing water in the searing heat of the sun experienced in this part of the world. Roots plucked are taken at long distances from the base of the plant in order not to expose them to the heat of the sun, which may dry and kill the plant. Where several trees grow together, the local experts identify the roots they need by smell and taste, consequently the whole root system need not be exposed to the scorching sun, not to mention obviating the danger of these being eaten up by goats or smaller antelopes, hence conserving the trees. As seen earlier, the parts of the trees used for firewood are mostly dead wood which has either fallen from a tree or the whole tree has died from natural causes. The major setback which has almost paralysed the conservation efforts to preserve indigenous trees in the Meru forests is illegal logging with loads of timber transported to many parts of the country for commercial purposes. While the *mwananchi* (citizen) has no power to control this, it depends wholly on the Government to curb the trade. Recently, more shocking news has revealed that forests are being used to grow *bang*, a plant which is used to make drugs, a practice which the current Government has curbed.

The culture of refurbishing the vegetable environment in Meru is reflected chiefly in the cutting and planting of trees, an issue which is very sensitive in conservation terms, especially in the use of wild indigenous trees. The cutting down of indigenous trees is devastating since these take a very long time to mature. Unlike in the other uses detailed in this study, the use of these plants therefore, results in whole plants being felled in a bid to acquire poles or wood for construction or furniture. In most of the other uses, only smallish, separate plant parts such as leaves, roots or bark are required. Most of the trees felled in large numbers in Meru as a whole were cut down by privately owned companies and on very rare occasions have ordinary local people done this, and then mainly to sell to these same companies. There is a common notion worldwide that developing countries cut trees for fuel. Unquestionably many economically minded individuals do this in order to make charcoal, it has been found that most Meru residents use dead wood for firewood. Indeed this is a practice which had been passed down from generations which are no longer alive.

Earlier in the chapter it was noted that the Meru watched in dismay as a neighbouring ethnic community felled trees, cleared forests and burned all types of vegetation to prepare ground for cultivation. These same members of that community were later expelled by the Njuri Nceke (local governing council), the then colonial authorities. Conservation of the entire vegetation environment is a practice which was instilled into the very lives of the Meru, hence their reason for using dead wood for firewood. Unfortunately, of late these former values are becoming eroded and people are clearing increasing areas of bushes and forests for settlements, diminishing the number of bushes and forest trees to be used as fuel.

A survey carried in the three villages of Meru reveal mixed reactions among respondents who were interviewed. The assessment was pegged on either planting or cutting down trees. Those who cut trees only and did not plant were categorized as 'low' conservationists; those who cut down but also replanted were placed at 'average', and those which do not cut down at all but planted were categorized as having 'high' levels of conservation. The survey data indicated that a relatively small percentage (16.0%) of respondents in all three villages planted trees without cutting down any the previous year. *KK Lumbi* (20.0%) and *Kagera* (16.0%) respondents showed slightly more conservation practices than *Kinoru* (12.0%). More than half (52.0%) of the *Kinoru* respondents seemed to have cut down more trees, but also to have planted similar numbers. *Kagera* (48.0%) and *KK Lumbi* (40.0%) had the highest number of respondents who only cut and did not plant any trees as replacement. Most of the respondents in all three villages claimed to have cut down trees because they needed space to build homes for their families and therefore had no extra space for replanting, confirming the Government's statistics (DDP 2002) of overpopulation in certain parts of the Districts. Less than one-fifth (16.0%) of all the respondents in all of the three villages surveyed planted trees without cutting any. The distribution of conservation efforts reported by the household heads in the three villages of Meru is shown in Table 5.15.

Table 5.15 Distribution of conservation efforts reported by the household heads in the sample survey over the 3 selected villages (N=75)

Conservation	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*		*N*	*%*
	N	*%*	*N*	*%*	*N*	*%*		
low	10	40.0	9	36.0	12	48.0	31	41.3
average	10	40.0	13	52.0	9	36.0	32	42.7
high	5	20.0	3	12.0	4	16.0	12	16.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

Although the local plant experts have concentrated great effort into conserving forests, overcrowding in high density areas of Meru North District and especially in the *KK Lumbi* region, plus cultivation on hilly slopes and in river valleys has caused soil erosion, while encroachment on water catchments (especially along the *Ncooro* River) now threatens water resources, adding greater imbalance to the ecosystem. The illegal cutting of trees for charcoal and construction is a common practice and has been known to threaten or even eliminate existing forests especially those which are not gazetted. The demarcation of land in this District has taken several years to complete and subsequent aggravation with the process has led to a lack of commitment in land use and conservation practices as most people know they will eventually be moved away.

Environmental degradation is rampant in Meru Central District, particularly affecting *Kinoru* Village. Here forests have been destroyed in search of building materials, fuel and farming land. Rubbish is dumped in forests and outbreaks of fire are rampant as well. These create favourable conditions for drought, since rainfall patterns are gradually affected, and community's vulnerability to sanitation-related epidemics is increased. Given these circumstances it has been necessary to enforce regulations against logging and the harvesting of indigenous forests, which entails the encouraging of the planting of seedlings on the destroyed sectors of the gazetted forests. It has also been found necessary to prohibit the dumping of garbage especially by the Meru Municipal Council in the Imenti Forest. Measures to curb forest fires have also been implemented. Gazetted forests in Meru North District currently cover an area of 110 km², non-gazetted 2.5 km², and these provide

timber, wood for charcoal, poles and support eco-tourism. They are the main water sources too. The percentage of people engaged in forest related activities is 12.0% and they use wood in saw-mills and furniture workshops. The area of gazetted forests in Meru Central District is 870 km² and non-gazetted is 160 km². The main forest products are timber and poles for construction and firewood. The percentage of people officially engaged in forest-related activities (sawmills, furniture workshops and the like) are few but there are numerous illegal loggers.

5.5 Traditional Institutions: Continuity and Change

5.5.1 Meru Administration, Marriage and Land Inheritance

From the days of their life on *Mbwaa*, the *Ngaa* had chosen leaders (*the councils of elders*) who could resolve conflicts. In other words, the Meru communities had their own traditional Government. The leaders in this Government could be chosen on the grounds of several characteristics: eloquence, pleasing physical stature or wisdom in resolving conflicts. In those days, the ruling elders played leading roles. In the new settlements on the slopes of Mount Kenya, most of the elders (*kiama*) were split up into smaller groups because of the fragmentation caused by the geography of the region. The Kiama of the Chuka people (*kiama kia ngome*), Muthambi and Mwimbi, (*kiama gia nkome*), Igoji and Imenti (*njuri ya kiama*) and in Tigania (*njuri nceke*) were the Governments of the day. All the above councils of elders with the exception of Njuri Nceke have since ceased to exist.

In Meru, decisions were collective. If an offender broke any rules, elders had to meet and decide what punishment should be meted out. If the offence involved killing or forcibly taking someone else's property, solutions had to be sought by slaughtering animals whose blood represented that of the victim, if the plaintiff denied the offence of which he had accused. For those who acknowledged their guilt most of the penalties would have been paid in live animals. For those who denied their involvement, the guilt would eventually ruin their lives and that of their relatives. Relatives therefore would volunteer to find a solution to a crime committed by their family member. From the early days of the settlements of the Meru to the east of Mount Kenya, law and order were observed by everyone, both young and old. Each individual knew their place in society and what was required of them. The older the person, the wiser they were considered and the more respect they commanded.

Age Sets: The Meru Calendar

Working backwards with data gleaned from oral traditions as documented by Fadiman (1982), males circumcised at the same time belonged to the same *nthuki* (age-set). See Table 5.16 and Figure 5.5 for the Meru calendar and age-set names. Each *nthuki* had its own name, which was bestowed on it during initiation (circumcision). For example, looking at the age-groups born in Meru in the 1970s, a male was a child until the age of seven (0-7), during which time such an individual, (*kiiji*- sing, *mwiji*- plural, - uncircumcised) was supposed to be guided until he obtained the age of between seven and fifteen. At the age of fifteen to eighteen (*ntaane, ndinguri*), the age-set was referred to as the *miriti*, at which point the boy prepared himself for circumcision. At this age, he was regarded as *ntaane/ndinguri* (adult boy) that was ready to be initiated into warrior-hood, leaving behind his earlier duty of herding his parents' animals.

After circumcision, he entered warriorhood (18-29, *nthaka*) and his age-set was *Murungi* and he was expected to learn all the skills required to go to war and to defend the Meru from any intruders.

At the age of twenty-nine to forty, the individual was regarded as an 'apprentice elder' and a 'family head' of the age-set of *kiramunya/kiramana*. It was at this age a man was expected to court, marry and raise children. At the same time, he was expected to be mature enough to be given a portion of land by his father and to inherit as well as to begin to assume responsibility for the entire family, lessening the load of his father. Figure 5.5 shows a schematic representation of the age-sets among the traditional Meru at the time of the British invasion (1906).

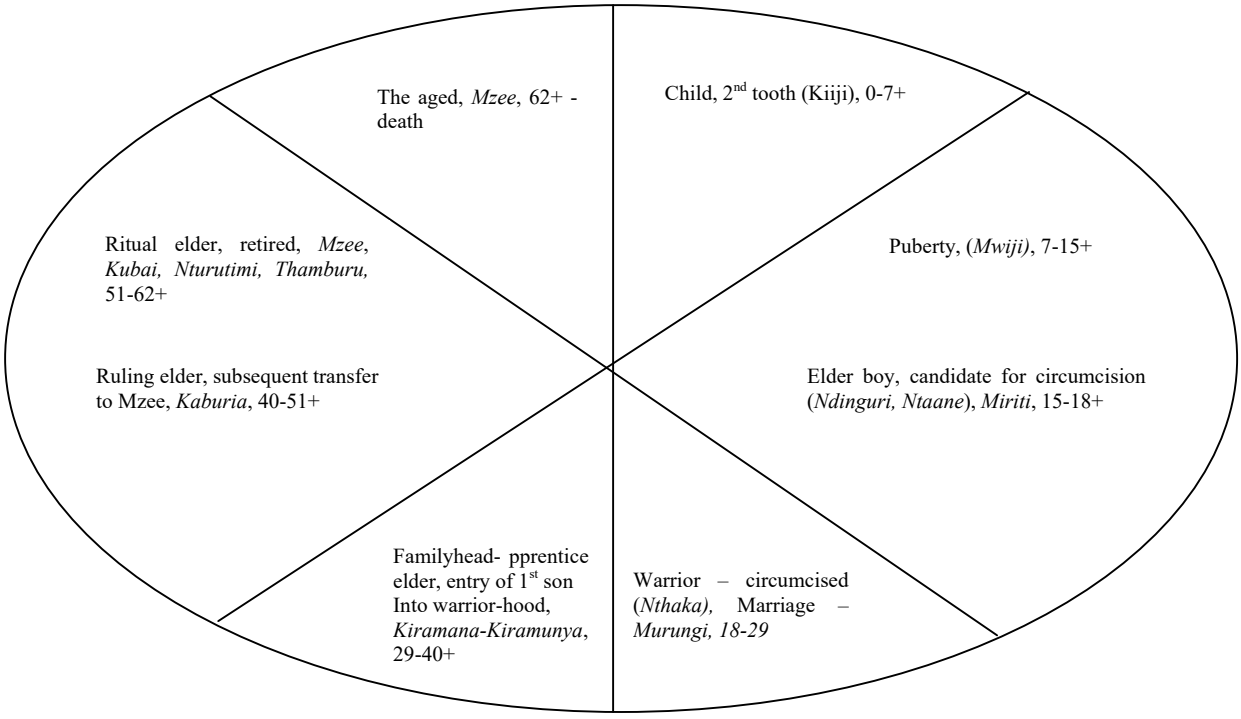


Figure 5.5 Age-sets of the traditional Meru at the time of the British invasion (1906).
(*Source:* Oral traditions of the Meru according to Fadiman 1982).

A family head could not rule as an autocrat or make any decisions for the tribe. Their position was supposed to be as observers at the meeting of elders until they personally graduate into the ranks of 'ruling elders'. This was part of their training to be elders in due course. With the entry of their first son into warrior-hood, they graduated into 'ruling elders' who's age-set was *kaburia*. The age of 'ruling elders', who were considered the trainers of the young warriors and the apprentice elders on how to run the society, is between forty and fifty-one. They eventually graduated to the rank of 'retired elders' (51-62). Once they reached the age of sixty-two and above, they become 'ritual elders' and were expected to perform all kinds of rituals, as they were now the *Wazee* (pl. m*zee*-sing.); 'the very elderly and the wisest', and their word was revered and sacred.

Age was always equated with wisdom, and conversely youth was said to be hot-blooded, emotional, violent and selfish. Age is supposed to cool the blood allowing acquisition of wisdom. To obtain some of the wisdom, the warriors and the ruling elders had to bring gifts to the *wazee*, who were sustained economically in this fashion. The *wazee* belonged to the age-set of *kubai, nturutimi or thamburu.* From the very birth of a Meru male child therefore, his role and position in society were defined. As Fadiman documents, only droughts, locust invasion, war, plague or fluctuations in birth-rate could reduce the number of males, thereby causing delays in filling the

warrior ranks. The various age-sets of the Meru which governed the institutions of the male child since the days of the *Ngaa* from the seventeenth to twenty-first century are shown in Table 5.16

Table 5.16 Meru age-sets since the early seventeenth century

Year	Age-set	Year	Age-set
1617	*Thangiri*	1827	*Thamburu 'gwita Nciru'*
1632	*Mbaine*	1842	*Nturutimi 'gwita Nciru'*
1646	*Nkuthuku*	1857	*Kubai, Gichunge*
1662	*Ntangi*	1872	*Kaburia, Kamundi, Mung'atia*
1677	*Mukuruma O Kiugu*	1887	*Kiramana, Memeu*
1692	*Githarii 'giekucia'*	1902	*Murungi, Riungu*
1707	*Micubu 'giekucia'*	1917	*Miriti, Nkonge, Ntarangwi, Kaaria*
1722	*Ratanya*	1932	*Kiruja, Kaburu, Gichuru*
1737	*Githangiiria*	1949	Guantai, Mbaya
1752	*Mbariungu*	1952	*Nangithia, Kibabu*
1767	*Nguthugua*	1964	*Gichunge*
1782	*Nangithia*	1979	*Mungatia o kiro*
1797	*Mbarata*	1988	*Kiramana*
1812	*Kiruja nguciari*	2000	*Nturutimi*

(*Source:* Oral Traditions according to Fadiman 1982;, Maitai 1988; and Ng'unyura 2000).

The institutions pertaining to women and girls were also clearly defined. Girls' duties once included fetching firewood and water, cooking and looking after children, weeding the gardens and child-bearing for the married women. In contrast to her male counterpart, a girl child did not undergo all the strenuous rites and rituals, but she did at least undergo certain initiation ceremonies such as circumcision. During this operation, part or whole of the clitoris was removed in order to lessen her libido. This, of course, gave her male an upper hand in sexual matters and also in marriage, allowing him to acquire more than one wife, either to prove his manliness or to achieve the satisfaction which was 'lacking' from the circumcised woman. During the few weeks seclusion period imposed on the girls as they healed, the older women were expected to advise them on social morals, wifely roles and motherhood.

Circumcision, which took place at the age of between fourteen and eighteen was expected to transform girls into candidates fit for marriage and after this they would indeed wed apprentice elders chosen for them by their parents and settle down to wifely roles and motherhood. All these rites and rituals were supposed to instil concrete discipline into the individuals involved. Nowadays circumcision for girls has been prohibited by the Government and has been blamed for impacting negatively on the life of a girl child. Female Genital Mutilation (FGM) as it is now called is unfortunately still being practised secretly in parts of *KK Lumbi* and *Kagera* villages.

When many of these structures which governed the Meru community were demolished with the coming of the colonial Government, most males were left in limbo, not knowing what to do or where they stood in society. The upshot was the creation of a group of idlers, whose indolent, purposeless behaviour drove many into excessive drinking and sexual immorality in a bid to hide themselves from their unreal world. The tried and tested ways of obtaining their daily bread, which included raiding for warriors and receiving of gifts for ruling and ritual elders were destroyed. Their role in society was replaced by the queen's rule and law. In simple terms, the male world crumbled completely. Idleness among men is a deleterious phenomenon which has continued up to the present

and it means that some of the *ndinguri* and the warriors of the time who died only recently were unable to 'marry' the new and the old. The heavy toll was too many early deaths from drunkenness and immense poverty. Whether it is because of their history as menfolk or a legacy of this recent past, the male Meru child still feels idle even today. Most of the duties of weeding, housework and raising children are regarded as women's duties. Only office jobs are regarded as suitable to men but such are hard to find since they require formal education which most have not pursued adequately and even if it is pursued, the lack of jobs drives most into even deeper despair. After retirement, many working males simply die; the victims of loneliness and idleness. It is unfortunate that no Government structures are put in place to take care of the elderly at this vulnerable period in their lives.

From the very beginning when the *Ngaa* people began to initiate their young people, immediately after leaving *Mbwaa* - because that is the time when they learned of circumcision from a captured Masai man whose wife revealed the secrets of why the Masai are such 'tough warriors' - historical events can be dated according to the age-sets of individuals as warriors or apprentice elders or elders and so on at the time. The naming of the age-sets is still observed in most parts of the Greater Meru region, but has lost most of its initial glory because of the nature of the modern initiation where male youth undergo the operation in medical institutions. Until recently such initiations have been seen as cowardly and lacking the original glory. Despite this carping, they are found necessary since sterilized instruments are used for each individual, in contrast to the single knife used previously. The HIV/AIDS pandemic makes such an old-fashioned operation even more hazardous.

5.5.2 Religious Believes and Practices

The Meru believed in a supernatural being, which they referred to by several names: - *Kiini Kiiru* - the toothless old one who had all the wisdom; *Murungu wa Kirinyaga/Kirimara* - God of Mount Kenya; *Gitije* the respected one; the rain or rain-bringer or just simply *Ngai*. In the history of the Meru, there had never been a time when the community worshiped objects or fashioned such for worship. In cases when there was no rain, sacrifices of animals, mostly goats, would be made to *Kiini Kiiru*, *Murungu wa Kirinyaga*, *Gitije* or *Ngai*. These sacrifices would be made under certain giant trees such as the *Mugumo* (*Ficus thonningii*) which were believed either to be home to or would be visited by the Meru God. None the less the Meru God was not an individual God but a communal one. He was only known through a prophet or seer who was referred to as *Mugwe*.

The Meru believed in the spirits of the dead as well, namely, spirits of the ancestors who had died full of years. These spirits were believed to watch over the people who in return were not expected to do any wrong in case they upset them and bring calamities upon themselves. The people also believed in bad spells which could be cast on them by someone with an evil eye, especially if a *Murogi* (curser) was involved. Such spells or curses could only be removed by a *Muraguri* (curse remover). The traditional Meru believed that their God resided on top of Mount Kenya, and occasionally the spiritual leaders who were regarded as prophets would make visits to this mountain to make sacrifices and appease God on behalf of the people. If drought persisted or famine or outbreaks of disease struck, this would be done and more often than not, these calamities would cease. Traditional elders who were known as *Akiama* (pl.) *(Mukiama* - sing.) and believed to be holy would be chosen to go and intercede for the people.



Figure 5.6 Sacred Tree *mugumo* (*Ficus thonningii)* of the Meru with some members of the field team standing under it. *Photograph:* A.K. Ibui (2002).

While the almighty God was said to live on top of Mount Kenya, the spirits of the ancestors lived in forests, groves, lakes, swamps and waterfalls and had to be appeased from time to time in order to avert calamities from the people. If not, diseases, droughts, locust plagues would afflict the community, compounded by various misfortunes witnessed in the birth of deformed children and twins. Twins and deformed children would be seen as bad omen and would be taken to the forest and left there to die. Healthy babies would be brought to some of the giant trees such as the *Mugumo* tree and blessed with a life as long as the tree itself. The dwelling places for these spirits were well cared for and respected. The spiritual leaders made sure nobody destroyed them. All this was turned upside-down during the colonial invasion as forests were invaded and destroyed. Not only were these destroyed, but the people's beliefs were termed satanic and evil in the face of the 'new' religion. Indeed, as been noted earlier, most of the sacred forests were destroyed in a bid to rid the

people of the primitive beliefs as well as to show the people that their religion could not match the new religions in strength. Simultaneously the wood was used to construct Christian mission centres. Currently, most of the traditional religious beliefs have been replaced by Christianity. Indeed about 78.0 per cent of the Kenyan population is said to be Christian, of whom 45.0 per cent are Protestant and 33.0 per cent Roman Catholic, 10.0 per cent still follow indigenous beliefs, 10.0 per cent is Muslim and 2.0 per cent other. The percentages of the people who are Muslim or are indigenous believers vary, but unquestionably the majority of the population is normally Christian.

There are several Christian denominations found in Kenya, ranging from the mainstream Roman Catholic, Anglican, Methodist and Presbyterian to Baptist, Greek Orthodox and many other splinter denominations falling into the major group of Pentecostals. Most Kenyan Christian goes to Church on Sundays but some prefer Saturdays (*The Sabbath*) as their day of worship, especially the Seventh Day Adventists. Muslims go to the Mosque on Fridays, while traditional religions conduct their spiritual rituals at unspecified days of their choice. Traditional marriages which used to be conducted at family and community levels after the exchange of local brews and *miraa* have been replaced by Church weddings, where dowries sometimes in the form of money may be paid to the parents of the bride. Other ceremonies which used to be conducted under trees, such as the blessing of the newborn and the giving of new names to children are now conducted in churches.

This chapter has presented the way the Meru people live in respect to their population sampling, geography and landscape as well as their socio-demographic and economic life, the culture and traditional institutions. The next Chapter will go into more detail to explain how wild plants have been used from the past even up to the present. It explains how wild plants have been used not just by recent humans, but also by those beings who lived in pre-human times, giving further confirmation of the significance of wild vegetation in human prehistory.

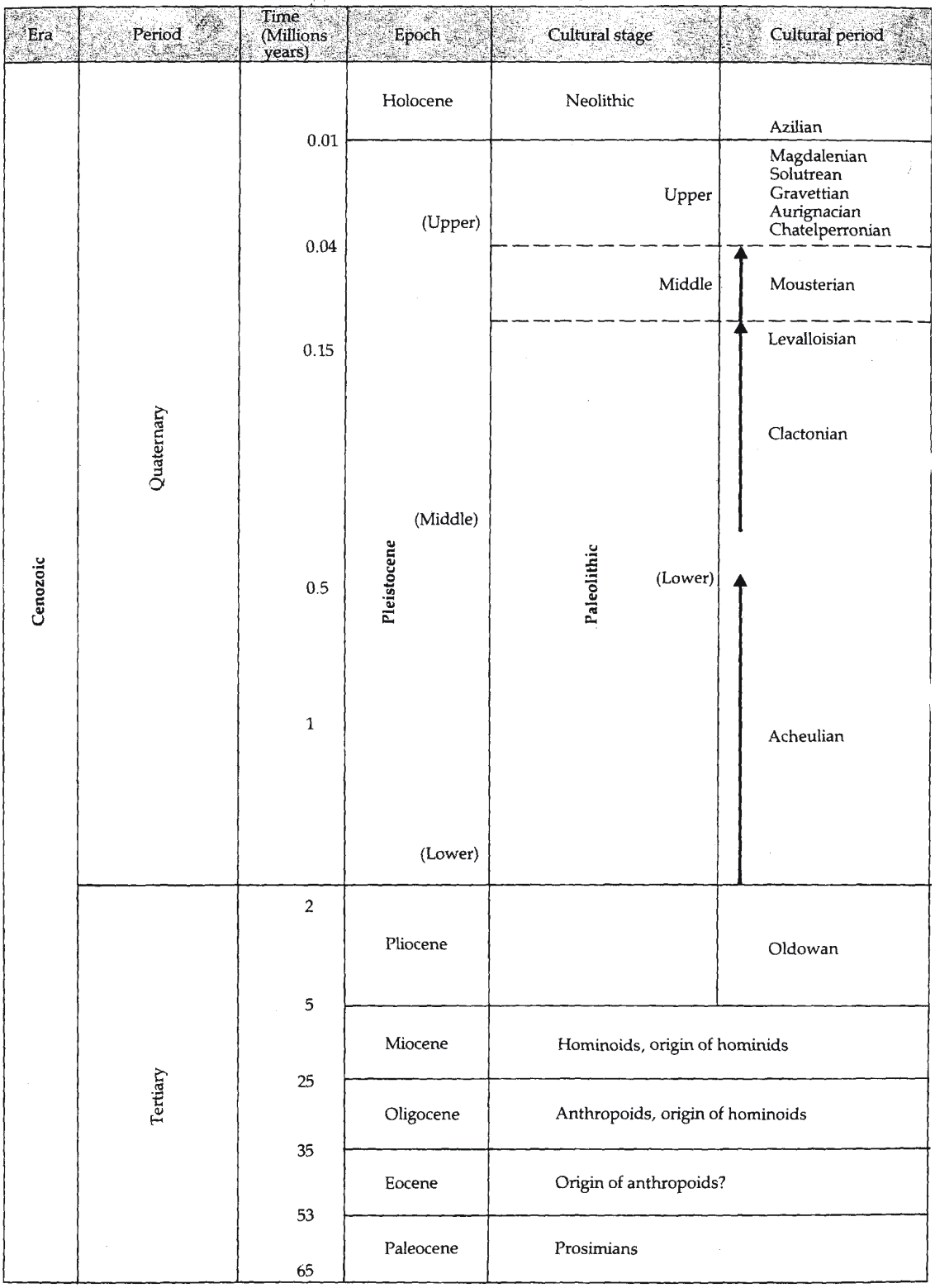


Figure 6.1 The geological time scale of Planet Earth (*Source*: Lewin 1992).

VI The Evolution of Human-Plant Relations in Kenya

The purpose of this chapter is to attempt a description of the evolutionary process of human-plant relations in Kenya on the basis of yet very limited palaeo-ethobotanical evidence from the region by asking the question: 'When is it possible to speak for the first time in history of *humans* in the sense of relevant human-plant relations'? This question touches the present debate in palaeo-anthropology about the *process of humanization*, centred on the evolutionary processes since the emergence of *Homo sapiens* during the last 150,000 years, defined on the basis of qualities largely defined as human such as a certain degree of intelligence, technology, culture, social behaviour and language (*cf.* Cavalli-Sforza *et al.* 1988; Davidson & Noble 1991; Lieberman 1991; Stoneking 1993; Lee 1994; Leakey 1994; Foley 1995). Although the extent of this debate is beyond the scope of this study, the implications of the current view about the attainment of humanity over the last 20,000 years in terms of the occurrence of modern human behaviour, the growing impact on the environment and resources, and cultural diversification emphasize the significance in the understanding of the shift from hunter/gathering to early agricultural production of modern humans in the Neolithic to a diachronic approach to human-plant relations in East Africa.

While the need for more palaeontological evidence has widely been voiced as a major issue in the understanding of pre- and early human use of their environment and its important plant resources, the search for more palaeobotanical evidence is highlighted as being of even greater importance to the reconstruction of early humans' relations with plant resources, mainly for food and survival. Here, the scarcity of relevant archaeological evidence, specifically in East Africa, forms the background to current endeavours in palaeoethnobotany and ethno-archaeology to throw more light on these basic processes in the past.

The *first part* deals with the increasing interest in documenting the fossil plants in Kenya, an assessment of current interpretations of early plant use in the *Australopithecine* Heritage, dating back to 7-5 Myr. Subsequent relations, respectively in the *Homo erectus* Heritage of 2-1.6 Myr and in the Archaic *Homo sapiens* Heritage, lead up to the human-plant relations of the early modern humans of the Neolithic. Following on from this, the *second part* describes the first period of time in human prehistory in which modern humans in the Neolithic made their break-through which created the Agricultural Revolution, which is well-documented elsewhere in the Middle East and South America, but less studied in East Africa, particularly Kenya. The *third part* focuses on pre-contemporary times by documenting the recent history of domestication *versus* wild plants, in which processes of food production and wild plant use among the hunter gatherers of the pre-Meru (*Ngaa*) are discussed. The *final part* presents a review of relevant processual models of modern communities designed to contribute to a diachronic perspective on human-plant relations, especially in relation to the methodologies of the 'Ethnographic Analogy' and the 'Ethnobotanical Knowledge Systems' Approach.

6.1 Hominins of the Palaeolithic: Early Dependence on Plants

6.1.1 Kenya: A Growing Record of Fossil Plants

In contrast to considerable amount of palaeo-ethnobotanical research conducted in such other regions of early human settlement as in Asia Minor, and Meso- and South America, the ethnobotanical study in Meru has had to be conducted against the background of just a few

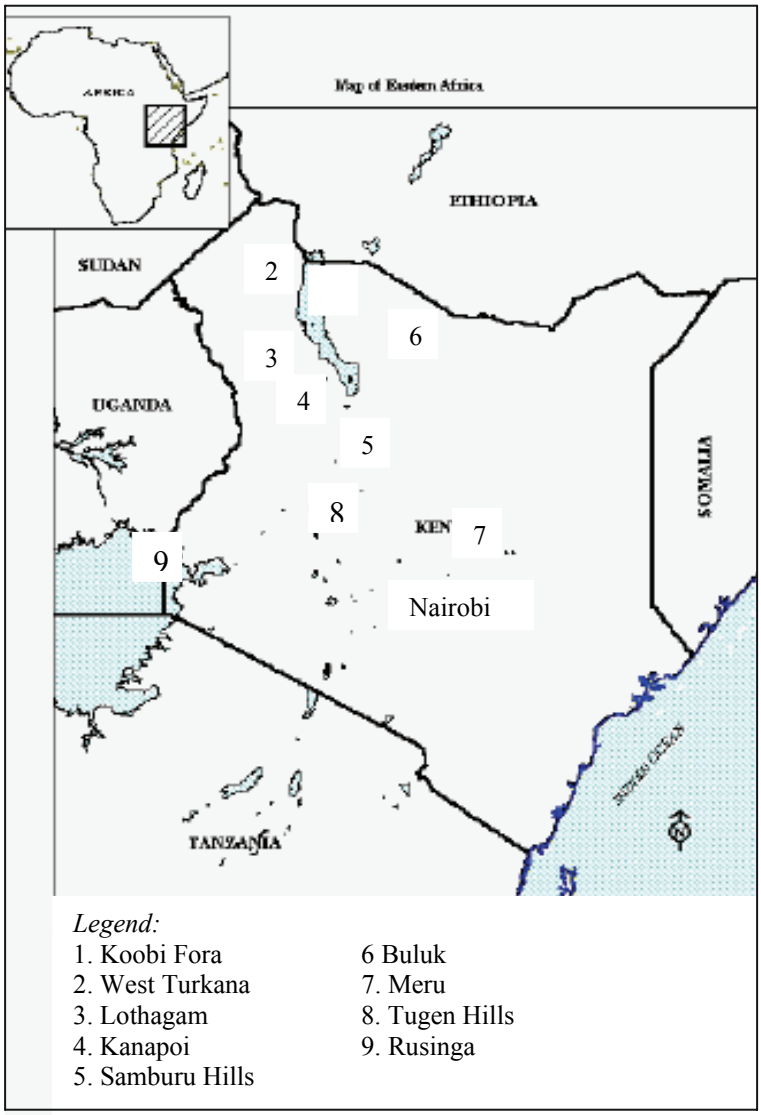
prehistoric studies which have provided comparatively fewer results on the understanding of early human plant relations in Kenya. This is remarkable phenomenon, since this region is as well-known as the area in which humans evolved, earning it the name of 'the Cradle of Humankind'. Understandably, the great interest in and passion for the discovery of human fossils continually adding to the reconstruction of human origins and evolution in this part of the world has led to less attention being paid to retrieving palaeo-ecological and palaeo-ethnobotanical evidence about the environmental context of human evolution, specifically human-plant relations. The relatively few studies on the interaction between early human ancestors and their natural resources tend to focus primarily on material evidence from prehistorical campsites and assemblages, and the significant transition from hunter/ gatherers to early agriculturalists, providing important data on human evolution and spread throughout the globe from Africa.

Unquestionably, the study of ethnobotany in Meru cannot be complete without addressing the historical background to the human-plant relations of modern peoples living in this area, but it also cannot be disputed that much more archaeobotanical research has to be conducted in order to contribute to the explanation of the ethnobotanical context of human evolution, especially in relation with human dependence on plants for food, medicine, shelter and other basic needs, in which until recently, the natural resources have shown little change since prehistory (*cf.* Chesters 1957; Hamilton 1968; Jacobs & Winkler 1992; Foley 1997; Judd *et al.* 2002). Consequently, it is of great interest - and indeed eventually necessary to the understanding of the entire process from the past through the present to the future - to assess the complicated process of human-plant relations in the cultural area of Meru from a diachronic point of view by embarking on the construction of an understanding of the present configurations, which has been facilitated by the development of the 'ethnobotanical knowledge systems' approach, always taking into account the current paucity of significant material evidence from the past.

While humans and their ancestors have so far been dated back to as 'recent' as from about 2 million years ago, the earliest multi-cellar plants and animals have a much longer history as they evolved about 750 Myr (Leakey 1992; 1994; 1995; Leakey & Slikkerveer 1995; Judd *et al.* 2002). Higher plant life has been in existence since the *Palaeozoic Era* in the *Silurian Period* (439 Myr). Flowering plants *(Angiosperms)*, which form the majority of green plants today and also made up the majority of the plants collected in Meru during the survey of 2002, have evolved from as early as the *Late Mesozoic*, during the period of time referred to as the Cretaceous, about 145 Myr. It is not unusual therefore to find plants which have been in existence for millions of years still living and surviving in the world today (*cf.* Judd *et al.* 2002). Similarly, in East Africa it is not uncommon to find living plants which were already growing over 2 million years ago (*cf.* Chesters 1957; Hamilton 1968; Jacobs & Winkler 1992; Foley 1997).

As mentioned before, East Africa - and Kenya in particular - has been referred to as the 'Cradle of Humankind', because of the study and analysis of the relatively high number of human fossils discovered there - the highest number in the world – which unequivocally substantiates the general view that modern humans emerged in this area about 150,000 years ago, and since then have dispersed from this part of Africa into the other parts of the globe. In 1951, Vavilov (1951) also suggests that this unique region of the world might likewise encompass the 'Cradle of the Plant Kingdom', which would make it the ideal place to study human-plant relations throughout history. Such a perspective is particularly challenging since the rich fossil record - despite some gaps - provides a unique context for the reconstruction of human-plant relations in the area. At the beginning of the dissertation, it was said that this part of the world has been shown to have been heavily forested with vegetation which resembles that of the equatorial forests nowadays found in the Democratic Republic of the Congo. Map 6.1 shows the geographical location of some of the

major human fossil sites in Kenya to date, where also some fossil plant remains have also been found.



Map 6.1 Geographical locations of some of the major human fossil sites in Kenya to-date, where also some fossil plant remains have been found. (*Source:* Reconstructed from Palaeontology Records at NMK).

The tropical rain forest was already growing in eastern Africa before the formation of the Great Rift Valley, providing the conditions conducive to the maintenance of abundantly higher plant life in the region. As plant fossils generally represent the material evidence of early forms of plant life, these have been found in Kenya mainly in the form of leaf impressions on rocks, calcified seeds, woods, twigs and pollen. (Jacobs & Winkler 1992; Maitima 1997). The plant fossils dating back to about 5 - 3 Myr are significant since they provide a glimpse of the environment and its plant resources of the early hominins, such as the *Australopithecines* who lived and partly survived on plants, shrubs and trees in East Africa between 5 and 2.5 Myr. Figure 6.2 shows fossil seeds recovered from Rusinga

Island in Kenya dating to 18 Myr, while Figure 6.3 shows fossil wood recovered from Rusinga Island in Kenya dated to about 14 Myr.



Figure 6.2 Fossil seeds recovered from Rusinga Island in Kenya (18 Myr). (*Source*: Palaeontology photo Collection at the NMK).



Figure 6.3 Fossil wood recovered from Rusinga Island in Kenya (14 Myr). (*Source:* Palaeontology photo Collection at the NMK).

Significant plant fossils have been recovered in west and south-west Kenya, the Samburu Hills, Tugen Hills, West Turkana and East Turkana, and Meru (Chesters (1957; Kabuye & Jacobs 1987; Jacobs & Winkler 1992; Ibui *et al.* 2003). The sites in Kenya range from approximately 20 million years ago up to the present. Western Kenya particularly has some of the oldest plant fossil sites, found chiefly in Chianda Uyoma, Kanjera, Karungu, Maboko, Mfwanganu, Nyakach, Rusinga and Songhor. Most of these sites are located along the shores of Lake Victoria, the largest fresh water lake in the world. Other localities, such as Rusinga and Mfwanganu, are islands located in this large lake. Figures 6.4 show fossil leaves recovered from Tugen Hills which date back to 12.6 Myr.



Figure 6.4 Fossil leaves recovered from Tugen Hills in Kenya (12.6 Myr).
(*Source:* Palaeontology photo Collection at the NMK).

Chesters (1957) documents fossils of plants which were collected at the 18-million-year-old sites of Rusinga and Mfwanganu which: *'...have affinities with recent species, genera or families with a tropical African distribution'.* Some of the fossil plants to which he refers include genera of

Balanites, Acasia, Euphorbia, Fiscus and *Albizia*, all of which have relatives living today. She notes that the majority of fruits and seeds represent living tropical African genera. In her research, seventeen families, which included twenty-one genera, were studied. Another seven other families were recognized but not studied. Among the plants which she analysed, there were some climbers suggesting a gallery type of forest as observed in the forested areas of Meru at present bordering the Mount Kenya Forest. Plant fossils have also been found in 14-million-year-old sites in south-western Kenya at Chamtwara, Legetet, Fort Ternan, Koru, Majiwa, Meswa Bridge and Mtetei Valley. Here, the Ngorora Formation (9-13 Myr) is a plant locality situated in the lower part of the eastern branch of the East African section of the Rift Valley near Kabasero Village in Central Kenya. It has been dated to an age of 12.6 million years by palaeomagnetic and Potassium\Argon (K/Ar) dating methods, revealing the fact that Ngorora has yielded the highest number of fossil plants in East Africa. These include impressions of leaves on rock, a few twigs and a rare fruit (Jacobs & Winkler 1992).

Fifty-seven taxa of plants have been recovered of which twenty-five have been identified and assigned to various taxonomic levels. Most of the fossils found in this region have been leaves of *Pollia sp*. consisting of 40.0 per cent of the most common taxa, (Jacobs & Kabuye 1987). These authors report that three grass species are found, two of which are identified as *humbertochloa* and *leptapsis cf. zeylanica*. Eleven of the twenty-five taxa identified are found primarily in the wet forests with West African floras. Kabuye & Jacobs (1987) believe that a forest with West African affinities existed here 12.2 million years ago. Studies carried out by Jacobs & Kabuye (1987) also suggest that the Ngorora Formation provided forest habitats similar to those which exist even today. Figures 6.5 and 6.6 shows the well-preserved carbonized stems and leaf imprints from the Mutonga Site in Meru, Kenya.

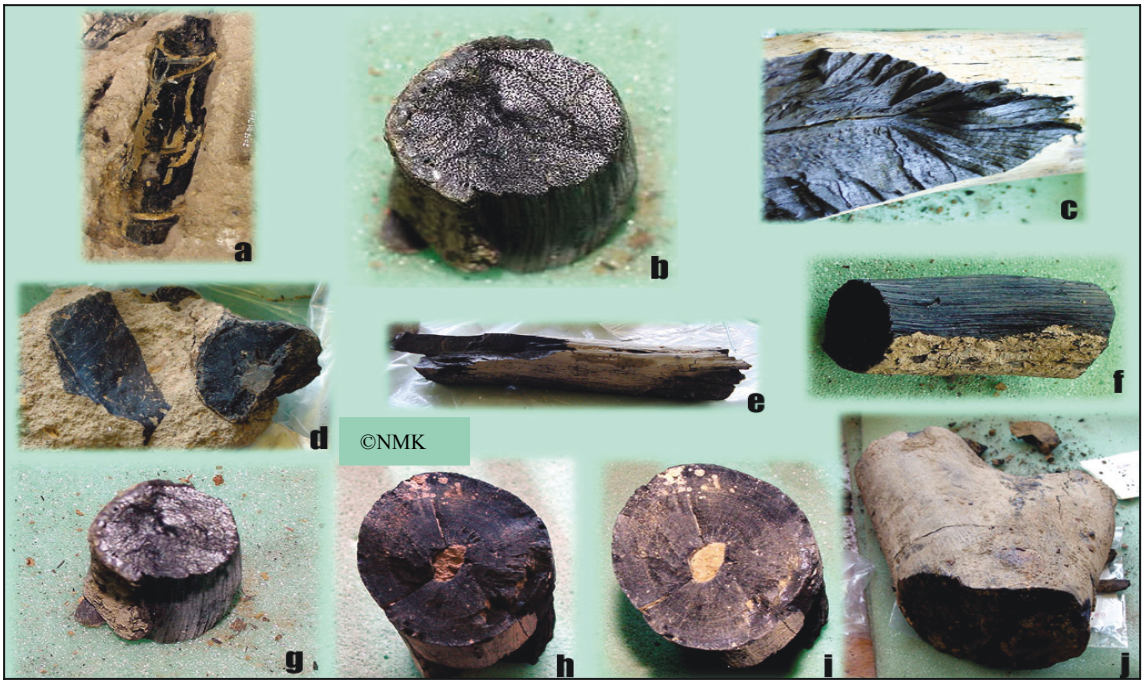


Figure 6.5 (a-j) Well-preserved carbonized stems showing plant barks and the detailed internal structures still intact. (14 Myr).
(*Source:* Ibui *et al.* 2003).

A rare occurrence of plant fossils has recently been reported on the eastern slopes of Mount Kenya along the Mutonga River on the border between Meru Central and Meru South Districts. So far these remains provide the only evidence of plant fossils collected outside and on the eastern side of the Great Rift Valley, presenting more direct evidence of organic evolution as a historical event (Ibui *et al.* 2003). Plants preserved as leaf impressions and charcoal stems and branches exhibit a phenomenon not reported anywhere else in eastern Africa. Such carbonized stems are used to heat metal rods which are used in breaking hard rock during quarrying. The fossils are exposed during quarrying for building stone. This has seen many Meru homes adorned with stones displaying beautiful imprints of fossil leaves on their walls. Fossil climbers found among the specimens are a possible indication of a forest with a closed stand of large, tall trees and a thick canopy. The stem sizes and underlying climbers are characteristic of a thick tropical forest. Although the quarried stones with fossil imprints have contributed to great economic gains among the Meru in both the Central and South Districts, the trade has left some members of the community with eroded land as the result of recurring landslides in the harvested areas during heavy torrential rains.

In the rush to grab a quick economic gain, some of the workers in these quarries have also been buried alive during their work. Although Mount Kenya, which was formed about 14 million years ago by massive volcanic eruptions, has been extinct since then, its lava flow, which covered these plants at the time, enabled their excellent preservation (*cf.* Willis 1989; Ibui *et al.* 2003). Tree trunks and branches, some of which are still standing upright in their original position today have provided the charcoal for heating and forging metal bars and rods. The quarrying activities of local workers demonstrate their unique and skilful interaction with plant remains from the Pliocene.

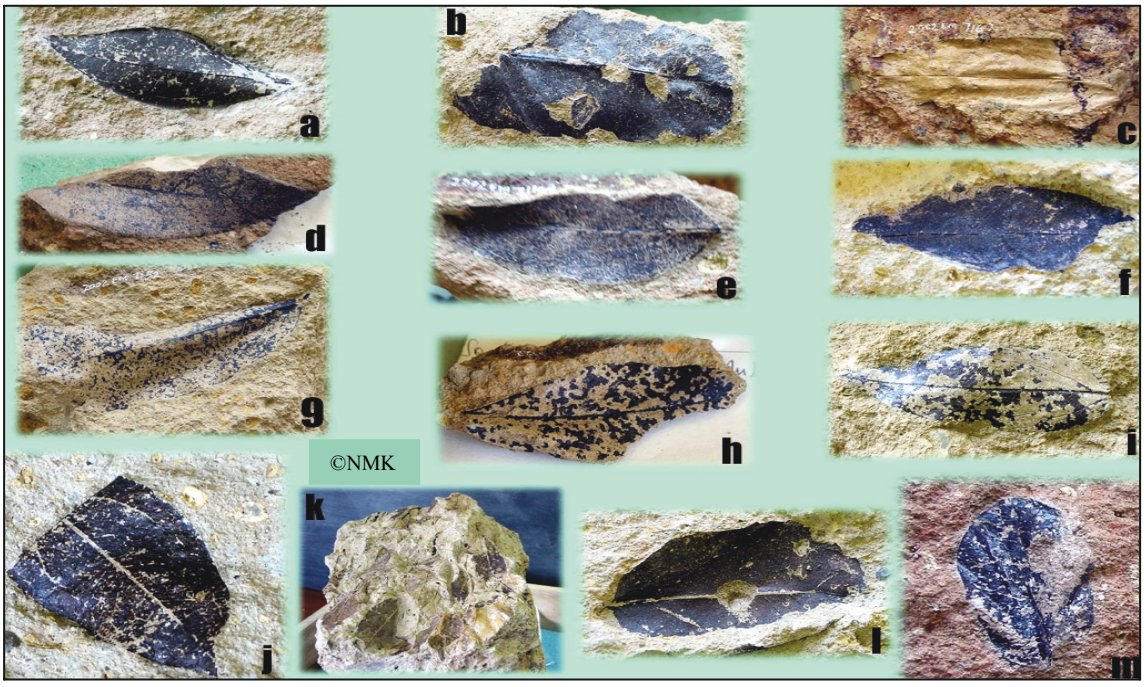


Figure 6.6 (a-m) Leaf imprints on rock recovered from the Meru, Mutonga site (14 Myr). (*Source:* Ibui *et al.* 2003).

The Samburu Hills sites are about seven million years old. The name 'Samburu Hills' is used to refer to a cluster of localities in the Samburu District in the eastern part of the country encompassing such localities as *Samburu Hills* itself, *Baragoi* and *Kirimon*. Furthermore, Hamilton (1968) reports that

some plant fossils found in the Mount Elgon region, Bukwa, Uganda, dating from 7million years BP, represent certain types of leaves of trees still common in Uganda today. He also notes that the environments then contained a great deal of grassland which formed the most common vegetation. The area of West Turkana is located on the western shores of Lake Turkana in north-western Kenya. The plant fossil localities here include Lothagam, Kalodirr, and Lothidok. Most of the plant fossils retrieved from the sites mentioned above are stored in the National Museums of Kenya in Nairobi, and have yet to be studied and identified in the context of human evolution. The growing interest in micro- and macro-plant remains from the past is permitting lessons to be learned from examining the (pre-) historical relations and interactions between people and their floral environment, especially in the region of East Africa in which humans have evolved since the dawn of humanity.

6.1.2 *Australopithecine Heritage*: Early Use of Plants

In Kenya, the area of East Turkana is a special region in which several important fossils of the hominins have been discovered, including most species of human ancestors. The major sites are located on the shores of Lake Turkana in northern Kenya and include the renowned sites of West Turkana and Koobi Fora. The earliest known relatives of humankind found so far in Kenya cover a wide range of species and date back to a little over 4 million years before present, including the *Australopithecines* found on the western side of Lake Turkana, dating back to 4.2 Myr (*cf.* Meave G. Leakey and Harris 1995). Palaeo-anthropologist Richard E. Leakey has contributed most of his pioneering efforts to the reconstruction of early human evolution, and has provided unique discoveries and interpretations of human fossils from this region, ranging from a species of early *Australopithecus anamensis*, which lived over 4 million years BP – of which only limb bones have been recovered from East of Lake Turkana - through the *Kenyanthropus platyops* of about 3.5 Myr to the robust *Australopithecus aethiopicus* of 2.7-2.3 Myr both from West Turkana.

The robust *Australopithecines*, of which important fossil remains have been discovered not only in Kenya, but also in Tanzania and South Africa, is remarkable for their giant brow ridges, possession of a sagital crest, and massive cheek teeth suggesting adaptation to crushing hard fruits and nuts obtained from the dry prehistoric floral environment for food. A specific characteristic of the *Australopithecines* was revealed in an anatomical analysis of the skull, particularly the great jaws and dentition, both evolved and adapted to the cracking of nuts and seeds. A famous example is the *Australopithecus boisei* (KNM ER 406), a robust species of which a fossil dating back to 1.7 Myr (*cf.* Figure 6.7) was found by Richard Leakey and Harrison Mutua in Koobi Fora in1969. The *dietary hypothesis*, initially expounded during the 1960s by Robinson (1962, 1963, and 1965), sought to explain the morphological differences between the 'gracile' and 'robust' Australopithecines, depicting *Australopithecus robustus* as a specialized vegetarian and *Australopithecus africanus* as a more omnivorous hominin. The later electron microscope analysis of micro-wear patterns of the molars by Grine and Kay (1988) indicate that *Australopithecus robustus* had a diet including such hard food items of nuts and seeds, suggesting that it was basically vegetarian. While it is certain that plants and fruits formed a significant part of the predominantly vegetarian diet supplemented by occasional meat eating of the early humans from the Palaeolithic, hardly any specific studies have shed new light on the relationships of these early human ancestors with their plant resources.

So far of the early stage of the existence of Australopithecines, no artefacts or stone tools have been found and the related archaeological record has proved poor in providing evidence of use of materials for food and nutrition. The period of time of the Pliocene, when the first hominids evolved in Africa, was one of major climatic cooling as global temperatures dropped and the Earth's climate

regressed into an ice age. This drop in the temperature had a paradoxical effect in Africa, making the environment much drier (*cf.* Foley 1995). The eastern part of Africa experienced reduced rainfall, and the tropical rainforest receded, gradually being replaced by scattered wood- and grasslands, which eventually transformed into the African savannah. There is no evidence yet from the fossil record that the earliest hominins made or used stone tools, which makes drawing any inferences about early hominin way of life in the current absence of such tools as 'relics' of behaviour still rather difficult. The appearance of early tool-making happened much later, about 2.5 million BP.



Figure 6.7 Fossil skull of *Australopithecus boisei* dating back to 1.7 Myr discovered by Richard Leakey and Harrison Mutua in Koobi Fora in 1969. (*Source:* McKee *et al.* 2005).

Although their morphology suggests that the Australopithecines were capable of climbing trees in search of food and shelter, these early hominins spent more time on the ground. The drier savannah environment played a major role in the evolution of bipedalism which commenced about 5 million years ago. The process thereby engendered provided bipedal hominins with another advantage of being able to cover larger areas of their habitat to collect plant resources for food and nutrition. The relative brain expansion ensured the continuation of the substantiation of the process of encephalization throughout the Pliocene in another major step towards the humanization of these early human ancestors. As Foley (1995: 141) notes, the selective pressures which caused the hominids to walk upright were largely ecological: *'the problems of finding food in an environment where resources are widely dispersed and scarce'.* In this context, meat may have been a critical resource in the relatively plant-poor environments, crucial to allowing the expansion of the human brain as a major element in the process of humanization. .

6.1.3 *Homo erectus Heritage*: The Quest for Plant-Based Food

The first fossils, eventually called *Homo erectus*, were found in 1891 in the island of Java, Indonesia by a Dutch physician Eugene Dubois, who believed that he had found the 'Missing Link' between humans and apes. Convinced that the fossil skull, femur and molar belonged to an imagined pre-speech group of 'Ape-Men' who formed the transition between some extinct Miocene apes and *Homo sapiens*, Dubois named this human ancestor from Asia *Pithecanthropus erectus*, also known as e 'Java Man' (*cf*. Leakey & Lewin 1992; Leakey & Slikkerveer 1993; 1995). The advancement in the process of human evolution around the period of time of about 2 Myr is indicated in yet more indications of the enlargement of the size of the hominin brain, coinciding with the emergence of the first members of the genus *Homo* (*cf*. Foley 1987; 1992). Significant evidence has been provided by the illustrious fossil discoveries by Richard E. Leakey and his team, including the famous skull of *Homo habilis* (KNM-ER 1470) of 2.5 - 1.8 Myr, from East Turkana and the most complete fossil skeleton ever found of *Homo erectus* from Nariokotome in West Turkana, known as the 'Turkana Boy', dating back to 1.6 - 1.4 Myr (*cf*. Figure 6.8 and 6.9). Following Richard E. Leakey's chronology of human evolution (1994), at the time of the extinction of the Australopithecines, another species, *Homo habilis* ('Handy Man'), had entered onto the stage and, as its nomenclature indicates, it began to create and use stone and bone tools which Keeley & Toth (1981) claim used mainly not only for cutting meat but, more significantly, for cutting wood and grass approximately 2.5-1.4 million years BP.



Figure 6.8 The fossil skull '1470' (KNM-ER 1470) of *Homo habilis* (Handy Man). (*Source:* McKee *et al.* 2005).

Homo habilis (KNM ER 1470) - later also referred to as *Homo rudolfensis* - is the earliest larger brained hominin known of 2.5-1.8 Myr, while the fossil skull KNM-ER 1813 of 2-1.5. Myr from the

same site was found within the context of early, rather primitive stone artefacts The differentiation between *Homo erectus* and the earlier *Homo habilis* is characterized by continuing changes in the face and cranial capacity, and the associated tool assemblages, the Acheulian handaxe culture, is primarily African-based.



Figure 6.9 Illustration of the most complete skeleton of the of the 'Turkana boy'. (*Source: Source:* McKee *et al.* 2005).

A number of studies have documented that *Homo erectus* was the first hominin to live in caves and use fire for warmth and for the preparation of food (*cf*. McKee, Poirier and McGraw (2005). In addition to the famous discovery of the 'Turkana Boy', other finds of larger brained fossils of *Homo erectus* in Kenya have been made by Richard E. Leakey's team, including the fossils KNM-ER 3733, KNM-ER 388 and KNM-992 from East Turkana. In Kenya, an extensive living site ascribed to *Homo erectus* is Olorgesailie in the Rift Valley. Geological and palaeobotanical evidence from Pleistocene sediments indicate the former presence of a large freshwater lake providing a durable

camp sites for groups of inhabitants. The archaeological assemblage with an abundance of handaxes, rubble and unmodified cobbles at Olorgesailie was later than the Acheulian assemblages from Olduvai Gorge in Tanzania, convincing Louis and Mary Leakey that the area was a living site dating back to 900,000 years ago (*cf*. Figure 6.10).



Figure 6.10 A researcher shows an archaeological excavation site in Olorgesailie. Olorgesailie is a site where an abundance of hand axes have been collected in Kenya. *Photograph*: A.K. Ibui (2006).

The work of Glenn Isaac and his team at the 1.5-million-year-old 'Site 50' near Koobi Fora, east of Lake Turkana has provided new, unique information on the hunting and gathering life- style of a group of *Homo erectus*, revealing the characteristically human co-operative behaviour in the quest for food, founded on social interaction and alliance formation in the use of food resources. Microscopic patterns of the many stone tool edges from the site indicate their use in cutting such textures as soft plant material, wood and meat. Isaac's (1978) focus on the interaction of *Homo erectus* with the environment and its resources inspired him to formulate his interesting 'food-sharing hypothesis' which has made an enormous to the greater understanding of the evolutionary process towards modern humans.

Contextual finds of more sophisticated tools with these fossils at these sites have served to substantiate the emergence of *Homo erectus*, which can be regarded as the ancestor of *Homo sapiens* (*cf.* Richard E. Leakey 1994). During these transitions which took place in a time span covering over 2 million years, the individuals in the *Homo* line changed in their morphology, gaining increased brain capacity, reduced jaws and more specialized teeth enabling them to eat more meat than before, although the main diet still consisted largely of plant-based foods. Although generally considered part of *Homo erectus* as the central stem of *Homo* evolution behaviour during the Lower and Middle Pleistocene, on chronological and geographical considerations some authors have recently divided the all-embracing taxon, in which *Homo erectus* is viewed as a specifically

Eastern Asian lineage (*Pithecanthropus, Sinanthropus*) and *Homo ergaster* as the African lineage, represented by the fossil finds in Kenya and Tanzania.

6.2 Modern Humans of the Neolithic: Agricultural Revolution

6.2.1 Archaic *Homo sapiens* Heritage: Brains and Strategies

In the assumed transition from *Homo erectus*/*Homo ergaster* to *Archaic Homo sapiens,* although incompletely documented and dated, the basis is laid for the answer to the critical question: *'What makes us human*? It is encapsulated in the explanation of a long and complex process of accumulation of such changes as walking upright, modification of dentition, larger brain, extended range, the emergence of spoken language, the development of social interaction and cooperation, and the emergence of consciousness, emotions and values (*cf.* Leakey & Lewin 1992). The implications for the study of early human-plant relations are that the actual subject matter actually emerged in the Neolithic, when modern humans began to explore and utilize their wild plant resources in a reflective way, eventually leading to the practice of cultivation and domestication of plants for food and medicine, generally referred to as the 'Agricultural Revolution'.

While most researchers agree that a number of evolved features distinguish present-day humans from their predecessors, disagreement still reigns about which anatomical characteristics define the first *Homo sapiens*. Since a series of fossils from Africa and Eurasia are different, on the one hand from the remains of *Homo erectus/Homo ergaster*, and, on the other hand, also from modern *Homo sapiens*, they are generally referred to as *Archaic Homo sapiens.* As a picture of widespread mosaic evolution of the species is emerging, dating and taxonomic reference of some of the associated fossils still remain problematic. The major morphological changes are observed in the skull, the major indications being increased cranial capacity and a flattened facial anatomy. Examples of *Archaic Homo sapiens* in the East African region include the Bodo skull, dating back to between 600,000 – 200,000 years ago (*cf.* Figure 6.11). Fossils from *Archaic Homo sapiens* have also been found in Asia, notably Indonesia, China and India, and in Europe, dating back to between 300,000 and 250,000 years ago.

Relatively complete data about the ways of life of *Archaic Homo sapiens* have been collected in Europe from two French sites, the Arago Cave north of the Rousillon Plain and Terra Amata on the French Riviera. Faunal remains from these sites include birds, turtles, and such various mammalian species as elephant, boar, ibex and rhinos, an indication that these early humans were big game hunters. Many stone tools have been in Terra Amata, where the occupants built simple huts with hearths and stoves. The flattened limestone blocks probably served for seating or breaking animal bones. These and other finds indicate the emergence of collective strategies for the collection and sharing food, obtained from animals and plants from the natural environment, among the members of the group. At this juncture, a special group of early humans in Europe, the Neanderthals, has also been included by some authors in the intermediate *Archaic Homo sapiens* whose major characteristic is the rich Mousterian stone tool assemblage, which began to emerge about 200,000 years ago. Artefacts from the Mousterian culture have also been found in North Africa, confirming the advanced technical specialization in the stone tool industry which allowed a variety of environmental adaptation and manipulation, including hunting animals and gathering wild plants. Although the role of the Neanderthals in modern human evolutionary history remains unclear, *Homo sapiens sapiens* appeared for the first time in Africa about 120,000-90,000 years ago. From there they later migrated into Europe, where fossils of modern humans appear only about 36,000 years

ago. Despite disagreement on the taxonomic assignments to the human fossils from Africa, Asia and Europe which date back to between 300,000 – 100,000, with some dating of older specimens to about 800,000 years ago, most researchers believe that *Homo sapiens* eventually evolved from *Homo erectus/Homo habilis* in one way or another.



Figure 6.11 The Bodo cranium and face, representing an example of *Archaic Homo sapiens* from East Africa, found in Ethiopia, dating back between 600,000 – 200,000 BP. (*Source:* McKee *et al.* 2005: 262).

The various interpretations of the evolutionary continuity which led to the arrival of modern humans - *Homo sapiens sapiens* - have led to two models; the *multiregional model* and the *Noah Ark's model.* The first model is based on the notion that modern human populations throughout the globe have evolved directly from geographical descendants of populations of *Homo erectus* which had moved there out of Africa about one million years ago. In this way, Asian *Homo erectus* became Asian *Homo sapiens*; European *Homo erectus* became European *Homo sapiens* and so on. This model emphasizes regional continuity in human anatomy, and rejects the ideas of replacement and migration. The other model embarks on the migration of *Homo erectus* about one million years ago, establishing various populations throughout the Old World. In this rather attractive view, however, these populations were later replaced by more recent migrations of modern humans who had also evolved in Africa about 150,000 years ago. In this model, migration and replacement are the basic theories, and the arguments about the regional continuity of anatomy are not supported.

Although the debate about the exact evolutionary relationship between *Homo erectus/Homo ergaster, Homo habilis* and *Archaic Homo sapiens* continues, it is clear that the evidence, largely built up in the fossil record, and supported by archaeological material, molecular analysis and linguistic studies, pertains to such complex human qualities as consciousness, reflection, morality

and ethics which have developed over a prolonged period of time. The anatomical and contextual evidence from the discovery of the 'Turkana Boy' in Kenya already indicates the beginning of this process of evolution of special human qualities of tool making technology, environmental adaptation and social interaction which formed the basis for the evolutionary the transition *to Archaic Homo sapiens* and, eventually to *Homo sapiens sapiens*.

6.2.2 *Homo sapiens sapiens*: Early Wild Plant Use in *Gogo Falls*

A famous discovery providing a true break-through in the theory of the African origins of modern humans was made back in 1967 by Richard E. Leakey who discovered, a remarkable fossil skull substantiating the first modern human, *Homo sapiens* known as the 'Pathfinder' who evolved in Africa and later spread from there around the globe, in the Omo River Valley. The skull dates back to about 130,000 years ago, endorsed by the associated faunal remains of Pleistocene origin at the site at Omo Kibish (*cf.* Richard E. Leakey 1994; Stringer & Andrews 1995). Indubitably, this important find pushes back the date of the emergence of *Homo sapiens* from 60,000 years ago - as was generally believed at the time - to 130,000 years ago - and, as Stringer & McKie (1996:3) note: *'it provided scientists with a fresh start in the study of Homo sapiens origins.'* First and foremost, it convinced most scientists in the 1970s that the 'Pathfinder' from Omo was more likely to have been an early ancestor of the Cro-Magnons from France than the Neanderthals. Secondly, it became clear that, instead of the Cro-Magnon, this *Homo sapiens* from Omo was the forebear not only of the Europeans, but in fact of every human living today (*cf.* Figure 2.1).

Consequently, the general view on the evolutionary process of modern humans had to be adapted to the recognition that, following the first migration wave 'Out of Africa' of *Homo erectus/Homo ergaster* about 1.5 million years ago, was followed by a second migration 'Out of Africa' of modern humans who began to spread into Europe, Asia, and later onwards to the rest of the world. The modern humans of the Upper Palaeolithic period of time from 40,000 -10,000 years ago were mainly big game hunters, using spears, harpoons and stone missiles, and they also developed a number of rather sophisticated tool assemblages such as the Aurignacian, Gravettan, Solutrean Magdalenian and Chatelperronian cultures. These cultures reveal an interesting development in cultural traits and materials for such highly developed tools as fine blades, scrapers, bone needles and microliths used for cutting and preparing meat, bone and a wide variety of plant materials. Similarly, the geological period of the Upper Palaeolithic was also characterized by the first aesthetic expressions in cave and rock art, and in wood and stone sculptures.

By 10,000 years ago, when the Upper Palaeolithic develops into the Neolithic Period, human food-gathering behaviour began to change considerably, when foragers began the transition from food collecting in nature to establishing settled agricultural practices, eventually leading up to simple farming methods. The availability of reliable food supplies near the dwelling-places soon enabled the first sedentary communities to emerge, later developing into villages, towns, cities, and eventually large cultures and civilizations. The inception of farming in terms of stock-rearing and agriculture had already been recognized by Gordon Childe as a major step in the history of modern humans, in 1941 when he coined the term 'Neolithic Revolution'. In later studies on the origins of agriculture this evolved into the concept of 'Agricultural Revolution'. While Child's research focused on the Near East, other researchers in the post-war years such as Braidwood (1960) in Iraq, Hole & Flannery (1968) in Iran, Kenyon (168) in Palestine and Mellaart (1967) in Turkey, followed with studies carried out in other areas where comparable developments had occurred independently. In his multidisciplinary research, Braidwood (1960) stressed the important role of domestication in early farming, arguing that the domestication of such crops as wheat and barley could only take

place in areas where the wild forms are available. In his approach, he involved such other disciplines as technical ceramic studies, radiocarbon dating and pollen sequence analysis. Interestingly, the manipulation of plants and animals started to develop within a relatively short period of time in these areas of the world, independent from each other. While wheat was cultivated in the Middle East, rice in China and maize in South America, the first farmers in Africa managed to cultivate a whole range of food plants, including yams, African rice, sorghum, bulrush millet, finger millet, *fonio*, peanuts, *treff*, *ensete* and *noog*. As mentioned in Chapter II, cultivation appears to have spread rather slowly southwards from North Africa, partly because of the long process of domestication of indigenous plants, with the exception of barley and wheat the principal crops of the North African farmers which were not suitable to cultivation in tropical Africa, (*cf.* Klein 1993).

An important driving force behind the 'Agricultural Revolution' in Africa was the change in climate at the time. Indeed, the last Ice Age had ended, the weather became warmer and moister, and water began to rise, creating ideal conditions for seeds and plants to grow. The early farmers from the Neolithic must have noticed that the remains of their wild food plants as seeds and leaves, discarded at places which they regularly visited for their food supplies, had begun to sprout and grow. However, studies of human use of and impact on wild plant communities during the Neolithic have been carried out to a much lesser extent, and often as a sideline to the palaeo-anthropological search for human fossils and archaeological excavations of human settlements and artefacts.

In East Africa, only a very few studies include an assessment of early food production in Kenya, examining the processes which led to the 'Agricultural Revolution' in East Africa. Some floated material available at the National Museums of Kenya in Nairobi, from the site of Enkapune ya Moto located on the Mau Escarpment in Nakuru District dating back to 26,000 years BP does not contain any cultivated plant remains from that time, indicating a more recent transition to agriculture (*cf.* Ambrose 1984). As is the case with the 'missing links' in the study of human fossil remains, there have been similar 'missing links' in the archaeological record. Robertshaw (1991) puts part of the blame for this on the lack of this kind of important research by the archaeologists: *'Archaeologists all too often have simply not looked for archaeological remains.* Referring to his previous efforts at soil sampling by floatation in which no cultigens were discovered, he reports that: *'sediments near the Ethiopian boarder were found to contain cultigens*'. Robertshaw (1991) also claims that '*later evidence was recovered of finger millet from Deloraine, a site in the Central Rift Valley further revealing which a Bantu-speaking people such as the Meru had been established in Kenya highlands for several hundred years'*.

A pioneering study of the origins and development of agriculture in Kenya introduced a more diachronic perspective on the process of the 'Agricultural Revolution' in the region, by also focusing on the present-day people's behaviour in their food plant and crop production practices as part of the prolonged process of the evolution and adaptation of the indigenous agricultural knowledge systems. The related discovery of a carbonized wild relative of finger millet, *Eleusine indica africana* by a team of Leakey & Slikkerveer (1991) at the site of Gogo Falls in the Nyanza province of Kenya indicate that East Africa could hold important genetic sources of most of the world's relatives, not only present in food crops but also in under-utilized edible plants (*cf.* Figure 6.12). Just about the same time, Riley & Brokensha (1988) produced a comprehensive overview of the botanical identities and uses of the plants of the Mbere people. Since then, various researchers from different parts of Kenya have conducted research on indigenous knowledge and use of wild plants in the country. Njiro (2002) reported to the National Workshop on Indigenous Knowledge about the way the Tharaka - a population group living on the semi-arid eastern slopes of Mount Kenya bordering Meru - used wild plants and trees for food, medicine, firewood, and grass for thatching their houses and weaving baskets (bulrushes). These practices is widespread throughout the country as

indigenous trees, shrubs and herbs have played a major role in providing food in the form of fruits, seeds and vegetables for the local people. Musimba (2002) agrees that wild plant and their edible fruits, leaves and seeds are used among the communities in Southern Kenya for food, including the *amaranthus* leaves which are eaten as vegetables by many communities in Kenya (Maundu *et al.* 1999). In the indigenous food plants database, a total of 800 plant species used for food in one way or other have so far been recorded.



Figure 6.12 Electron microscope photograph of *Eleusine indica spp. africana*, a progenitor of millet, retrieved from the archaeological site at Gogo Falls.
(*Source:* Leakey & Slikkerveer 1991).

Additional ethnographical studies of uses of indigenous plants by various groups of people in Kenya have recently been carried out by several indigenous scientists. The traditional herbalist Githae (2002) from Central Kenya, for instance, confirmed that his practical daily work with indigenous medicine from local plants is safe because they have carefully been selected and tested over many years. They are regarded as effective since his patients have provided positive evidence-based information. The overriding importance of traditional herbal medicine is that it is affordable, culturally appropriate and widely accessible, easily used in soups and tonics. Githae (2002) asserts that indigenous medicinal plants are also environmentally sustainable since herbalists are engaged in the growing, utilization and conservation of medicinal plants as part of the local tradition.

In her research Muya (2002) points out that in traditional medicine two main pillars need to be safeguarded if indigenous knowledge of plants is to be preserved. These are the indigenous medicinal plants themselves, and the related indigenous knowledge which is vested in the elderly community members who are the true repositories of the cultural heritage, but whose days may be numbered. She expressed her concern that this type of unique knowledge may become extinct since there are no specific national regulations and policies in place to promote their conservation or to offer protection or stimulate propagation of Kenya's useful wild plants, especially those which provide medicine.

Mogire (2002), who conducted several studies on the medicinal plant use of indigenous trees in Migori, West Kenya, noted that there was a variety of trees and shrubs which were used locally in many medicinal concoctions to treat wounds, sexually transmitted diseases (STD), headaches, diarrhoea, measles and infertility and a range of other ills. These and related studies indubitably stress the great importance and potential of the advanced study of indigenous knowledge and practice for implementation in a variety of sectors for future sustainable community development. Obviously interdisciplinary ethnobotanical research in the 'Cradle of Humankind' is facing a challenging task: to throw light on the various interesting dimensions of human-plant relations in Kenya. The virtual paucity of archaeobotanical evidence, highlighted in the theoretical orientation of the study as crucial to the development of the ethnobotanical knowledge systems approach in this part of East Africa, needs special attention.

As Bower (1991: 44) notes*: 'As my colleagues in archaeology will agree, these goals, which roll lightly off the tip of the pen, are in fact very ambitious. But I think they may not lie beyond the grasp of an international, multidisciplinary research enterprise of the sort envisioned by Dr. Richard E. Leakey and Dr. L. Jan Slikkerveer'*. Obviously, such an absence of any significant archaeological excavation or anthropological research carried out on this promising side of Mount Kenya in conjunction with the rich cultural heritage of the Meru people inhabiting the area demonstrates the critical need of an interdisciplinary approach to document and preserve the indigenous natural resources management and conservation system for the future.

6.3 Pre-Contemporary Cultures in Meru: Use of Wild Plants

6.3.1 *Ngaa*: Pre-Meru Hunter/Gatherers and their Wild Plants

As research on the origins and development of traditional farming in terms of indigenous agricultural knowledge and practices generally lags several decades behind similar studies carried out elsewhere, the study of human-plant relations in Kenya and the state of wild plant use before the arrival of Europeans - as indicated in the Introduction - still has a pioneering character (*cf.* Brower Stahl 1984). Notwithstanding, it is clear that people in Kenya have used a great variety of wild plant products for centuries. The transition phase from hunter/gatherers of the *Ngaa*, the pre-Meru people of the north- eastern side of Mount Kenya, basically reflects the recent history of most ethnic groups in Kenya, and Africa in general. Many African communities trace their origin and cultural identity back to a particular geo-cultural area of Africa, and share similar experiences in their migrations and the settlements in which they are living today. The transition from hunter-gathering to farming refers - despite the term 'Agricultural Revolution' - not to a sudden event, but a gradual process of adaptation and change.

A Meru legend tells the story of the people's migration *'a long, long time ago'* from *'the other side of the great water',* where they managed to escape from slavery. During the migration of the pre-Meru people inland from the island of Manda, commonly referred to as *Mbwaa*, a wide river had to be crossed, as is mentioned in Chapter IV. As it flowed towards the Indian Ocean it created a very muddy delta where it entered the ocean. Because of the huge size of this river, the Meru then known as the *Ngaa,* call it the 'Red Sea', comparing their crossing to the miraculous Biblical exodus of the Israelites through the Red Sea during their flight from Egypt. These local stories have been told among the *Ngaa* during the last three hundred years although in the beginning, the narrators had no formal education and could not read or write. During the flight, which took place at night because of the fear of the *Nguu Ntune* (the Red-clothed – their captors) the *Ngaa* had to cross the river in

three groups. The first group who did this when it was dark was later called the *Njiru* (black) because the night was pitch black. The second group managed to do this at sunrise as the sun turned the sky red, which earned them the name *Ntune* (red). The third group made its passage in the morning in clear daylight, giving them the name *Njeru* (white). Since then, these three groups have formed the social divisions of the Meru some of which still exist today.

In *Mbwaa*, there were economic groups which controlled the lives of the members of the community. The people lived close to the Tana River, using its water for fishing, herding and farming. They had their own judicial system consisting of a *Kiama* (Council of Elders) which would solve any conflicts in the community in accordance with the age-set system described earlier. As a result of the diminishing resources, professional groups were formed within the community, consisting of the *aturi* (ironsmiths), *athi* (hunters) and the cultivator/herders, who did not have a special *Ngaa* name. In this way, the groups managed to survive fairly harmoniously with the other groups of the community, although the resources from the river grew scarcer as they moved farther inland. The oral tradition documents that these groups of the *Ngaa* people continued to form the social structure of the community which can be seen in contemporary Meru society. Although hunting and gathering used to be practised in the past by the *Ngaa*, as most other groups in Kenya, it has remained a way of life often intertwined with agricultural practices.

As elaborated in the next chapter, the origins of sacred forest and groves still respected among the present-day Meru, are recounted in the local oral tradition. Hills and mountains, for instance, still considered sacred by the Meru, restrict trespassing or the purloining of any natural materials from, substantiating the indigenous people's concern for conservation. While conservation is now widely promoted by conservationists, many people seem to be forced to continue exploiting the forests in order to live and survive. Vast amounts of construction poles in Kenya come from forest trees, contributing to the transformation of many indigenous tropical forests to grassland, and subsequently to human settlements. Although the Government of Kenya has launched the slogan *"If you cut one, plant two",* it is only be put into practice in some parts of Kenya, while it is completely ignored in other areas. In farms and homes, indigenous bushes are planted as hedges to keep the livestock out of the compound, or conversely to keep them in their feeding enclosures. Dried poles and branches are also used for fencing paddocks.

In Meru, many crafts have been prepared from indigenous wild plants, including batik, carvings and *viondo* (bags). Although herbal medicine is a trade not fully accepted in Kenyan society, herbalists comb the forests for plant parts (roots, leaves, barks) to make medicines. Though despised in the open, secretly this type of primary health care is very popular among the older generation and among those who fail to find healing in contemporary medicine. Wild grasses and bushes constitute the main resources for animal fodder in Kenya where most animals are let to wander in open fields or in paddocks. These natural materials also constitute land cover on water catchments. A host of wild plants is harvested for food as they make a nutritious supplement to the everyday diet. Most of the food plants on the Kenyan farms and in the bush have made a drastic disappearance since the beginning of modern agricultural practices.

As already mentioned, there was very little done in the way of cultivation by the indigenous people before the coming of the Europeans. Cone and Lipscomb, (1972) give a detailed history of Kenyan agriculture at this time. The meagre cultivation practices could be attributed to the fact that most settlements were temporary. The lives of the inhabitants were poisoned by suspicion of their neighbour whom they believed were either witches or possessed the evil eye which would harm their children and livestock. Cross-border conflicts in which cattle-raiding neighbours would destroy whole villages were common. Houses would therefore be semi-permanent structures built of poles/sticks, mud and thatch. These were easy to vacate without incurring too great a loss, hence

early Kenyan families were nomads. Under these circumstances, it would be difficult to plan organized cultivation. The only option was to grow certain crops which could withstand long periods of neglect and the encroachment of the bush. The crops suited to this kind of cultivation included millet, sorghum, cassava, sugar-cane, sweet potatoes and yams. Land would be prepared using hoes and sticks and planting was done with machetes and hoes. Crops would be rotated in these small gardens to prevent loss of nutrients in the soil. At times natural disasters, warfare and other calamities would leave Kenyan families without food until the next rainy season.

Towards the end of the nineteenth century, most of East Africa and indeed Kenya was covered by vegetation which ranged from mountain forests, lowland trees and shrubs to grass- covered plains. Wild animals and people roamed this expanse, which provided for their livelihood, freely. Domestication of wild plants started with the cultivation of such foods as sorghum and millet. Once the ground was exhausted, it was left to rejuvenate while the local people moved to virgin lands. This allowed re-growth of the vegetation cover. This kind of life-style was possible because the population was small. The coming of the Europeans brought with it a change in life-style, which turned out to be an intrusion into the local peoples' way of life. Inhabitants were concentrated into villages for which boundaries were marked, introducing a new kind of life alien to the locals. This restriction on movement did not allow they type of sustainable cultivation previously known and hence resulted in overgrazing and eventual soil erosion which left land bare and unproductive. This in effect resulted in increased poverty among the local people and inexorably higher death rates because of the lack of natural resources both for themselves and their animals. The settled areas eventually grew overpopulated because families, which could not settle long enough to rear children, could now do so. The resultant rise in the population exacerbated the poverty thereby increasing vegetation loss and exposing the local peoples to extremely poor living conditions.

In contrast, the Europeans settled on the most productive land, cultivation was enhanced and trees and bushes were cleared in the process. Extensive chunks of forest cover would be reduced to maize and wheat fields. Logging for wood for construction of houses and farm equipment took with it the tree cover which could not be immediately replaced. One of the areas which suffered this catastrophe was the Meru Central District, which saw most of the land around Timau under European occupation. The post-colonial period has not yet brought any improvements to the vegetation cover. Populations continue to outgrow their designated boundaries, and hence steadily encroach on the remaining virgin lands. Wild vegetation therefore keeps on decreasing as farmers have turned to extensive farming in order to grow enough food to feed their growing families. Although most farmers have tried to leave some indigenous trees on their farms during cultivation, these eventually have been felled in search of wood for fuel. With the influx of the Europeans in the late nineteenth and the beginning of the twentieth century, farming methods began to be influenced by Western methods of cultivation. Many Kenyans who employed in the white-owned farms borrowed some of the ideas on cultivation, which they then practised in their own gardens. Others decided not to abandon their former food crops completely but to grow the modern alongside the indigenous copied this practice.

Incontrovertibly, the arrival of the Europeans brought drastic changes in cultivation practices in Meru, as elsewhere in Kenya. Men who never used to cultivate their land as their task was to provide security as warriors, were forced to take up jobs in the 'white man's farms' as agricultural labourers. New agricultural crops were introduced on these new, large-scale farms, and new farming machines and chemical fertilizers were brought into the country. Vast areas of land had to be terraced to prevent soil erosion, and Meru labourers had to be trained in the new farming methods and techniques. Wheat and maize, imported from South Africa and America, were the first major crops grown on the new farms. Later, other crops such as potatoes, beans, coffee, tea, sisal,

sugarcane were grown on both the new and the traditional Kenyan farms. Although large quantities of export crops were primarily produced at the new farms, the position of Meru farmers working as labourers on the European farms came under threat. Used to their traditional hunter and warrior duties in the community, the Meru men now had to perform the task of cultivating the land once women's work. As well as the lower agricultural labourer position, the men had to take jobs in new factories while they still retained their traditional farming work or attended the land plots they owned. In African terms, these tasks were traditionally highly regarded as they provided social security for the family and personal fulfilment.

6.3.2 The Development of Modern Agricultural Production

After independence, the Government of Kenya promoted the introduction of machinery, the training of agricultural officers and the establishment of demonstration centres which were the supply centres for new, imported seed for planting, This top-down system imposed by the Kenyan authorities played a crucial role in the development of agriculture in the country. Simultaneously, the implementation of European agriculture, based on the production of cereal crops and the production of black wattle bark as a successful commodity similarly expanded. Notwithstanding, crises caused by drought and disease continued to menace the livestock and crops of people living in the rural areas.

In contrast to an increasingly intensive farming system in Europe, agriculture in Kenya remained largely extensive, and when the world economy collapsed in the early 1920s, the agricultural sector experienced big losses. As the result of the extensive farming methods, the loss of vegetative cover had increased substantially, which also threatened the rich diversity of indigenous wild plants. *Pyrethrum* thrived as an additional cash crop, and made good profit as did coffee and tea. Maize as the major staple crop in Kenya also flourished alongside wheat, making the two products the major export crops, particularly as they did not require refrigeration as did meat or dairy products. Kenya's famous wildlife, whose habitat had been placed under continuing pressure as the result of urbanization, logging and land clearance was regarded as a threat to the crops. This meant a severe curtailment of its free movement. Zebras, for instance, were used to moving in large numbers and although the new farmland fences were not able to halt the large migrations, many were killed. Following the decrease in the number of zebras, wildebeest, giraffes, elands, kongoni and gazelles appeared in these areas, but they also ended up being killed by the farmers. Moreover, huge swarms of locusts would sometimes inflict great damage on all plants, trees, grass and food crops, sweeping across the fields leaving nothing but bare soil behind. As Cone & Lipscomb (1972) note: '*Sky blackening swarms fell greedily on growing crops leaving a few shreds of stalk behind.'*

The eventual take-over of the Colonial Government by Kenyans themselves caused some exodus of white farmers who chose to leave the country. Considerable numbers, however, decided to stay and continued farming, as the new Government was more concerned with political problems and power-sharing with the opposition parties than with agriculture. The one-party system of government which eventually emerged permitted many white farms to be allotted to Kenyans. At this time the Asian community became involved in the development of the industrial sector. Nearly 2½ million acres were transferred for agricultural development. This eventually boosted agricultural products after the decline during the process of transition (*cf.* Cone & Lipscomb, 1972).

The population continued to grow largely as a consequence of new settlement and improved living conditions in the country. Some major diseases had been curbed by the introduction of modern medicine, and poverty was substantially reduced by the increased cultivation of food crops. The growth in production, however, was slowed down by the low per capita income, the ineluctable

result of rising population growth. Increased use of machinery and better training and research meant that the agricultural sector prospered to the extent that Kenya could begin exporting wheat and maize to Uganda and Tanzania. Beef, dairy products, coffee, tea and cotton also found good overseas markets and still remain Kenya's major export products. Although the British money exchange diminished after independence, other foreign countries began to support the agricultural sector with development projects. As modern agricultural plants and crops have been produced ever more frequently on Kenyan farms, the long-term traditions of use of wild food plants have been placed under pressure, although many Kenyans still use these plants for complementary purposes (*cf.* Maundu *et al*. 1999).

After Kenya's independence in 1963, the land which was formerly reserved for the white settlers was opened up to African farmers. The subsequent departure of large number of white settlers initially left a great many Kenyans farm labourers jobless. The labourers had had no land to turn to during the colonial era. Soon, most of the farmland, a total of over 1.4 million acres, was bought off by the British Government and subdivided among Kenyan farmers. Against all expectations, these farms have been managed fairly successfully; to which the rich farming areas of Limuru, Ol Kalou, Njoro, Kitale, Kericho and Meru bear eloquent testimony today. Apart from this development, local people in most regions of the country, including Meru, continue to use and conserve the wild plants in their indigenous forests and scrubby fields for a variety of purposes.

Today, the major cash crops include English potatoes, maize, beans, and also such vegetables as cabbage, carrots and spinach. Traditional cultivation is practised in many parts of Kenya including Meru, where much un-demarcated land is used for a combination of indigenous cultivation and modern agricultural practices. Hence, it is not unusual to observe both such indigenous crops as sorghum, cassava, sweet potatoes and sugarcane growing alongside maize, English potatoes and beans. Wild trees and shrubs are allowed to flourish side by side. Instead of moving gradually towards modern agricultural systems, farmers in Meru still remain true to traditional practices alongside modern agriculture. They report that the indigenous food plants and crops are generally more nutritious. Drought resistance seems to be another important consideration revealed in the prominent position of such food plants such as sorghum, cassava, sweet potatoes and yams in local farming systems. The most interesting factor is that most farmers regard this form of subsistence as their ultimate goal, providing them with enough food to eat, sell some extra and enable them to pay debts, health care or school fees.

When these indigenous plants and crops do happen to yield bigger harvests, the owners are not inclined sell their surplus, hence no attempt is made to export these local products. The completion of the Uganda railway also contributed to the development of agriculture in Kenya. The easy access to the country by rail brought European settlers and farmers to Kenya. By the 1920s agricultural cultivation had increased despite the depredations of wild animals on the crops. Wildlife, birds and diseases were the major enemies of the early farmers. Kenyan squatters on European farms commenced growing such modern agricultural crops as coffee, tea, sisal and maize in their small gardens, with little initial encouragement from the Colonial Government. Prior to this period of time, land was owned by clans - a lineage group of relatives with a common ancestry - but as the population increased, the land became a scarce commodity. The fact that most land adjacent to the densely populated areas was 'crown land' complicated the problem. Soon, Kenyans craving to own their individual farms claimed ownership to cultivate their own crops and also to sell as they had learned that land could be exchanged for money, as could goats, sheep and cattle. This marked a turning point in Kenyan agriculture as it could be merged with European agriculture providing it was integrated into the national economy.

After World War I, large European farms were rapidly subdivided to cater to the arrival of servicemen and white farmers, who came in search of smaller farms which became more viable as the result of increased intensive mixed farming. The Kenyan population, which was about 2½ million at the outbreak of the First World War, had greatly multiplied by 1959. Yet more land was required for the growing population, and as the colonial settlements had encroached on the most arable lands, expansion was increasingly difficult. This need of arable land was also felt among the communities in Meru where the fertile highlands - also referred to as the 'White Highlands' - had been the first choice of the Colonial Government. This period of time was the beginning of the political instability in the country, culminating in the fight for freedom of the Kenyans, but also causing even more clearance of much of indigenous plant cover in the area.

6.4 The Meru Heritage

6.4.1 Ecological Adaptation to Changing Habitats

These descriptions of the recent history of the *Ngaa* evolving into in the Meru people helps to clarify the overall picture of them as a highly adaptive ethnic group in Kenya which throughout its long and dynamic history of migrations and adjustments has been able to retain its indigenous culture and systems of knowledge, belief and practices, responding to their changing environments and wild plant resources. This eventually enabled them to settle down to live and survive in a fairly sustainable fashion in the Meru region, east of Mount Kenya since long before the sixteenth century.

According to the oral stories told among the Meru, the *Aturi* were one of the three groups of the *Ngaa* people who were specialized in iron-working. The iron was panned from the river which deposited it as iron sand, a magnetic substance with a black metallic patina. The *Aturi* families made such iron tools as arrowheads to fit a wooden shaft, specially found in the forest. Moreover, the forest also provided them with trees from which they could obtain material for making bows for the protection of the community against enemies during their long journey into the hinterland. As the supply of raw iron sand diminished, their insecurity rose and they turned to the supernatural to gain protection and security. In this process, they developed rituals and practices which were unknown during their residence on their island of origin. These rituals and practices often involved the use of concoctions made from plant and animal parts which were usually kept in the compounds of their homes in order to protect the families against enemies. These concoctions were later referred to as *urogi* (poison) by the members of the other groups who soon adopted these practices as preventive measures against other community members. In due time, as in their own trade declined, they had to change to the practices of the mainstream group of the community which included cultivators and herders.

The *Athi* were the group of hunters who had been hunting on wild game and gathered honey instead of fishing, herding or farming from the beginning of the migration. During the migration, the dearth of food from cultivated grain led the *Athi* to continue this trade to provide their families with meat and honey, an undertaking unknown on the island of origin. For a very long period, the *Aturi* remained together in close family groups but, as the resources grew scarcer, they had to venture farther inland in search for more supplies. The deeper they penetrated into the wild, the greater their tendency to form close in-groups which performed special rituals and practices. Intriguingly, they developed a particular language and vocabulary which was understood only among themselves. Wild honey was retrieved from holes in trees and when a substantial amount of game was killed and prepared, special feasts had to be held to ensure that the *Aturi* would safeguard their dwindling

resources as they travelled farther inland. Initially the herders and cultivators had full access to unlimited land to graze their animals and grow grain, preponderantly finger millet and sorghum. They also kept domestic animals including cattle and goats. Unfortunately, most of their food crops were often damaged by wild animals and birds, making them increasingly dependent on wild fruits and nuts as they travelled onwards on their journey. Although the three social groups of the *Ngaa* retained their individual trades, they always moved forward together and faced the same challenges, especially resistance from inhabitants of the lands through which they passed. In the end, the *Athi* and the *Aturi* became more absorbed into the social group of cultivator and herders. Nevertheless, these groups retained their sub-group identity, even after the time of their settlement in the present Meru region, and after the subsequent invasion of colonists from Europe.

The oral tradition also revealed that during their long trek, the *Ngaa* had difficulty in crossing wide rivers in which case *ikongolo* (bridges) had to be built from specifically selected, well-known trees which provided the passage towards the land of the Meru believed to have been promised by their God. While the food and the provision of honey became the major food for the *Ngaa* people during their long trek inland from the coast, other rituals and ceremonies developed to protect them during their migration. The oral tradition also documents that rituals and practices were developed among the social groups of the *Ngaa* community. This also required the use of certain revered figures to which they turned to during times of crisis or distress, as well as during internal or external conflicts. If serious calamities struck the community - for instance if there was no rain - the wisest members who were referred to as *mugwe* or *mukiama* (prophets) were asked to protect the community. When diseases broke out or catastrophes which caused many deaths assailed them, these individuals interceded for the people, asking forgiveness from the Almighty (*Murungu*).

The sacrifices made at such times were held at selected places, for instance, at the base of the *mugumo* (*Ficus thonningii*) tree, which is known to grow so high it towers above most other trees. Such a tree provided the right environment for the sacrifices, since its huge size would symbolize the overwhelming presence and might of God *(Murungu)*. During such sacrifices, wood from some of the trees which were named in the survey of 2002 were used for firewood. Other rituals which involved cursing and communal security used such wild plants as the *muninkithia* (*Clematis brachiata*) to make infusions which were carried around to provide protection. As the *mugumo* tree was designated for general spiritual purposes, it was also used when a baby was born. Then, the newborn was laid at its base, since the parents believed that this practice would mean that the baby would live to a ripe old age, as did the tree itself.

Besides thinking about spiritual welfare, the Meru also loved leisure and hence would be found enjoying such games as the *kiuthi* (a piece of wood which had holes scored on it to a depth of an inch or so), and seeds from *mujuthi* (*Caesalpinia volkensii*) would be used on it to play a game. After reaching their final destination in the fertile lands east of Mount Kenya, in their new settlement the Meru - no longer referred to as the *Ngaa* - continued to discipline strict children strictly, a task generally regarded as a communal responsibility. The rod was always handy should a child behaved in a way of which the parents or the members of the community disapproved.

When the *Ngaa* had eventually settled in all three districts of present-day Meru, there was an upswing in the use of wild plants, especially as materials for the construction of shelters; tools for farming, including *mirwa* (digging sticks) handles for knives, machetes, *matumo* (spears) and *imee* (swords); utensils for the house which included *twau* and *iujuga* (drinking and eating vessels respectively), *iikiri* (special porridge containers) used to store *ucuru* (millet porridge) and *miiko* (wooden spoons). There were timber *ncuku* (storage barns) which were later also built to store grain, and smaller *miuuru* (storage containers) were placed inside these barns to store each type of grain separately. Additional tools were made to process the grain before cooking or grinding it into millet

porridge. These included *ntiiri* and *mutiri* (wooden mortar and pestle) and *iiga* and *nthie* (grinding stones) which are similar, albeit more advanced, to those used in the Neolithic period. Since the Mount Kenya region was densely forested, fires would be made to ward off such wild animals as leopards and lions which were a constant menace to the livestock. Most of the plants named in the Chapter VII used for fuel are known to have been in use since this pre-contemporary time of the *Ngaa*. Oral stories also recount that the Meru never cut living trees for firewood, but would always depend on dead plants and trees, which were by no means scarce in the vast wealth of vegetation and forests surrounding the Meru region. The life of the Meru meant also living in close proximity to their livestock in order to protect them against attacks by wild animals. The most vulnerable were kids, calves and lambs and they were kept inside the homestead where they shared the single room with the children or the father, also providing them with warmth in cold weather. Since the presence of chickens in the same huts encouraged the invasion of chiggers and fleas, particular shrubs were valuable as their branches and leaves were cut and tied into a bundle and used as brooms to sweep the huts clean and at the same time act as disinfectant. Some of these plants are named in the Chapter VIII in the category of non-vertebrate poison plants.

As the honey naturally available grew scarce as the result of the new, settled life-style of the Meru people, the sub-group of the *Athi* found new ways of obtaining honey. During the journey, they had been aware of the particular trees which formed the hollows in which wild bees built their nests and deposited their honey. Among the most common bee trees was the *muringa* (*Cordia africana*) which is now the major plant to provide the wood for making beehives. The *Athi* also knew of particular plants which were used to smoke bees out of caves, as well as those special wild plants which attracted the bees. Thanks to this form of indigenous plant knowledge, the *Athi* were able to continue their trade in a sustained manner accumulating the current skills and methods of honey harvesting which were reported and observed during the qualitative study in Meru.

Finally, after their settlement in their new homes and adaptation to their new habitat, each Meru family created an environment which would be comfortable by planting hedges which provided nice enclosures. These would eventually identify each individual homestead. Here too, the people had acquired local knowledge during their trek about which plants could be placed in the ground and later sprout, especially since they had often used these special branches to make simple sheds for their animals. They realized that if they remained in a place for a while; these hedges grew and were often left behind marking their settlements for longer periods of time. They had also built up their knowledge about the types of trees which would be best to mark boundaries and operate as wind- and dust-breaks. This specialist knowledge acquired during migration proved very useful in their new settlements, assisting them to improve the environment in which they had come to live. Knowledge and use of plants for medicine were also vital during the migration of the *Ngaa*.

The Meru oral stories document many occasions in the recent past on which accidents had occurred and people had broken their bones, for example during flight from enemies or in combat. On such occasions, the bark of the *muringa (Cordia africana)* tree was used as a protective covering bound around the broken arm or foot until the bone had healed. Strains caused by long walks sometimes gave rise to swollen limbs and aching backs which were massaged with leaves of a special wild plant, *mutorombololo(ro)* (*Solanecio manii*), heated on the open fire, a practice still in use. Although medicine was intertwined with magic and poisoning by the *Arogi* (cursers), the community knew exactly how to identify the kind of help it required. It could consult a so-called 'curse remover' (*muraguri*) if magic had caused their illness or complaint. The spiritual healer usually turned directly to special wild plants from which he prepared the desired doses of herbal medicine as the appropriate remedy. Sometimes, these healers needed the help of an expert to identify the right remedial plants and dosages.

Despite some gaps in the information on the evolution of the complex human-plant relations in Meru, Kenya, attributable to the lack of substantial archaeobotanical material evidence and the absence of the people from the past that used these plants - the best approach for studying such relationships is in retrospect from the present through the pre-contemporary period of time to pre-history. The next chapter will one step further to reach the core of the research by studying the knowledge and use of wild plants as reported by respondents from the three sample survey villages in Meru. The data on the useful wild plants subdivided according to the emic rather functional classification of useful plants in respectively *medicinal* and *non-medicinal* wild plants, will be presented later in Chapters VII and VIII.

6.4.2 Ethnographic Analogy *versus* the EKS Approach

Archaeologists have as yet been pretty unsuccessful in retrieving evidence of prehistoric human-plants relations in Kenya, largely because plants are made up of tissues which are very soft and hence not easily fossilized (Marshall 1991). Moreover, the primary focus has understandably been on human evolution because of the rich fossil record of human ancestors in the area, and the challenging interpretations of the major discoveries which make it seem that such study areas as Lake Turkana in north-west Kenya confirm Darwin's hypothesis of the African Origin of humans encapsulated in his notion of the 'Cradle of Humankind'. However, since new areas of research are currently being pursued to explain human utilization behaviour of useful plants in a more processual mode over longer periods of time, also highlighting the applied-oriented implications of results for sustainable community development, it has become interesting to study and explain the interrelationships between variables of knowledge, belief and practice of wild plants among different ethnic groups in a comparative way. In this context, the Ethnobotanical Knowledge Systems approach, which also includes the study of plant-related tools and artefacts as material ethnobotanical evidence, enables the integration of evidence of the processual models of contemporary peoples into the overall assessment of human-plant relations in this part of East Africa. Albeit very limited, a preliminary review of some material plant-related evidence collected in Meru during the study is represented in a few tools and artefacts, documented *in situ* from among the people in the sample surveys. For a general comparison, some prehistoric plant-related artefacts are presented as well, as they are part of the collection of the National Museums of Kenya in Nairobi. Against the background of the emergence of herding in eastern Africa around about 2500 BC, accompanied by some form of early cultivation when the early Sub-Saharan pastoralists appeared in the highlands of southern Kenya, material evidence in the form of bones from sheep and goats has been found in some Pastoral Neolithic sites. This suggests that herding may have supplemented hunting and gathering, but only later did it become the main mode of subsistence.

So far, there has been no equivalent evidence that these Pastoral Neolithic people cultivated plants, but almost certainly they relied heavily on wild food plants. Interestingly, among the artefacts made by these peoples which include obsidian flakes and blades and remarkable pottery, there are also skilfully crafted ground stone bowls and platters, which led to them originally being referred to as the Stone Bowl culture (*cf.* Bower 1991; Klein 1993). Furthermore, certain artefacts such as grinding stones are a clue that certain food plants were common in recent archaeological times. At the Elmentaita and Lewa Downs sites, for instance, researchers have unearthed grinding stones which date from 1000 – 2500 BP and reveal certain similarities to those used in Meru today. Figures 6.13 and 6.14 show grinding stones from the Pastoral Neolithic which have yet to be studied and date approximately to between 1000 - 3000 years BP, while Figures 6.15 and 6.16 present stone bowls and grinders from the same Pastoral Neolithic period.



Figure 6.13 Grinding stone from the Pastoral Neolithic Period (2,500-3,000 years BP).
(*Source:* Archaeology Collection at the NMK – *Photograph:* A.K Ibui 2006).



Figure 6.14 Grinding stone from the Pastoral Neolithic Period (1,000 - 2,500 BP).
(*Source:* Archaeology Photograph Collection at the NMK).



Figure 6.15 Stone bows from the Pastoral Neolithic (1,000 - 3,000 years BP).
(*Source:* Archaeology Photograph Collection at the NMK).



Figure 6.16 Grinders from the Pastoral Neolithic Period (1,000 and 3,000 years BP).
(*Source:* Archaeology Photograph Collection at NMK).

The discovery of the wooden drinking vessel shown in Figure 6.17, dated to around 1000 BP, reveals a technology in making home utensils still seen among the Meru.



Figure 6.17 Wooden drinking vessel from Tsavo Kenya (1,000-2,000 BP).
(*Source:* Archaeology Collection at the NMK – *Photograph*: A.K Ibui 2006).



Figure 6.18: Grinding stone and grinder used a century ago by Meru Central inhabitants.
Photograph: A.K. Ibui, *Kinoru* (2006).

Meanwhile, plant-related artefacts collected from among pre- and contemporary people in Meru in principle show a remarkable similarity with those retrieved from the Pastoral Neolithic period, known as the Stone Bowl Culture from East Africa. Figures 6.18 show a Meru grinding stone and associated grinder, depicted as the single artefact in use about a century ago which was discovered on a farm in Kinoru village. Figure 6.19 shows a *KK Lumbi* woman using present-day grinding stone to make flour for *ucuru*. The stages and transitions witnessed in the life-styles of people in East Africa and in Kenya have taken some interesting turns and circles depending on the realities which the local communities faced in their quest for medicine, food and other plant resources. The prehistorical, historical and contemporary lands which the present peoples inhabit have been turned into testing laboratories, particularly by Western scientists. Crops and plants have been introduced, tested and either confirmed for cultivation or discarded altogether as time tested their compatibility.

In most cases, the indigenous knowledge of the local peoples and their environment has never been taken into consideration, since the people have been dismissed as primitive, ignorant and backward. They have been assumed to be completely incapable of contributing anything to new, modern agriculture. Unfortunately, the failure of many introduced plants and crops has led to newcomers to think twice, and they have often turned to the local people for advice. Initially the local people practised small-scale cultivation and crops would be grown in new areas when the older cultivation areas lost their fertility. Knowledge of the types of soils was widespread although they never had any formal education. They knew what to do with soils which could not hold water for long; had knowledge of the type of crops which would grow in certain soils and so on. Most of these were ignored when the Westerners arrived in most African countries and particularly in Kenya.



Figure 6.19: Present grinding stone, grinder, gourd and port in use by a *KK Lumbi* woman. *Photograph:* A.K. Ibui, *KK Lumbi* (2006).

Chemical fertilizers which are used by most farmers today have turned the original farming land into non-productive wastelands forcing most communities into abject poverty. Knowledge of grains which could be harvested and replanted by most farmers has been lost to the communities, forcing

them to go back and buy new seed even when there are heavy harvests. In times of drought, when crops fail, farmers cannot plant the earlier crop as it is rejected by the soil, of which the composition has changed through time. At times such processes have pushed local communities over the precipice into poverty, as they mourn the loss of the indigenous species and the genetic erosion of their local cultivars. In the wake of increased species loss and genetic erosion, particularly of indigenous plant and crop varieties in the Third World, scientists have begun to expand their interests into the wider documentation of local cultivars and wild relatives in terms of recording past and present, indigenous agricultural knowledge, use and technologies (Leakey & Slikkerveer 1991; Slikkerveer & Lange 1991).In the recent past, many communities in Africa and Kenya in particular have been re-orientating themselves towards the traditional systems of agriculture. Traditional foods have recently flooded the local markets, a phenomenon rarely witnessed since independence. Most wild food and medicinal plants which would not have been tolerated once on modern agricultural farms currently form part of the intercropping in many parts of the country and elsewhere around the globe (*cf.* Innis 1997).

Such grains as sorghum and millet are sometimes found grown together with maize, English potatoes and beans. Sweet potatoes, cassava and yams likewise grow alongside other crops. Such indigenous systems have been incorporated into what is now referred to as the Ethnobotanical Knowledge System Approach, in which local people have the upper hand in determining what crops and plants should be grown on their farms. Organic compost instead of the imposed modern fertilizers is also increasingly being introduced on farms since it does not sap the fertility in the soil. There are also people in the community who decide not to clear the fodder remaining from the previous harvests. Later this becomes the much needed organic compost used in farming and the growth of various types of food crops. Such fodder is left to decay on farms, while ants and caterpillars feed on it and break it down into fertile soil suitable to growing crops. There are communities which practise the burning of grass as a means of getting rid of pests which affect livestock and food crops.

Traditional tree planting and terracing also help to stop erosion of fertile top soils and growth of *Napier* grass helps to control running water which would otherwise carry the rich top soils to rivers, lakes and seas. Different types of trees survive the droughts because of the trenches local peoples dig around them to preserve running water, keeping them watered and/or full of moisture during long dry periods. These current developments in conjunction with the growing interest in ethnobotanical knowledge systems research in Eastern Africa emphasizes the great importance and potential of the advanced study of indigenous knowledge and in the 'Cradle of Humankind', in order to throw light on the various interesting dimensions of human-plant relations among comparable ethnic groups living in the rich cultural areas of Kenya. Obviously, the paucity of archaeo-botanical evidence as the result of the lack of any significant archaeobotanical excavation and ethnobotanical research in this part of Kenya calls for an interdisciplinary research effort in which a combination of the method of the 'Ethnographic Analogy could be carried out on diachronic material evidence, complemented by the 'Ethnobotanical Knowledge Systems' approach in order to provide new theoretical and methodological insights combined with applied-oriented strategies for sustainable community development in this part of East Africa.

This chapter has presented the background on human-plant relations from the Cradle of Humankind from prehistory through pre-contemporary to contemporary period, thus providing insights into the early hominins of the Palaeolithic and their dependence on plants. Here the growing record of fossil plants has been highlighted in addition to providing greater insight in the understanding of the *Australopithecus* as well as the *Homo erectus* heritage and their quest for, as well as use of food plants. Furthermore, a detailed account of modern humans of the Neolithic and

the emergence of the agricultural revolution as relates to both Archaic and *Homo sapiens sapiens* is presented. The contemporary cultures in Meru detailing the life of the *Ngaa* as hunter/gatherers and the eventual advancement to modern agriculture, further reveals how quickly adaptable humans can change in changing environments. The chapter concludes by presenting the *Ngaa* life as they face the challenge of adapting into new ecological habitats. The next chapter therefore presents the results of the Qualitative data collected in 2002 relating to wild medicinal plants use in Meru among the *Ngaa* descendants of the 21st Century.

The next chapter is going to present the data relating to the Meru knowledge and use of medicinal plants detailing the useful wild plants of the Meru; Indigenous classification of medicinal plants; wild plant use and in herbal medicine; and information concerning the traditional healers and community plant experts of Meru.

VII Meru Knowledge and Use of Medicinal Plants

The study on the various uses of wild plants in Meru was carried out during the months of August, September and October 2002. As described in Chapter III, information was gathered with the assistance of informants who are local experts in indigenous knowledge and practice of the useful wild plants of Meru. They had acquired their expertise from their parents and grandparents; and some claimed divine inspiration. Throughout the field work which lasted three months, a total of 567 plant specimens were collected, dried and preserved for future reference and study. In the Meru plant collection 77 families, 178 genera and 271 species were identified. The list of the plants is given in the Appendix.

In the field, eight major categories of wild plant use were identified on the basis of the plant specimens collected, the information of local plant experts, and details of the preparation of related products was documented. Among the different categories of use were: a) medicinal plants; b) food plants; c) material plants; d) social plants; e) environmental plants; f) fuel plants; g) non-vertebrate poisons plants; and h) bee plants. These eight categories of different types of wild plants were later grouped into two major categories, reflecting the emic differentiation of the Meru people, which is also put into use in the description of useful wild plants and, in the final analysis, as a dependent variable in the model of wild plant use behaviour. The two major categories are *medicinal* and *non-medicinal* plant use.

Part *one* contains a general overview of the way in which the useful wild plants of the Meru were collected, documented and preserved in the three Districts. A classification of types of use of plants is also presented, based on the major distinction between medicinal and non-medicinal wild plants. *Part two* focuses on the local people's indigenous medicinal plant knowledge**,** documented as medicinal, aromatic and cosmetic (MAC) wild plants. It presents the classification of medicinal plants, including the local and scientific nomenclature. The related indigenous classification of diseases is also presented in this part, based on the qualitative surveys in 2002. *Part three* documents the Meru people's use of wild plants for the preparation of herbal medicine, followed by an assessment of their conservation practices. The *final part* of the chapter elaborates on the various types of indigenous healers and plant experts, and the role they play in current efforts of integrating traditional and modern medical systems in Kenya. It also presents the views of Government of Kenya health officials about the co-operation envisaged between the staff of the two forms of health care delivery in the country.

7.1 The Useful Wild Plants of the Meru

7.1.1 Collection and Documentation of Wild Plant Specimens

During the fieldwork in Meru, as said a total of 567 useful wild plants were collected. These were later identified and preserved at the National Herbarium of the National Museum of Kenya (NMK) in Nairobi for conservation. Botanist Mr Michael Mungai classified the specimens and provided a list with their Latin names. The highest number of plants was collected from the more rural Meru South District, where the environment was relatively undisturbed, and there was no threat from wild animals. The collection of plants in Meru North District was hampered by insecurity caused by cattle rustlers from the Isiolo border. The collectors in Meru Central District working in the forest environs of Mount Kenya were scared off the forest fringes by the presence of elephants and

buffaloes. Most local experts could also give meticulous explanations of the sizes, heights and shapes of trees, although extreme heights had to be estimated. Colours of leaves, flowers and fruits proved very important information in establishing definitive identifications. The pressing of collected plants had to be executed quickly, since colours fade rapidly after parts are separated from the parent plant. Leaf shapes and arrangement of the same on the branches, as well as bark colours and appearances were also described by the experts. It was fascinating to observe how they identified plants by their sense of touch in order to determine the texture of the leaves and how they managed to distinguish between the different shades of green. They could smell and sometimes even taste particular plant parts including fruits and roots, showing their experience and skills in identification including determination of shapes and vein arrangement of the leaves. They also identified trees from the colour of the bark and whether this was smooth or peeling.

Wild plants are used by the Meru people in various ways, which will be gone into in Chapters VII and VIII. Here, the local experts also provided information on the various categories of use, explained which parts of the plants were used and how these were prepared. In the case of medicinal plants, they described the preparation of the medicine and the practical experience they had accumulated in the matter of the dosage and administration. For the purpose of this research, *trees* are defined as vegetation that is single-stemmed from the ground with branches occurring at a height of about four feet above the ground. Most of these can be classified as material suitable to a variety of purposes, environmental uses and as wind- and dust-breakers, not to mention aesthetic splendour. Their trunks are supposed to have much larger diameters than those of shrubs. *Shrubs* are said to posses several branches emanating from the base of the plant or from the ground, and also have thinnish stems. The local experts were not specific about the thickness of the stems and would ask for a specimen to be looked at the plants and checked whether or not it was a tree. Most shrubs had seeds which could be eaten, providing the much needed energy between meals. Herbaceous plants were classified as vegetation with soft stems and leaves and were grouped mostly as food or medicinal plants.

Various grasses were basically classified as *grass*, while such grass-like vegetation with thin long leaves as *irimba* (*Cyperaceae*) was included in the group as well. It was not easy for some informants to explain the difference between grass and rhizomes, but some would say that it was a rhizome if it had a stem creeping under the ground. *Muugu* is the name for creeper or climber in the Meru language, indicating that its stem cannot support the plant upright. Generally speaking, it was not always easy to explain particular types of plants in words, in which case the respondents asked the research team to look at the plant's appearance. Succulents were characterized as puffy, full of juice and sometimes spiky. Bulbs were simply called *gitunguru*, which means onion. Tuberous corms were categorized as something with the appearance of *mutuuma* (*Colocasia antiquorum*).

Respondents were asked about their uses of plants in the various categories already named and asked whether they had used any plants during the previous year. If so, they explained what parts they have used and from what location they have collected the plants. Another question posed them was whether they spent money either to purchase the plant or whether they had incurred any expenditure in travelling to acquire the particular plants. Finally they were asked if they would use such plants in the future and for what reasons.

When probed for information about conservation methods and practices, a number of respondents became uneasy because the limitations imposed by their small plots of land, made it impossible to plants new trees. The respondents from Meru Central District particularly where population density is high because of the location of Meru town experienced this problem. Each plant collected was arranged between two felt blotters to look as natural as possible with its leaves flattened and flowers arranged to allow different views. Large flowers and fruits were separated into

half before pressing. Succulent plants were boiled in water for about 5-10 minutes as they tend to continue growing even after harvesting. They were then dried and pressed. Although such a method is not as satisfactory as immersing the specimen in mentholated spirits or alcohol for an hour, it was the best method available in the field at the time of the research. Thorny plants were put between two boards and trodden on to break or bend the spikes before pressing so as to prevent damage to other specimens in the press. The pressed plant specimens in the felt blotters were placed in between newspapers and filed to look like a book. These were then placed on top of each other, making sure that cardboard was placed in between. The bundle of plants was put between wooden presses and firmly tied with straps. As shown in Figure 7.1, the bundles were placed in the mild sunlight to drain the specimens of all moisture. Changing the paper was not often necessary since the heat of the sunlight was intense enough to dry the specimen. Only during the cold, cloudy days of October and November, the paper was changed once a day and a small charcoal burner placed in the room where the plants were stored to dry.



Figure 7.1 Collected wild useful plant specimens in presses put out in the sunlight in Meru District to dry.
Photograph: A.K. Ibui (2002)

Depending on the degree of humidity, the drying time took one to two days, sometimes longer. Plants collecting locations were set up at the Njuri Nceke Museum in Meru North District, Meru National Museum in Meru Central District, and the District Officer's office grounds in Meru South District, where tents furnished with beds, tables and chairs borrowed from the Koobi Fora Field School were set up. Other than their use as medicine, there were seven other applications determined for 48.0 per cent of the specimens collected. This provided the basis for the construction of the second dependent variable: *non-medicinal use*. Quite clearly the Meru people feel very close to their vegetation environment since they have interacted with plants for hundreds of years. They have also depended on them for many uses and treat them as possessing a soul and life as do animals or people. Just as animals are named, every plant has a name and is treated with care and respect in order not to hurt it. In classifying the plants, the Meru look at such factors as habit, texture, colour and size as well as use. Since the plants are considered to have a spirit, they regenerate through seeds. Plants are also seen as clothing or an adornment for the Earth and are viewed as providers of the Earth's beauty and freshness. They are viewed as bearers of peace and serenity as well as rain-bringers. Depending on the features of particular plants they can be viewed as peaceful or beneficent plants especially those used in marriage, child birth and religious rituals. They may also be considered bad plants especially if they emit choking fumes, have piercing thorns or produce poisonous saps. These are used chiefly for inflicting curses and sometimes as barrier hedges against wild animals and thieves. It was important to discover which of each of these plants might also have medicinal properties and may not be viewed entirely as malevolent. The major classification of plants collected fell into the categorization of the uses which will be discussed below.

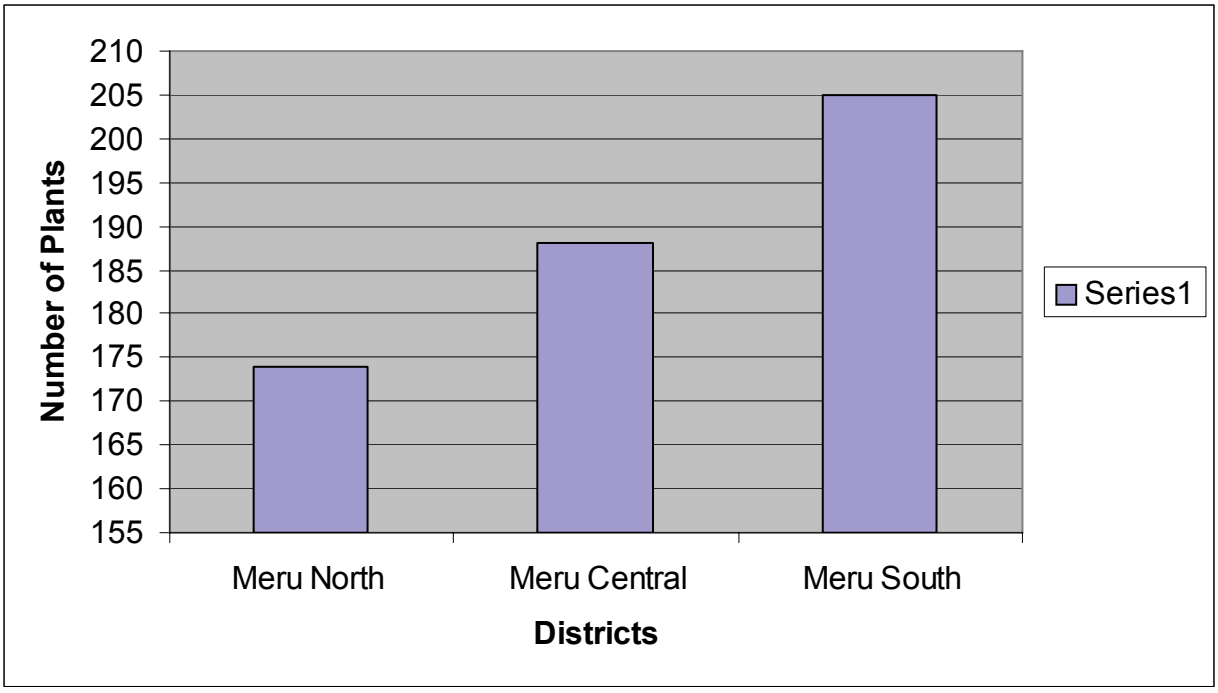


Figure 7.2 Bar Chart showing the number of plants collected in each District in Meru
Source: Fieldwork (2002).

During the field survey carried out in 2002, 271 species of plants were identified among the 567 plants collected in the three Districts of Meru of which 174 were from Meru North, 188 from Meru Central and 205 from Meru South Districts respectively. Figure 7.2 shows the number of plants

collected in each District and Figure 7.3 shows the various uses of plants identified. There were a few plants among these which have not yet been identified and will need to be looked at in more depth to see whether they compose new genera and species.

Description of Vegetation

The plants collected were grouped as shown in Table 7.1 as shrubs, trees, herbs, climbers/creepers, succulents as cacti, grasses, corms as arrowroots, rhizomes and bulbs as onions. Shrubs composed the highest type of vegetation commonly found in most of the greater Meru region where people have cleared large trees and left only a few to grow alongside other crops. The number of grasses collected was not a representative of the distribution in the Districts, but a representation of the types which are used by humans.

Table 7.1 Indigenous grouping of Meru vegetation in local and English Names (N=567)

Vernacular name	English name	Total
Gikamba	Shrub	227
Muti	Tree	178
Nyani	Herb	80
Muugu	Climber/Creeper	55
Kithunju	Succulent	12
Nyaki	Grass	7
Mutuuma	Corm	5
Muthangari	Rhizomes	2
Gitunguru	Bulb	1
Total		567

Source: Fieldwork (2002).

Description of Plant Parts

The Meru are quite conversant with the parts of the plants which they use. They have their names in the local language and the people know what to pick and the seasons in which the parts are available. The local experts are quite aware when the parts they need have a maximum food and medicinal content. They are also experts in identifying roots of plants, even when there are no leaves, fruits or flowers, as is common in the dry season. In such times, they resort to their senses of smell and taste. The descriptions of the useful parts named in the field survey are given in Table 7.2.

Table 7.2 Descriptions of Plant Parts Used

Vernacular name	English name
Muri	Root
Gitina	Stem
Ibura/Nyaani	Leaf
Rwangi	Branch
Gikonde	Bark
Kongo ka muti	Bud
Itunda	Fruit
Mpindi	Seed
Gikwaci	Tuber
Nthang'ari	Rhizome
Gitunguru	Bulb
Iua	Flower

Source: Fieldwork (2002).

7.1.2 Classification of Uses of Wild Plants

Most of Meru North District where plants were collected is covered with scattered trees, bushes and grasses growing on a dry flat landscape with the exception of a few places where small hills dot the surface. There are no permanent rivers in the areas where plants were collected and vegetation growth is dependent on the two rainy seasons for its water. The majority of the plants collected in Meru Central District came from formerly forested habitats, near riverbanks and riverbeds and on homesteads where gardens are continually nourished with compost to improve the fertility of the soils. Meru South District has several rivers flowing through deep gorges. Most plants were collected in gardens and on farms. Since Mount Kenya Forest extends to Meru Central and Meru South Districts the plants collected there were part of the forest vegetation growing ear the edges, no more than 100 or so metres inside where collectors felt safe and out of the danger which might have been posed elephants and buffaloes.

Vegetation in Meru is very important to the people, part and parcel of the Meru life-style. Before the arrival of the Europeans, forests and bushes provided hiding places for the people when they were attacked by enemy tribes. They were also believed to be homes of ghosts and spirits of the ancestors and consequently harboured the secrets of the dead. This translated them to the position of sacred habitations in which vegetation could never be destroyed. They provided the habitat of the wildlife for hunters to hunt and hence provided their daily meals. They were pharmacies and food sources for the indigenous Meru, providing medicine for their health care for over three hundred years (Fadiman 1982; Rimita 1988; Iuw 1993; Ng'unyura 2000). Forests were viewed differently during the colonization which lasted for forty-six years. After Kenya gained independence, forests were no longer regarded as being sacred. Besides the benefits bestowed by trees and forests, flowers produce nectar for the bees resulting in increased supplies of honey which the local people use for medicine at certain times and as sugar in their drinks. Nowadays use of plant materials is less frequent since most of the respondents' land is limited and leaves no room for planting trees. Flowers are also used in cultural festivals and more, as will be elaborated in Chapter VIII. In the past, trees and bushes were never cut for whatever reason. On the basis of the field survey carried out in 2002, useful wild plants of the Meru were classified as follows: Medicine; Food (food, beverages additives and such ingredients used in food preparations appetizers, flavours), Fermenting aids for local brews; Materials (wood, timber and rafters), fruit ripening accelerators (bananas) and basketry and rope-work (ropes, baskets and mats); Social uses (masticators, smoking, contraceptives, abortifecients and poisons used on arrowheads, ritual, wedding and religious purposes); Cosmetics - skin lotions, oils, perfumes and soaps); Fuel (firewood and charcoal); Environmental uses (barrier hedges, land markers, ornamentals, erosion controllers, windbreakers, soil improvers and rain bringers); Non-vertebrate poisons such as insect repellents; and Bee plants (attracts or repels bees into/from beehives). Table 7.3 shows the distribution of the various uses of plants which were later grouped into *medicinal* and *non-medicinal* as reported by household heads in the household surveyed in 2003 in the three selected villages of Meru.

There are 784 reported uses of wild plants in Meru. Table 7.4 shows that out of 567, 442 (53.8%) were reported to used in medicine, 140 (17.9%) in food, seventy-nine (10.1%) for materials, seventy-one (9.0%) for social uses, thirty-seven (4.7%) for fuels, twenty-six (3.3%) for environmental uses, seven for non-vertebrate poisons (0.9%) and two (0.3%) for bee plants. In short, a plenitude of plants used in many different ways as will be illustrated in the next sections of this chapter. For instance, plants would be reported to be useful in making medicine although their primary use was either as food or materials or perhaps in social functions and so on. Discoursing on the uses of wild plants for medicine and food, Iuw (1993) noted: *'there is no clear distinction in*

traditional African medicine as when an herb ceases to be a health food and when it becomes a medicine. --- many food plants are used for therapeutic purposes, and medicines are not viewed as' necessary poisons'.

If the total number of reported uses for each (medicinal, food, materials) is divided by the total reported uses and multiplied by100, a Pie Chart as shown in 7.3 can be developed, indicating the percentages of useful wild plant reported during the surveys. Table 7.3 shows how the uses were recorded as reported as first, second, third or fourth uses. The first use was always that which the local experts gave as the most usual for that particular plant, and hence other uses would be reported in the order of their applicability. The figure shows that 150 species were identified as having at least two uses, while thirty species out of these were reported to have at least three types of uses. Three species were identified as useful in a total of four types of uses which was the maximum number for a given plant. Among these were the *mukau* (*Rytigynia sp.*) the bark and roots of which are boiled to prepare a decoction, and the liquid obtained is taken as *medicine* to treat malaria, and the branches and stem are used for building *material* as well as for *fuel*. Powder is made from the bark is used for such social purposes as a cosmetic. One of the other two species are *muthanduku juria mwiru* (*Acasia mearnsii*) of which the leaves are boiled and the decoction used as a medicine to wash and clear rashes Its wood is used for construction materials and fuel and its gum is eaten as food (snacks). The second species if the *mung'wani (Markhamia lutea*) of which the leaves are used socially as washing soap, its wood is used for construction material and fuel and serves as an environmentally useful tree as well, as it provides a break against wind and dust.

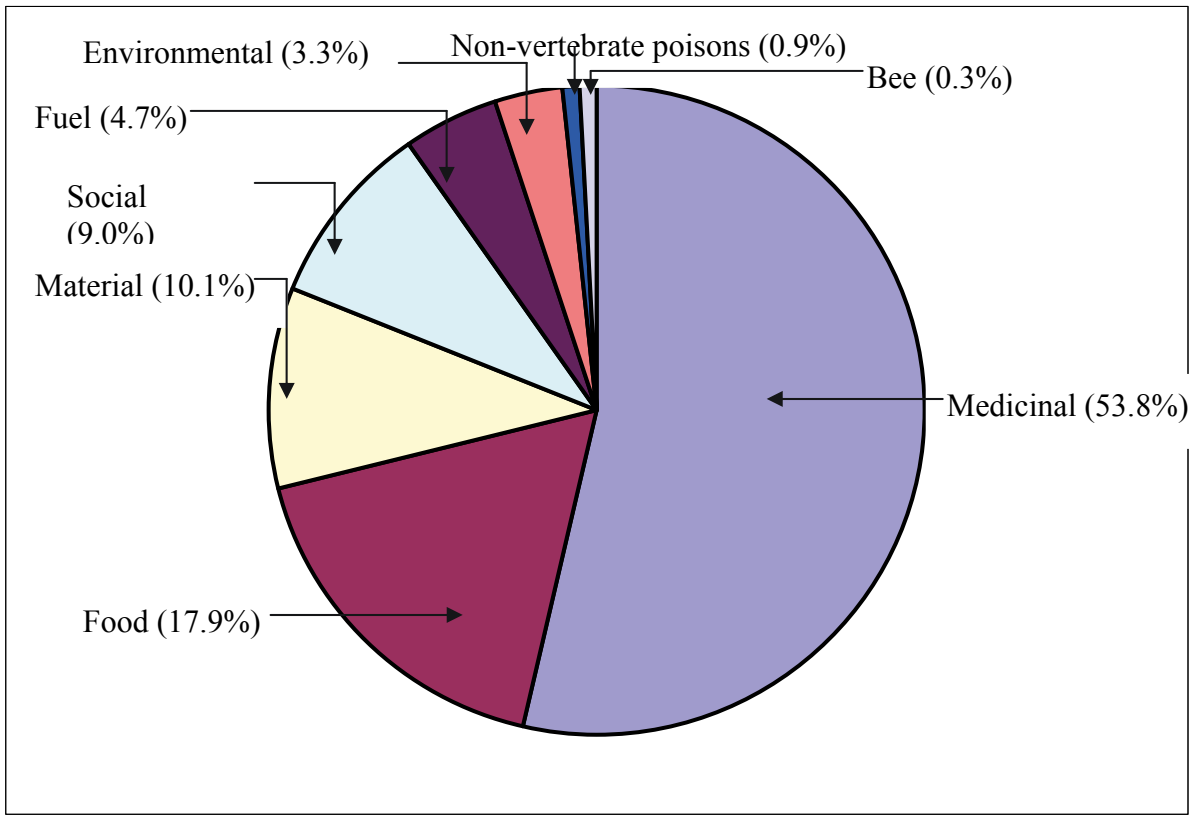


Figure 7.3 Pie chart showing the distribution of different wild plants according to their local use in Meru
Source: Fieldwork (2002).

Table 7.3 Various uses of wild plants reported as 1St, 2nd, 3rd or 4th uses

Reported plant use	1st	%	2nd	%	3rd	%	4th	%	Total	%
Medicinal	392	69.1	30	16.3	-	-	-	-	422	53.8
Food	103	18.2	34	18.5	2	6.9	1	25.0	140	17.9
Material	25	4.4	50	27.2	3	10.3	1	25.0	79	10.1
Social	32	5.6	32	17.4	6	20.7	1	25.0	71	9.0
Fuel	3	0.5	17	9.2	16	55.2	1	25.0	37	4.7
Environmental	7	1.2	17	9.2	2	6.9	-	-	26	3.3
N/V poison	5	1.0	2	1.1	-	-	-	-	7	0.9
Bee plants	-	-	2	1.1	-	-	-	-	2	0.3
Total	567	1000	184	100.0	29	100.0	4	100.0	784	100.0

Source: Fieldwork (2002).

In the final analysis of wild plant use behaviour among the Meru, the first-mentioned type of use was formulated to determine the final category into which the plant species was classified, namely, wild medicinal, food, material, social, environmental, non-vertebrate poisons or bee plants. The uses of the 271 species of plants are illustrated in the drawing shown in Figure 7.4.

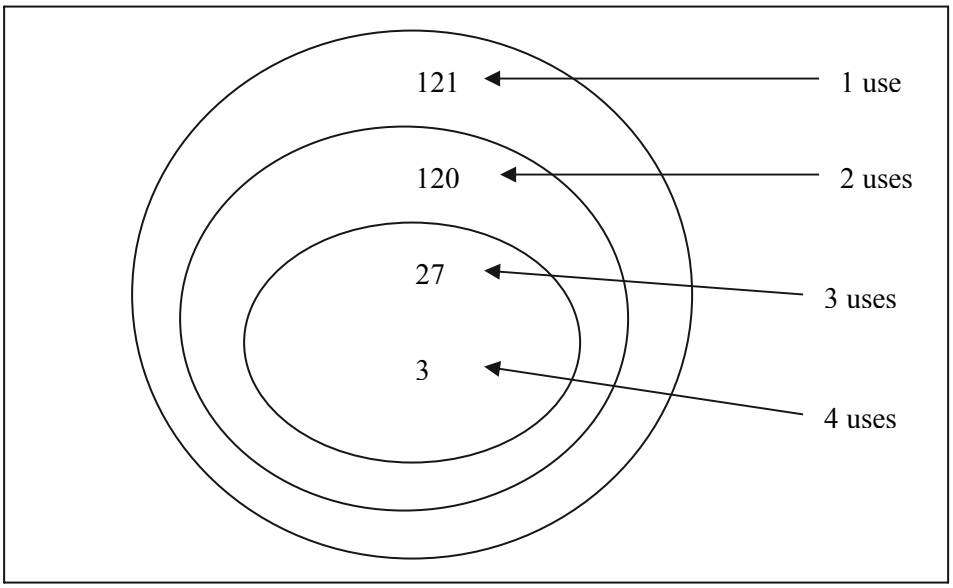


Figure 7.4 Complex uses of the 271 species of wild plants collected, total number of species of plants with at least 1 use = 271 2 uses = 150, 3 uses = 30, 4 uses = 3.
Source: Fieldwork (2002).

The Venn diagram in Figure 7.5 shows in what way the multiple uses of plants are intertwined, as seen in medicinal, food and material plant uses. The total number of uses (789) reported and the total number of plants (567) collected is indisputable evidence of the intertwined nature in different types of use. From the figure, it is possible to see that two (2) species of plants were attributed all three uses (medicine, food and material), while fifty two (52) were used in medicine are also used in food. Nine (9) species were used in food and material, whereas thirty-nine (39) were used in medicine and material. A total of 329 were reported to be used as medicine only, seventy-seven (77)

for food and twenty-nine (29) for material. The Venn diagrams in Figure 7.5 demonstrate the interaction of uses among wild medicinal, food and material plants in Meru

7.2 Indigenous Medicinal Plants

7.2.1 Indigenous Classification of Medicinal Plants

Kenya is endowed with a wealth of plant resources and over 7000 plant species and sub-species have so far been identified, while the number of species found in the greater Meru region are yet to be identified and documented. Traditional healers used to prepare concoctions which consisted of various parts of herbs, animals, fish and birds. At that time, people believed that there was no disease which could beat the medicine of these healers and often most of the medicinal plants could also be used for food. Up until now, in the view of the local people there is no clear distinction between food plants and medicinal plants.

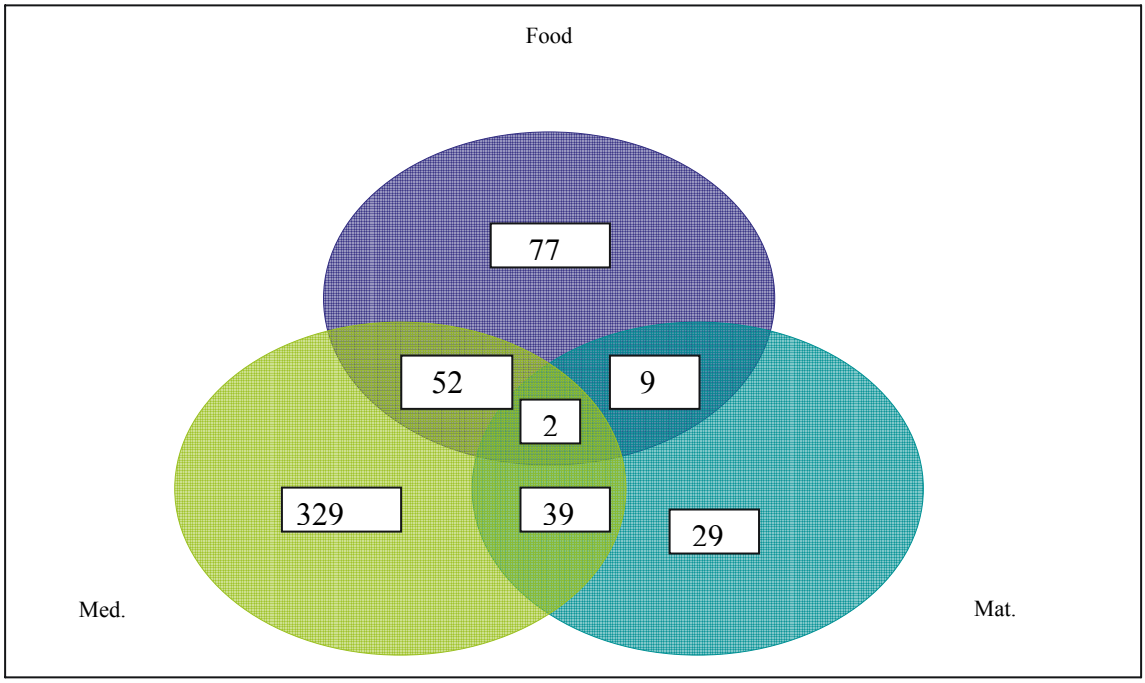


Figure 7.5 Venn diagram showing Interaction of uses among medicinal, food and material wild plants in Meru (medicinal (Med.) = 422, food = 140, material (Mat.) = 79. *Source: Fieldwork (2002).*

In Meru, most common disorders and diseases are treated using herbal medicine prepared from indigenous wild plants. The people who possessed the knowledge of this art of healing include the *aga* (herbalists).They are thought to have the power to treat *all* types of diseases and ailments. They know the particular plant parts required to prepare the concoctions and decoctions to be administered to their patients. As modern doctors, these local medicine men, herbalists and 'witchdoctors' are highly esteemed as people who can make a diagnosis and define the treatment of diseases. Although they use mostly medicinal plants to prepare the medicine, other parts are constituted of such domesticated food crops as yams, cassava and millet as well as such animal and

bird products as milk, fish and honey are sometimes added. Diseases which include diabetes, high blood pressure, arthritis and in particular anaemia can be treated. Illnesses which cannot be diagnosed easily or which are thought to have been inflicted by witches or spirits of the ancestors as curses are the preserve of the 'witchdoctors', but ailments with recognizable symptoms are still treated by the herbalists. Most of the 'witchdoctors' have currently gone underground as some religions claim that their activities are evil or sinful, and could bring about the wrath of God on those who submit to their treatment. No such stigma affects the herbalists who are regarded as highly skilled healers in the preparation and application of medicine. This does not detract from the fact that most Meru people themselves also possess some knowledge of how to prepare home remedies to treat their relatives. If no simple cure is found, an herbalist is often sought. There are also other local plant experts in the communities who once used herbs to prepare concoctions to poison supposed enemies. Such felonies could occur in the event of land disputes or in personal jealousy of someone's wealth, education or success. Similarly, poisonous extracts were used on arrowheads for hunting or fighting against invaders. Indeed, some poisonous herbs were also used in small doses to prepare medicine, and should these potions adversely affect the sick person, there are always others plants to be used as antidotes. Sometimes, such herbs were also used to clean wounds inflicted by arrows, snake bites, bee- and scorpion stings, and scratches caused by thorns of poisonous plants.

The term 'classification' is unknown to most indigenous people either in Meru or in other parts of Kenya, or indeed elsewhere in Africa. It is a term developed in the Western world and therefore difficult for the local people to imagine. Plants are grouped - or 'classified' in Western terminology - by looking at the broad characteristics of the entire plant. Although local people can identify the intricate details of plant and leaf shapes, and distinguish the colours of flowers and fruits, leaf arrangements and forms of bark with great perception, they have no specific group names for such detailed categorizations. Therefore, they arrange their plants into the much larger categories mentioned above: *gikamba* (shrub), *muti* (tree), *nyan*i (herb), *muugu* (creeper/climber), *kithunju* (succulent), *nyaki* (grass), *mutuuma* (corm), *muthangari* (rhizomes) and *gitunguru* (bulb). Table 7.4 shows a list of the indigenous medicinal plant classifications of the Meru, indicating the local or *vernacular* and the *scientific* name, their uses for medicine and the parts used. The columns of 'vernacular names' and 'medicinal plant uses' refer to names and information provided by the local Meru plant experts during the field survey conducted in 2002. The *scientific names* have been determined from botanical lists and publications with the assistance of the Curator of the East African Herbarium in Nairobi. The complete list of the species of plants collected is given in the Appendix, in which both the family names and that of the authors are included. After lengthy search of equivalent English names of the plants and also the result from inquiries from botanists in the National Herbarium in the Netherlands, these names have been omitted since most were confirmed not to have names in this language.

Many medicinal plants are also used to prepare cosmetics and perfumes with a sweet scent. Local plant-based inhalants are also resorted to for their soothing and healing effects. The people find it very difficult to separate aromatic and cosmetic plants from medicinal plants. For instance, the seeds of the castor oil plant *kiariki* (*Riccinus communis*) can be roasted, ground and boiled in some water and finally sieved, after which the oil can be filtered for application to the skin. This local product is effective for clearing rashes, boils and dandruff on the scalp, but is also used as a skin care lotion, that is a cosmetic. In the past, this was often used by adult girls for body decoration, especially mixed with *nondo* (red ochre) and applied to their skin, in the same manner as powder is used today. In some cases, castor oil was mixed with the ground tubers of *ndago* (*Cyperus articulatus*) and used as perfume, and the *ndago* would also have been roasted in the fire to produce

a sweet aroma to scent the girls' skin, skirts and houses in the same way as modern perfumes are presently used. When *ndago* is chewed and rubbed on the chest of a child, it cures common colds and de-congests the chest. Several plants also have been used to clear body rashes, boils and soften rough skins, combining the effects of healing and cosmetics at the same time. Respondents asked whether they or the members of their families used these cosmetic and aromatic plants replied that there are plenty of modern replacements and hence they no longer require them. Others say that they are outdated. Yet others say they have had no experience on how to use them and could not use or prepare them. There are those who also indicated that cosmetic and aromatic products are available everywhere in the markets today and hence they had little need to behave as if they are living in 'prehistoric times'!

Table 7.4 Classification of major Meru medicinal plants, medicinal uses and parts used

Vernacular name	scientific name	medicinal use	part used
Butonwa, Mutonwa	*Galinsoga parviflora*	fresh wounds, tetanus, coughs and colds	leaves, roots
Cubutei	*Sehkuria pinnata*	malaria	whole plant
Gakenakeni	*Ipomoea obscura*	anthrax	leaves
Gakonge karia kanini	*Aloe sp.*	hair dandruffs	leaves
Gakumu	*Oreosyce sp.*	malaria, intestinal worms	roots
Gatunguru karia gaceke	*Allium annuloprason*	aching ears, coughs, colds	leaves
Gicibi, Muchibi	*Leonotis nepetifolia*	acidity, malaria, worms	leaves
Gikandu, Mukandu, Makuri	*Ocimum gratissimum*	colds, stomach ailments, coughs, intestinal worms, body rash	leaves, branches
Gikuruthi	*Ocimum basilicum*	coughs, colds	whole plant
Gitiki	*Sida tenuicarpa*	diarrhoea	stem
Gitorombolo, Mutoromboro (lo)	*Solanecio mannii*	sprains, boils, scurvy, fresh wounds, rheumatism, stomach ailments, sprains	leaves
Kabeche	*Crotalaria mauensis*	asthma	leaves
Kaimba na ncici, Makena	*Asparagus racemosus*	rheumatism, stomach ailments	roots
Kalema ntiiri	*Cucumis dipsaceus*	acidity	fruit, leaves
Kamama	*Amaranthus graecizans*	fresh wounds	leaves
Kamila	*?*	sexual weakness	whole plant
Kamugerwe	*Hibiscus aponeurus*	rushes	leaves
Kamuti Komu	*Microglossa pyrifolia*	gum aches	roots
Kanuku, Kaari	*Dichrocephala integrifolia*	measles, skin growths (*ncaucha*), stomach ailments	fruit, leaves
Karigicha	*Cissampelos mucronata*	stomach ailments, constipation	roots, leaves, stem
Karura	*Asparagus setaceus*	boils	tuber
Karuta	*Sesamum calycinum*	sore eyes, hair relaxer	leaves, sap
Kathuri	*Euphorbia tirucalli*	tooth aches	stem
Kiariki kiria kinene	*Unknown*	rashes, boils, itching	stem
Kijara, Mugoya, Mwogoya	*Plectranthus barbatus*	fresh wounds, skin growths (*ncaucha*), tooth & gum aches, toxicity	leaves, stem, roots
Kilantana	*Lantana camara*	toxicity	leaves
Kilui, Muthare	*Lobelia gibberoa*	urinary track infections, joint aches	stem, roots
Kilantana	*Lantana camara*	toxicity	leaves
Kilui, Muthare	*Lobelia gibberoa*	urinary track infections, joint aches	stem, roots
Kinyakwe	*Ageratum conyzoides*	rheumatism	stem
Kiramata karia Kanene	*Cyathula polycephala*	ulcers, breast cancer, boils	roots
Kiroo, Mwino	*Senna didymobotrya*	malaria, anthrax, stomach ailments, measles, body aches, colds, rushes, boils, scurvy, constipation	leaves
Kirurite	*Ajuga remota*	malaria, acidity, nausea, head and joint aches, pneumonia, body aches, coughs, colds	leaves, branches
Kithiamura, Muthiamura, mununkutha	*Vernonia brachycalyx*	acidity, constipation, poisoning	leaves
Kithunju	*Aloe secundiflora*	malaria	leaves
Kithunju	*Opuntia vulgaris*	boils	fruit
Kithunju	*Aloe literatia*	malaria, fresh wounds, aching ears, diabetes, headaches	leaves
Kithunku	*Solanum nigrum*	worms, stomach crumps, acidity, indigestion	leaves, roots,
Koomere, Mukamwiru	*Tridax procumbens*	fresh wounds, tooth aches	stem, leaves
Likithente, ntilikungi, Mumango	*Pappea capensis*	body aches, invigorator (athletics), rheumatism, body weakness	roots, bark
Lukweyi	*Balanites aegyptiaca*	body aches	roots, stem
Managwi	*Gyndropsis gynandra*	stomach ailments	leaves
Mang'ua, Mumang'ua	*Sclerocarya birrea*	joint aches, backaches, general body aches	bark, roots
Maragwi	*Artemisia afra*	malaria	leaves
Menywa	*Afromomum augustifolia*	worms	seeds
Muakwa, Muthakwa	*Vernonia auriculifera*	malaria, coughs, colds, mouth wounds, intestinal worms	roots
Mubaki	*Symphytum officinale*	ring worms	leaves
Mubaumauta	*Eucalyptus saligna*	measles, stomach ailments	leaves
Mubungu	*Caesalpinia decapetala*	gum ache	roots
Mucegene	*Achyranthes aspera*	general body ache	roots
Muchabi	*Cassia occidentalis*	malaria, backaches	roots
Muchagucha	*Drypetes gerrardii*	wounds	leaves

Table 7.4 (cont'nd) Classification of major Meru medicinal plants, medicinal uses and parts used

Vernacular name	scientific name	medicinal use	part used
Muchaii	*Rosemarinus officinalis*	coughs, colds	stem
Muchamaru, Munyalikwa	*Grewia similis*	fresh wounds, wounds, bleeding gums	bark, stem
Muchambi, Muchambi	*Strychnos henningsii*	malaria	bark, leaves
Muchogomo, Muchogoma	*Ekebergia capensis*	malaria, fevers, joint aches	bark
Muchoka	*Plumbago zeylanica*	impotence, sexual inactivity	roots
Muciri, mukinduri, Muui	*Croton macrostachyus*	malaria, amoeba, coughs, colds, venereal diseases, backaches, fatigue	roots, branches, bark
Mucugucugu jwa kithaka	*Crotalaria sp.*	coughs, colds, sore throats, wounds	roots
Mugaa	*Acacia gerrardii*	wounds from poisoned arrows	bark
Mugenkagenka	*Senna singueana*	malaria, fevers, diarrhoea	leaves
Mugeta	*Rapanea melanophloeos .*	malaria, rheumatism, body weakness	bark
Mugorona	*Rhamnus prinoides*	malaria, rheumatism, neck stiffness	leaves
Muguita	*Kalanchoe sp.*	body aches	leaves
mugumbao, Mukumbau, mugumbee	*Withania somnifera*	headaches, malaria, rheumatism, boils, general body health	leaves, stem, roots, seeds
Mugumo	*Ficus thonningii*	toxicity	roots, bark
Muguruka	*Securidaca longipedunculata*	intestinal worms, acidity, malaria, stomach ailments	roots
Mugutugutu	*Gomphocarpus integer*	amoeba	roots
Mugwatia Nderi	*Scutia myrtina*	joint ache	roots
Muiimbi	*Allophylus sp.*	body aches-general	leaves
Mujuri	*Unknown*	rheumatism	roots
Mujuthi, muchuthi	*Caesalpinia volkensii*	malaria, acidity	leaves, roots, seeds
Mukalamatu	*Melia azadirachta*	body aches, joint aches	roots
Mukambura, Muro	*Dovyalis abyssinica*	body aches, boils, gonorrhoea, heartburn, acidity, stomach ailments, malaria, rheumatism	roots, stem, leaves, fruit
Mukaraku	*Salvia coccinea*	menstrual overflow, ulcers, bad eye	leaves
Mukau	*Melia volkensii*	malaria, gum and tooth aches	bark, roots
Mukaua	*Rytigynia sp.*	chest pains, coughs, colds	roots
Mukinda Nthaka	*Clematis brachiata*	coughs and colds, venereal diseases, bad eye, malaria, amoeba, stomach ailments	roots, branches
Mukuananthi	*Ipomea sp.*	diarrhoea	whole plant, stem
Mukuma	*Hibiscus fuscus*	coughs, swollen feet, rheumatism	roots
Mukuria mbungu	*Unknown*	joint aches	bark, stem
Mukuu	*Calotropis procera*	tooth aches, yellow fever, anaemia	branches, buds
Mukuuru	*Flueggea virosa*	joint aches	roots
Mukwego	*Bridelia micrantha*	stomach ailments, acidity, ear aches	roots, leaves, stem
Mulele	*Fiscus sp.*	tooth aches	stem
Mulialia, Muriaria	*Emilia discifolia*	stomach ailments, constipation, nausea, amoeba, body aches, fatigue, malaria	roots, leaves
Mulikinyai, Mumanko	*Euclea divinorum*	constipation, anthrax - infected meat, rheumatism, stomach rumblings	roots
Mumilinchui	*Acacia mellifera*	body ache	roots
Munamulia	*Carissa edulis*	gonorrhoea	roots
Mung'ang'a	*Zanthoxylum gillettii*	rheumatism, joint aches	bark
Mungetia nthaka, muruciu, Kirugundu, Kiragwi	*Conyza bonariensis*	tooth aches, gonorrhoea, diarrhoea, measles, stomach ailments, rashes, boils, rashes, itching	roots, stem
Mung'wani	*Markhamia lutea*	rheumatism	bark
Muninkiu	*Unknown*	ulcers, breast cancer, boils	roots
Munyithia, Mukithia	*Clausena anisata*	constipation, poisoning	leaves, stem
Muoru, Muboru, Mooru	*Plectranthus sp.*	sore eyes, colds, stomach ailments, constipation, burns, tooth & gum aches	leaves, roots, stem
Muraa	*Catha edulis*	gum and tooth aches, acidity	leaves
Murama	*Unknown*	post natal bleeding, worms, stomach ailments	roots
Murangi	*Arundinaria alpina*	malaria	faeces deposited on the plant by an unknown bird
Murantina, Murigi	*Kigelia africana*	rheumatism, malaria, stomach ailments, amoeba	fruit, leaves
Muratha ngii, Runyugunyugu, Muchege	*Bidens pilosa*	coughs, colds, sore eyes, malaria	roots, stem, leaves

Table 7.4 (cont'nd) Classification of major Meru medicinal plants, medicinal uses and parts used

Vernacular name	scientific name	medicinal use	part used
Murathaiga	*Osyris lanceolata*	indigestion, diarrhoea, excessive bleeding after birth	bark, roots
Murathaiga, Mugokora	*Trimeria grandifolia*	rheumatism	roots
Murenda, Muuruka	*Pavonia patens*	diarrhoea	roots
Murera njau	*Solanecio angulatus*	backaches	roots
Murigarigu	*Rauwolfia caffra*	amoeba parasite	bark
Murigarigu	*Clerodendrum myricoides*	coughs, coughs	roots
Muringa	*Cordia africana*	coughs, wounds	bark, branches
Muriuntui	*Olea capensis*	stomach ailments	bark
Murumu, Mururu, Munaciano	*Fagaropsis angolensis*	intestinal worms	bark
Murunwa	*Piper capensis*	kidney problems	roots, leaves
Mutabi	*Ocimum kilimandscharicum*	sore eyes, constipation	seeds, seeds
Mutanda mboo, Mutanda Mbogo, Muchaani	*Toddalia asiatica*	joint aches, body aches, worms, malaria	roots, bark, leaves
Mutariani	*Steganotaenia araliacea*	boils	stem
Mutata	*Harissonia abyssinica*	malaria, body aches	roots
Muteletu	*Teclea simplicifolia*	malaria, poisoning	roots, leaves
Mutenderuka	*Cardamine obliqua*	scurvy	leaves
Mutero	*Olea europaea L. ssp africana*	malaria, intestinal worms	bark
Muthaiti	*Ocotea usambarensis*	whooping cough, body ache	bark
Muthandunku	*Acacia mearnsii*	wounds from poisoned arrows	leaves, stem
Muthangira	*Olinia usambarensis*	rheumatism	bark
Muthara jumweru, Muthaara	*Indigofera arrecta*	coughs, colds	roots
Mutharange, Mulinkoloi	*Indigofera swaziensis*	malaria, worms, body aches & weaknesses	roots, whole plant
Muthigio	*Rhus longipes*	amoeba, intestinal worms, backaches	fruit
Muthii	*Cordia monoica*	joint aches, chest pains, backaches	roots, bark, leaves
Muthira Nthoni	*Maytenus senegalensis*	body aches	roots, stem
Muthiriti	*Lippia ukambaensis*	colds, headaches, coughs, colds asthma	leaves, roots
Muthithi	*Tamarindus indica*	rheumatism, malaria	bark, roots
Muthuguya	*Unknown*	stomach ailments, fevers	bark, stem
Muthunka, Muthunga	*Lactuca capensis*	coughs, stomach aches, rheumatism	roots, leaves
Muthunthi	*Ximenia americana*	tooth aches, aching gums	leaves
Mutogota inyo, Mutogota ingi'nyo (inginyo)	*Heliotropium steudneri*	wounds from poisoned arrows	leaves
Mutongu	*Solanum incanum*	poisoning, malaria, sore throats, jigger sores, stomach ailments	roots
Mutoo	*Azanza garckeana*	acidity	fruit, bark
Mutuati, Mutugati	*Trichila emetica*	rheumatism, coughs, colds, wound from poisoned arrows, body aches	bark, seeds
Mutula, Mutura	*Solanum aculeastrum*	joint aches, body aches, backaches, rheumatism	roots, leaves
Mutunguu, mutungururi	*Commiphora eminii*	coughs, colds, pneumonia, stomach ailments, anthrax, constipation, acidity, muscle pains, stomach crumps, measles	roots, leaves, branches, bark
Mutuntu	*Croton macrostachyus*	coughs, mumps	branches, bark, whole plants
Muturutua, Murua	*Rhoicissus tridentata*	anaemia, malaria	roots
Mututu	*Clerodendron myricoides*	backaches, gonorrhoea	roots
Muuchwa, Muluilui, Muruiri, Muguchwa	*Zanthoxylum chalybeum*	coughs, colds, rheumatism, body ache, mouth sores, malaria	leaves
Muugu	*Passiflora edulis*	poisoning	stem
Muukula, Muukura	*Dregea sp.*	malaria, alcoholic tremor, mouth freshener, coughs, colds, stomach ailments, diarrhoea, rheumatism	roots
Muumbukura	*Unknown*	rheumatism, joint aches	roots
Muuru	*Vitex doniana*	whooping cough	bark
Muuta, Mu'ere, Mukenia	*Pentas lanceolata*	joint aches, malaria, kidney problems, scurvy	roots
Mu'uti	*Aspilia mossambicensis*	fresh wounds, coughs	leaves, roots
Muuti, Mubuti, Mubutu	*Erythrina abyssinica*	malaria, body ache, gonorrhoea, snake bite, amoeba, coughs, colds, wounds from poisoned arrows	bark, stem, leaves

Table 7.4 (cont'nd) Classification of major Meru medicinal plants, medicinal uses and parts used

Vernacular name	scientific name	medicinal use	part used
Muutu	*Tabernaemontana pachysiphon*	malaria, amoeba, intestinal worms	bark, stem
Muutuutu, gitungugu	*Jatropa carcas*	fresh wounds	branches, branches
Mwananthenge	*Jasminum sp.*	menstrual overflow	whole plant
Mwangua	*Senna siamea Lam.*	malaria, gonorrhoea	roots
Mwaraka, Kiaraka	*Tetradenia riparia*	stomach ailments, constipation, body pains, burns & scalds, coughs, colds	roots, leaves, stem
Mwarankware	*Clerodendrum johnstonii*	body ache	roots
Mwariki, Kiariki	*Ricinus communis*	constipation, umbilical cord infection, birth control pills, stomach ailments, dry skin, ring worms, circumcision wounds, asthma, whooping cough	seeds, roots, bark
Mwatha	*Vernonia lasiopus*	acidity, nausea, malaria, heartburn, stomach ailments, sexual weakness, rashes, coughs, colds	leaves, branches, roots, stem
Mwenjela	*Cussonia holstii*	fever, coughs, rheumatism, alcoholic tremors	bark
Mwimba na Muthumbi	*Zehneria scabra*	gonorrhoea	leaves
Mwinyu	*Unknown*	body ache	roots
Mwiria	*Prunus africana*	rheumatism, brain fatigue	bark, stem, roots, leaves
Mwiru, Mwiru	*Vangueria infausta*	coughs, colds, worms, body aches	leaves, fruit
Ncani Mura	*Unknown*	rheumatism	roots
Ndago	*Cyperus articulatus*	body weakness, fever, pneumonia	tuber
Ngakura	*Rhamnus staddo*	body aches	roots
Ngangarisi	*Unknown*	joint aches	bark
Nguruka ya Kieni	*Vernonia grabra*	boils, stomach ailments	roots
Nkabakabu, Mbotwa	*Physalis peruviana*	coughs, colds, anaemia, acidity, diarrhoea	fruit, leaves, stem
Nkenkeyia, Mugenkeyia	*Commelina sp.*	sore eyes and ears	buds, leaves & flowers
Nkiloloti	*Acacia nilotica*	joint aches, malaria, improves appetite	bark, stem
Nkonko, Kigonko	*Oxygonum sinuatum*	rashes, dandruffs, burns, boils	roots, leaves
Ntaratare (cia rwego)	*Rubus volkensii*	coughs, colds, acidity, general body health	fruit
Ntaratare iria nceke	*Rubus apetalus*	coughs, colds	stem
Nthangari	*Digetaria abyssinica*	backaches	rhizome
Nturiri	*Turraea robusta*	intestinal worms, malaria	roots
Nyaari	*Sporobolus pyramidalis*	stomach ailments	roots
Quinini	*Unknown*	malaria, nausea, body weaknesses	whole plant
Rukwa	*Dioscorea minutiflora*	heartburn	tuber
Rukwa Karukwaci	*Ipomoea batatus*	wounds from poisoned arrows	stem
Rungu	*Unknown*	fresh burns	fruit, stem
Terere	*Amaranthus hybridus*	acidity (boiled in cattle blood)	leaves
Thaa ya njogu	*Urtica massaica*	cancer, diabetes, kidney problems, anaemia	leaves
Thibini	*Psilotrichum elliottii*	boils	whole plant
Thunui	*Warburgia ugandensis*	intestinal worms, amoeba	bark
Tigiji, ntigiji	*Myrsine africana*	intestinal worms	roots

Source: Fieldwork (2002)

7.2.2 Indigenous Classification of Diseases

Malaria, respiratory infections, intestinal worms, rheumatism and joint aches, HIV/AIDS, skin diseases and diarrhoeal diseases are reported as most common in the three Districts of Meru (*cf.* DDP 2002-2008).

Table 7.5 Indigenous classification of diseases as reported by community local experts in Meru both in vernacular and English languages

Vernacular names	English names
Mirimo ya ngosi	**Diseases of the skin**
gitemerwa	fresh cuts
gutunda	rashes
kabarabari	scurvy
kiirwa kia mwanki	burns
kiirwa kia ruji rwa mwanki	scalds
kironda kia mugwi	wounds from poisoned arrows
kironda kia rutano	circumcision wounds
kithainya	ringworms
kithuku	measles
kubarabara	dry skin
mutundu kwaga mauta	hair and scalp dryness including dandruffs
mwithwaa	itching
ncaucha, mwimbwa	growths on the face and skin
nkuji	cancerous wounds
nuungu	chigger wounds
nyimba	boils
Mirimo ya kiu	**Diseases of the digestive system**
ironda bia kiu	ulcers
kerega kwigwa kurea	lack of appetite
kirungurira	heartburn
kuruuma kiu	stomach crumps and noises
kuumirwa ni kioro	indigestion
kuuna	constipation
kwarwa	diarrhoea
kwarwa tharike	cholera, typhoid
njoka cia kiuu	intestinal worms, amoeba
nkoronjiru	nausea
nyongo	acidity
thiita	anthrax from eating infected meat
Mirimo ya gwikia miruki	**Diseases of the respiratory system**
gukunikanwa kibara	chest and nose congestion
kibara	coughs
kibara kia mieri itantatu	whooping cough
ncoma	common colds
ndimoni	pneumonia
rweeu	asthma

Table 7.5 (cont'nd) Indigenous classification of diseases as reported by community local experts in Meru both in vernacular and English languages

Vernacular names	English names
Mirimo ya tharike	**Diseases of the circulatory system**
kunyuruka ndamu itikuma	difficult in blood clotting
gwitia tharike	high blood pressure
kuria thumu	food poisoning
kurumwa ii njoka	poison from snake bites
kuthirirwa ni tharike	anaemia
murimo jwa cukari	diabetes
murimo jwa tharike	cancers including leukaemia
thumu	other poisons
thumu	toxicity
Mirimo ya matu, nyiuru na karakara	**Diseases of the ear, nose and throat (ENT)**
kironda gia mumero	sore throat
kuthandika matu	aching ears
murimo jwa karakara	tonsillitis
Murimo ya guciara	**Diseases of the reproductive system**
gisonono	venereal diseases especially gonorrhoea
guitaa tharike ya kurika	excessive breeding after birth
Ironda bia mukou	umbilical cord wounds
kuinga guciara	birth control
kuwhicha	impotence
kwaga inya ya guciara	lack of sexual strength or inactivity
tharike ya mweri	menstrual overflow
thina ya nyomba ya mwana	problems with afterbirth
Mirimo ya kumaa	**Diseases of the excretory system**
mirimo ya njira cia guciara	urinary track infections
Mirimo ya kurumang'ua ni mwiri	**General body pains and aches**
kuriwa ii kiongo	headache
kurumangua ii mugongo	backache
kwajua ii metho	sore eyes
murimo jwa maruungo	joint ache
murimo jwa mpio	rheumatism
murimo kibara	chest pains
Mirimo ya rwagi	**Fevers**
murimo jwa kweruaa metho	yellow fever
rwagi	malaria
Mirimo ya kanyua	**Mouth diseases**
ironda bia (pl.), kironda gia (sig.) kanyua	mouth sores
kiini kuma thairke	bleeding gums
kurumwa ni igo (sing.) maigo (pl.)	toothache
murimo jwa kiini	gum ache

Table 7.5 (cont'nd) Indigenous classification of diseases as reported by community local experts in Meru both in vernacular and English languages

Vernacular names	English names
Mirimo ya marungo	**Bone and muscle problems**
gwotoka nkingo	neck stiffness
inya ya rwiro	athlets fatigue
kugwatwa ii macu	muscle cramps
kuinaina niuntu bwa ncobi	alcoholic tremor
kunenuka	sprains
kunika murutu	fractured bones
kunoga mathuganio	brain fatigue
kwimba maguru (pl.), kuguru (sing.)	swollen legs
mbucu	mumps
munoga	exhaustion
tetenasi	tetanus
Mirimo ya kurogwa	**Witch craft**
kurogwa	the evil eye / curse

Source: Fieldwork (2002)

In general, the study carried out in 2002, supported this profile, in which such illnesses as general body pain - including rheumatism, respiratory infections such as coughs and common colds - stomach ailments and malaria represented the bulk of the ailments recorded. Interestingly, HIV/AIDS was not reported by any of the informants since it was not understood and most of the symptoms resembled those of malaria and other fevers. Particular diseases which are caused by poor sanitation and the environmental conditions of rain, heat, dust and the like are prevalent at specific times of the year. The Meru people classify their diseases according to the location in the human body in which the symptoms are experienced. For instance, the category *mirimo ya ngosi* (diseases of the skin) referred to dermatological complaints, and other ailments are classified as *mirimo ya kiu* (diseases of the digestive system), *mirimo ya gwikia miruki* (diseases of the respiratory system), *mirimo ya tharike* (diseases of the circulatory system), *mirimo ya matu, nyiuru na karakara* (diseases of the ear, nose and throat), *mirimo ya nyumba ya guciara* or *ya kwaga inya* (diseases or disorders of the reproductive system or impotence), *mirimo ya mpigo* (diseases of the excretory system), *mirimo ya gukangatwa ii mwiri* (general physical pains and aches), *mirimo ya kiaara* or *rwagi* (fevers), *mirimo ya kanyua* (stomatic diseases), *mirimo ya maruitu na marungo* (bone and muscle problems) and *mirimo ya kurogwa* (cultural illnesses or bewitching).

7.2.3 Indigenous Conservation of Medicinal Plants

On several occasions it has been reported that the people of Meru take great care of the fields, forests and the entire ecosystem on which they depend. Indeed, every Meru clan used to reserve some part of the forest for the spirits of their ancestor, which could only be entered by the *Aga* or the *Arogi*. People would say that songs of the spirits of the ancestors could be heard echoing from the forests at night. This was the time when the forests in the Meru region were covered with dense

vegetation in the woodlands or rainforest. As Fadiman (1982) documents: '*No living Meru dared enter a spirit forest. No one could hunt there, chase straying livestock, or even cut wood. To be caught and cursed by the spirits in such cases meant experiencing personal terror, subsequent physical illness, and communal ostracism, and requiring the services of a curse remover. In theory, therefore forests were never entered.*'

The fear of entering or destroying such sacred forest which is deeply inculcated in Meru culture, contributed to the conservation of trees, shrubs and plants of the forest, protecting medicinal and other plants useful to the community. Unfortunately, these beliefs were not resilient enough to stop the first missionaries of the United Methodist Church from persuading the Meru elders that the sacred forests were the best place to build their churches. Although the Meru elders initially opposed such plans by the colonial authorities and their British Government Representative Mr Edward Butler Horne, they could not afford to antagonize the colonial power. They offered the Methodists a part of the sacred forests hoping that the ancestral spirits would wreak their vengeance on them. The missionaries rejoiced, feeling that, as Fadiman (1982) documents: *'a forest of wizards and witches would be the most fitting spot possible to sow the seed of God'*. Obviously the ancestral spirits did not intervene, and this speeded up the erosion of the indigenous belief system of the Meru. The preservation of the sacred forest with its rich resources of valuable medicinal plants for the herbalists was jeopardized even more.

The wanton destruction of their sacred forests, experienced as a threat to the Meru community, did not completely deter the people from looking for alternative practices of conserving their medicinal plants. During the field surveys of 2002, it was confirmed that farmers allowed considerable number of wild trees and shrubs to grow alongside their crops. These wild species provide the plant parts most useful for the preparation of traditional medicine. In addition, the Government has set rules to prevent the remaining forests from being destroyed. Recently forests have been placed under the care of the Kenya Forest Service of the Ministry of Environment and Natural Resources. Understandably most herbalists turn to their immediate environment to collect medicinal plants for the preparation of their medicines, and it is the forest fringes which still provide the essential alternative when the farm wild plant resources tend to diminish. Besides the age-old the taboos on the sacred forests, such wild animals as the African buffalo and elephants also make most Meru plant experts wary of venturing into the deep forests.

Trees in Meru have largely been cut down, not to provide material for medicine, but for such other purposes as the production of furniture, building materials and preparation of charcoal. Herbalists who collect medicinal plants take special care of the plant specimens which they use. If they need to use the bark of a tree, they remove it carefully to prevent causing any permanent damage. The bark is sliced not horizontally but vertically in order to avoid deep cuts in the trunk. Soil is smeared on the wound to prevent the loss of water which facilitates healing and the drying of the wound. If roots are to be taken, the herbalist picks those away at some distance from the base of the plant in to prevent the plant part for exposure to the scorching sun and to protect it from roaming sheep and goats, which are fond of fresh roots. Branches are cut with a sharp knife, an essential part of each plant experts traditional 'tool kit', in order to make quick, clean cuts which do not bruising the plant which can happen if harvesting is done by hand. Rough harvesting by hand might unnecessarily strangle, bruise or wound plants causing them to take a longer period of time to recover. The Meru herbalists know exactly how to identify certain roots of particular plants, even when they are collected far from the plant's base. They scratch the root to remove the epidermis, smell and taste it, enabling them to make a precise identification on the basis of their many years' experience and wisdom.

7.3 Wild Plant Use in Herbal Medicine

7.3.1 Wild Medicinal Plant Use

The HIV/AIDS pandemic has been declared a 'National Disaster' in the Republic of Kenya. The unprecedented problems which it has caused the people are recognized as a catastrophe, making serious depredations on the achievements made in health and education, thereby affecting the well-being of Kenyans. The prevalence rate of HIV/AIDS in Meru North District according to the estimates of 2002 was 15.0 per cent; in Meru Central District 38.0 per cent; and in Meru South District 30.0 per cent. The infection rate was highest among those inhabitants in the age-group between 14-49 years, causing a serious threat to both the district and the national economy. The inhabitants in the age-group between 14-49 years are the most economically productive members of the society, with educational skills, technical experience and immense investment from the Government. They, especially in the age-group- ranging from 25 – 34 years, also form the group which is raising young children. More than two-fifths (46.0%) of diagnosed cases are found among its members (*cf*. DDP 2002-2008). Women are most at risk, as the HIV/AIDS tests carried out in anti-natal clinics revealed. Although men are at risk, there is yet no systematic way of checking their health status as is the case among women.

The problem of the HIV/AIDS orphans is aggravating the situation in the heavily burdened health sector. Most infections, particularly in Meru North District, are caused by premarital sex and experimentation. *Miraa*, drunkenness, Female Genital Mutilation (FGM), polygyny, concubinage and the custom of wife inheritance/levirate are other sources of increased infection, posing yet another threat to the initial success of economic development since independence. Other reasons contributing to the high transmission rates of HIV/AIDS include the lack of sexual negotiating power among women and the risk posed by commercial sex workers who engage in multiple sex contacts. Children aged between 0-14 years have mainly been infected through their mother, either during pregnancy, birth or breastfeeding. Harmful traditional practices such as circumcision are also contributing to the spread of HIV/AIDS. The impact on the population at family, community and District levels is enormous because of the loss of income-earners and of members of the labour force in the food production sector, creating a pool of orphaned children who develop social, economic and psychological problems. Patients infected with HIV/AIDS absorb higher cost of the health care budget at all levels, and their morbidity also creates a loss of potential gains in agriculture, health, education and commercial activities (*cf*. DDP 2002-2008).

In addition to HIV/AIDS, there are other diseases which are prevalent in the Meru region. In Meru North District, prevalent diseases include malaria, respiratory infections, intestinal worms, rheumatism/joint pains, skin and diarrhoeal diseases. There are only three hospitals in this District, belonging to the Government and the other two are of the Methodist and Roman Catholic Missions. There is also one sub-District hospital and five Government health centres. In addition, there are twenty-one dispensaries, of which fourteen are run by the Government, five by the Mission and three are privately run. There is one Mission and one private pharmacy, six health clinics and five nursing homes. There are also nineteen community pharmacies. The District has ten doctors of whom two are employed by the Government, five by the Mission, and three are private practitioners. The doctor/patient ratio is 1:65,620. There are two dentists in the District, one of whom works for the Government and one for the Mission. All the three pharmacists available are private. There are twenty-two clinical officers, of whom fourteen are Government and eight Mission. The total number of nurses working for the Government and the Mission is 126. There are nineteen Growth

Monitoring Centres and eighty Community Workers. The closest distance to the facility is ten kilometres. The largest percentages of children, the under-fives, are underweight, suffer stunted growth and show signs of wasting. Immunization coverage for this age is 76.0 per cent. (*cf.* DDP 2002-2008).

In Meru Central District, the most prevalent diseases are malaria, respiratory diseases, intestinal worms and HIV/AIDS. The doctor/patient ratio is 1:33,259, while the number of Government hospitals is three. There are two Mission hospitals, four private maternity homes, five Government health centres and fifty-four dispensaries, of which twenty-three are privately owned, while there are over 100 private clinics. In Meru Central District, health facilities are located mainly in the urban centres, although currently some may be closed. The average distance to health centres is approximately 7 km. The most prevalent diseases in Meru South District are similar to those recorded in Meru Central District and include; malaria, respiratory infections, intestinal worms and HIV/AIDS. The doctor/patient ratio is 1:15,125, while the average distance to the nearest health facility is about 17 km. These statistics clearly show that there is an urgent need in the Meru community for more health care services since the already existing facilities are completely overstretched. With doctor-patient ratios of 1:65,620; 1:33,259 and 1:15,125 in the three Districts respectively, herbal medicine is used to complement modern medicine for health and healing. Poverty levels and the distance to the nearest health centres also play a significant role in reorienting the local community towards the use of traditional medicine.

The field survey data collected in 2002 revealed that the Meru people used wild plants first and foremost for medicinal purposes as is illustrated in Figure 7.3. According to the reports of the local plant experts, the traditional herbal remedies are efficacious in healing, and have no side-effects. Importantly, they are easily available and within direct reach when the need arises. As traditional medicines are cheaper than modern medicine, and often more effective, as it seems to cure all kinds of diseases, their use is generally preferred to modern medicine - especially in first aid. They are said to be more effective and currently people are using them more than ever.

Table 7.6 Distribution of the respondents' use of wild plants for medicine in the previous year

Year

Variable	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
	N	%	N	%	N	%	N	%
Use in Medicine								
no use	1	4.0	12	48.0	1	4.0	14	18.7
low	9	36.0	4	16.0	15	60.0	28	37.3
average	4	16.0	8	32.0	6	24.0	18	24.0
high	11	44.0	1	4.0	3	12.0	15	20.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

In the survey, a total of 422 useful wild plants were reportedly used for medicine, some of which were also useful for such other purposes as food and nutrition. The household surveys which were conducted in 2003 showed interesting results for the use of wild plants for medicine. Table 7.6 shows the distribution of the respondents' use of wild plants for medicine in the previous year and that the majority of slightly more than one-third (37.3%) report 'low use'; nearly a quarter (24.0%) 'average', and one-fifth (20.0%) 'high' use rates, and only less than a fifth (18.7%) report 'no use' of medicinal plants among the respondents in all three sample villages. More than two-fifths (44.0%)

of the respondents from *KK Lumbi*, for instance, reported 'high' use, and the rest 'average' (16.0%), 'low' (36.0%) and 'no use' (4.0%) respectively in the previous year. *Kinoru* village indicated a different trend. Nearly half (48.0%) of its respondents reported 'no use' of wild medicinal plants, also showing the lowest percentage (4.0%) of respondents in all three villages with 'high' use. It also had the highest fraction (32.0%) in the 'average' use. The majority (60.0%) of respondents from *Kagera* village were found in the 'low' use category, while the rest report 'no use' (4.0%), and 'average' (24.0%) use categories respectively. *Kinoru* respondents reported the lowest use of wild plants for medicine, while *KK Lumbi* reported the highest level. *Kinoru* respondents generally enjoyed a higher socio-economic status (SES), probably predisposing them to use less herbal medicine. Some of the reasons reported for 'low 'use or 'no use' of herbal medicine included fear of harming the body, the absence of a proper dosage and lack of experience. Other respondents reported that they believed only in modern prescribed medicines.

7.3.2 Preparation and Application of Herbal Medicine

The plant parts which were reported to beg used most commonly in the preparation of herbal medicine were roots, leaves, bark, stem, seeds, branches, fruits, or entire plants without roots, plants with roots, tubers, buds and rhizomes. Plants collected in Meru were primarily retrieved from the field or from private land. Three main ways of preparation of medicine for the treatment of illnesses are still known among the Meru. These include the treatment of internal and external Physical ailments, and mouth and gum sores. For internal body ailments, the plant parts are boiled and sieved after which the liquid is drunk when cool. Sometimes, the parts are crushed into small bits and soaked in cold water, wrung out or sieved and the liquid is taken. Plant parts are also crushed into powder and used in tea, porridge or food. Figure 7.6 represents a Line Chart showing most used plant parts in the preparation of medicine in descending order.

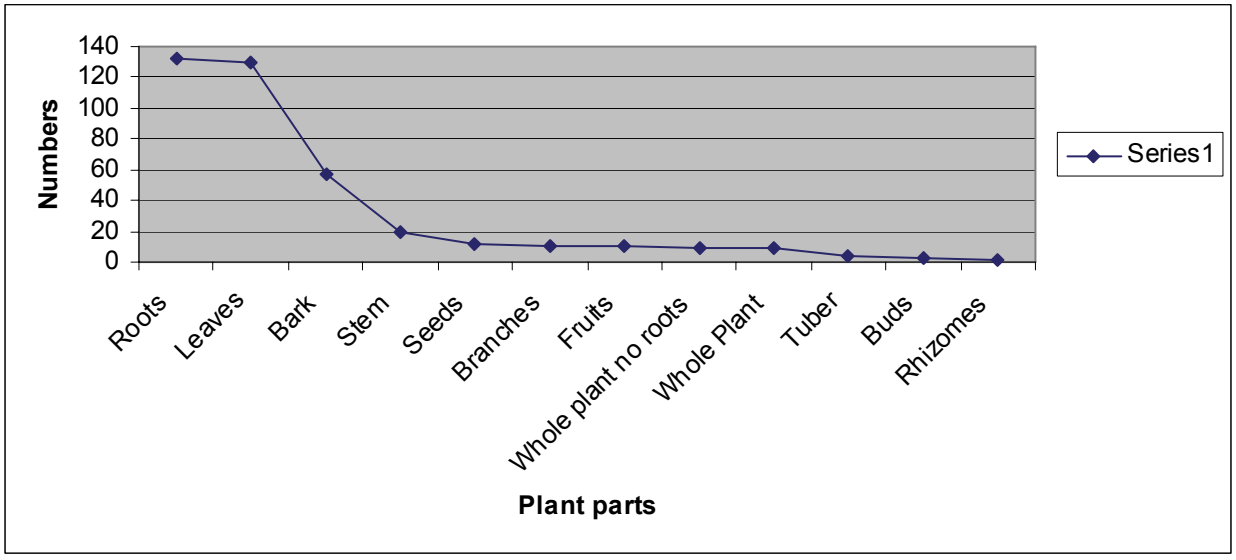


Figure 7.6 Line Chart showing most used plant parts in the preparation of medicine number of times reported: roots = 132, leaves = 129, bark = 57, stem = 20, seeds = 12, branches = 11, fruits = 10.
Source: Fieldwork (2002).

The most commonly reported method is boiling in a broth made of lean goat bones. A glass or two per day is regarded as a fair dosage in the case of passing illness, although it was also reported that there were no known cases of overdoses in patients. During preparation, parts from several plants are sometimes boiled together and, if the medicine is too strong, other boiled plant parts with neutralizing components are added in order to prevent overdosing. In general, a normal dose of one glass each day was reported, especially if the patient was using the plant as a prophylactic to prevent perceived illness; and three times a day one glass for three days to treat slight ailments; and one glass per day for seven days for more serious illnesses. For treatment of external body ailments, certain plant parts are crushed and wrung out to produce a sap which is applied to the ailing part, or the parts are broken if, for instance, the soft buds are used and the sap is squeezed onto the affected area. Plant parts are also boiled in water, or the patient is bathed with the liquid after it has cooled. Mouth ailments are treated as follows: branches which are neither too old nor too young are used as toothbrushes. They are either chewed until they are soft after which plant remains and the sap are spat out; or boiled, and the cooled liquid gaggled in the mouth for a while and then spat out.

7.4 Traditional Healers and Community Plant Experts

7.4.1 Meru Traditional Healers and Plant Experts

The 'Witch Doctor' (Muraguri)

When the colonialists entered Kenya during the early twentieth century, they wanted to know who the leaders of the Meru were, and what form their leadership took. Although the *mugwe* or *mukiama* were the spiritual leaders of the people, the colonial leaders were informed that the Meru people were governed by the Council of Elders, the *Njuri Nceke*. Rimita (1988) documents that the *muraguri* (curse-remover or 'witch doctor'), the *mukiama* or the *mugwe* were confused with the *murogi* (curser), who was known to have supernatural power to make people ill, or even cause death. The *mugwe* or *mukiama* was regarded simultaneously as a diviner and doctor. Witch doctors used to prepare concoctions from plant parts, sometimes mixed with parts of dead people or animals which were used in witchcraft. They were also believed to possess powers which could instigate poisonous snakes or wild animals to bite and kill people. Such allegations caused the rejection of most of their practices by the religious communities after colonization.

However, Meru witch doctors were also believed to cure mental illnesses and prevent sudden death. Such local beliefs are still strongly embedded in the Meru culture. The *muraguri* (witch doctor) was indeed perceived to be capable of casting spells, but at the same time, he was regarded as a healer by those who thought that they had been bewitched by the *Murogi*. Their opposing skills created enormous confusion between the witch-doctors (*muraguri*) and cursers (*murogi*). Witch doctors used to dress in a particular fashion using animal skins, birds' feathers and horns, and would sometimes look frightening, although they excited most of their clients and patients. Since most of them used medicinal plants to treat their patients, they are regarded as skilled herbalists and were held in high repute for treating *all* kind of illnesses, particularly psychological disorders.

Incidents of aggressive and violent individuals who were difficult to control in their attacks on innocent people, in tearing their own clothes and hurting themselves, have also been reported. Such would be brought to the witch doctors who managed to heal these mental patients with all their paraphernalia. Such mental disorders were generally reported to have been caused by the jealousy of relatives, neighbours or friends envying the victim's success in wealth, education or profession. In such cases, the parents and siblings would be able to pinpoint several 'suspects' whose names they

would immediately disclose to the witch doctor. Rimita (1988) reports that he followed such a case in Meru in which a woman teacher had become mad, and he reports: '*When she was brought (to the witch-doctor) her hands and feet were bound. She was too violent and had to be covered as she had thrown all her clothes away after tearing them into pieces. Immediately the witch-doctor went into action and told the relatives that she had been bewitched by a person who envied her as a teacher. The relatives including the father and brother had several suspects on their finger-tips. There was a big house where mad people who are violent were tied. She was tied there and the relatives were asked to go home and come the following day. At around 6.30 p.m. the witch-doctor took a gourd from his house and headed for the house where the mad teacher was tied up. He also picked up some sticks he had cut and heaped near the mad peoples' house. He caned her and forced her to take the drink he carried in the gourd. To make her drink was not easy but managed to make her drink enough. He untied her and she collapsed to the ground. She lay dead silent. The witch-doctor called his assistants and ordered them to remove her from the cold to a house in the homestead. The relatives arrived (the following day) at 10.00 a.m. The witch-doctor asked that the girl be brought. She came on her own (not assisted) covered with a blanket. The witch-doctor made her sit. The relatives could not believe that this was the same girl they had brought the previous day. It is then that the witch-doctor started performing a 'concert', surrounding her with charms, pointing (at) with the claws of birds and a lion. He was removing witch-craft! The girl was healed and went home a normal person. What healed the lady teacher? I will leave it to the reader and the local experts*.'

Iuw (1993) documents that traditional medical practice in the African culture, has received a barrage of criticism from the Western-oriented authors, especially in relation to the traditional healers or witch doctors. These healers' practices are portrayed as nothing more than 'magic' and 'witchcraft', and their herbal remedies are written off as weak in both diagnosis and pharmacology. Some authors have even argued that the witch doctors bemuse their patients with mysterious incarnations and fetishes, incurring sentiments which pushed traditional medicine and indigenous healers and experts underground, as these local functionaries feared being stigmatized as 'uncivilized' and 'backward'. Therefore, traditional medicine in Meru, as documented in this chapter, is based on the information from respondents proud on their heritage who reject any representation of themselves as superstitious. Meru witch doctors were regarded and respected as local experts in the wisdom and practice required especially in areas relating to curses, charms, evil spirits, aggrieved spirits of ancestors and spells cast by cursers.

The Future-Teller, Seer and Diviner

The group of local healers, referred to as future-Tellers, seers and diviners were highly regarded by the Meru. They were the 'eyes' of the community in foretelling impending droughts, calamities and invasions. It is this group of functionaries who also foretold the invasion of 'white man' whom they referred to as *Nguu Ntune*. They could also divine and determine why an individual would be singled out for misfortune or an illness. Besides this, they used to perform all religious worships in the community and as such were highly respected. The *mugwe* (prophet) or *mukiama* who would mediate between God and the community - and invoke His blessings upon the people - belonged to this respected group. This group also included the *iroria* (pl.) or *kiroria* or *muroria* (sing.), the seers who could intercede for the healing of the community rather than that of single individuals, especially when there were outbreaks of diseases.

These future-tellers, seers and diviners were not witch doctors. They foretold of 'long snakes' which would stretch from one end of Meru to the other and that elephants would walk on it. Eventually this metaphor was explained to refer to the road which now runs from Meru North

through Meru Central to Meru South Districts. Fore-telling was performed in several ways which included the examination of the internal organs of a goat. It also encompassed discerning signs of displeasure from the ancestors; explaining people's dreams; and warning victims of impending calamities. Sometimes, they used stones, rods or seeds, which they examined or threw into the air and listened to their sounds as they fell, as a way to determine the cause of a particular problem.

The Future-Teller, Seer and Diviner

The group of local healers, referred to as Future-Tellers, Seers and Diviners were highly regarded among the Meru people. They were the 'eyes' of the community in fore-telling of impeding droughts, calamities and invasions. It is this group of functionaries who also fore-told the invasion of 'white man' they referred to as *Nguu Ntune*. They could also divine and determine why an individual would be singled out for a misfortune or an illness. In addition they used to perform all religious worships in the community and as such were highly respected. The *Mugwe* (prophet) or *Mukiama* who would mediate between God and the community - and invoke His blessings upon the people - belonged to this respected group. This group also included the *Iroria* (pl.) or *Kiroria* or *Muroria* (sing.), the Seers who could intercede for the healing of the community rather than that of single individuals, especially when there were outbreaks of diseases.

These future tellers, seers and diviners were not witch-doctors. They foretold of 'long snakes' which would stretch long from one end of Meru to the other and that elephants would walk on it. Eventually this metaphor was explained to refer to the road which presently runs from Meru North through Meru Central to Meru South Districts Fore-telling was performed in several ways which included the examination of the internal organs of a goat. It also included discerning signs of displeasure from the ancestors; explaining people's dreams and warning victims of impending calamities. Sometimes, they used stones, rods or seeds, which they examined or threw into the air and listened to their sounds as they fell, in this way determining the cause of a particular problem.

The Herbalist (Muga)

The herbalist is commonly referred to as the *traditional healer (muga)* who normally cures his patients' illnesses using medicinal plants. Unlike witch doctors, herbalists do not mix their medicines with parts of dead people and animals. The plants are usually freshly collected either from around their homes or from far away fields. Sometimes, they even have to travel to other districts. After collecting particular plants, the parts with the most medicinal properties are washed and stored for immediate or future use. Herbalists often prepare their medications in the presence of their patients or relatives, and the treatment is given to individuals who are well known to them and who in return trust their 'doctor'. It was difficult to find patients who took traditional medicine from an herbalist they did not know well. A herbalist cannot take any medicine prepared by another healer they do not know. Often, two or more herbalists combine their forces to determine an appropriate treatment for a patient with whom they are both well acquainted. For mental disorders and psychiatric illnesses, the seer is usually consulted, and some herbalists also act as seers. Under such circumstances, a patient may also be asked to consult a religious leader for prayers as herbalists do not feel threatened by other healers. Initially, these people were confused with the witch doctors by Europeans, a situation which continues to cause confusion among most religions up until the present. While the services of a *muraguri*, *mukiama mugwe* and *kiroria* have vanished among the Meru people, the traditional herbalist continues to treat and cure many illnesses in the region. A central part of this study reports on the substantial indigenous knowledge of useful wild plants among the Meru. This is not far to find. The household heads of the three sample survey villages and the herbalists and healers in the three communities of Meru were all discovered to possess this.

Indeed the different types of healers, mentioned in the previous section: - the *mugwe*, *mukiama*, *kiroria*, *muraguri* and *muga* were among the local plant experts in the Meru communities who were able to identify numerous plants predominantly for healing purposes. Sometimes, the knowledge of all of them could be pooled to bring an appeasement or healing to an individual.

Finally, there were other local experts who used plants for traditional treatment of minor ailments, not because they were healers as such, but they happened to know so much about the indigenous plants' healing and soothing properties. Among these are the Traditional Birth Attendants (TBA), midwives, and surgeons (circumcizers) who also deserve special attention, and these will be discussed below.

The Traditional Birth Attendant and Midwife

The birth of a child in Meru has always been regarded as the responsibility of the community. If a mother-in-law discovered that her daughter-in-law was about to give birth to a baby, she would go to her women friends in the village and inform them about the expected arrival. A few women then would go to the house of the mother-to-be and assume all the woman's responsibilities until the child was born. These women would act as local nurses or midwives, comparable to those in modern hospitals. A midwife was usually a much older woman than a traditional birth attendant and would be called in to help with the actual delivery of a baby. If a midwife proved difficult to find, a birth attendant would take over the responsibility.

During pregnancy and childbirth, several plants were used. Before pregnancy, certain plant seeds were used as traditional contraceptives. Some of these seeds would sometimes be used in large quantities to cause abortion. The seeds of *mwariki* (*Ricinus communis*) were used in such cases, while the oil from the same plant was used on a baby's umbilical cord to help it dry and heal. Traditional midwives and birth attendants also knew how to prepare such medication and how to apply them. The oil from the same plant could also be rubbed on a baby's body since it was known to sooth the skin and keep it supple. A woman who normally stood in during marriage - comparable to to-day's chief bridesmaid - would always stay a bit longer with the new mother, preparing the local herbal products for both mother and baby. She would also take care of the other tasks in the household. In some cases, they were assisted by the new mother's mother-in-law.

Swollen feet would be massaged with heated leaves of *mutoromboro* (*Solanecio mannii*), while most newborn child's ailments were first treated with the application of *ndago* (*Cyperus articulatus*). This plant had to be chewed and the bits smeared on the baby's body to ward off all kinds of fevers. At the same time, certain species of sugar-cane were harvested and eaten by children who then threw the leaves on top of the new mother's house, a sign to everyone that there was a *ntomononi* (newly delivered mother) and baby (*nkemera*) in the house. Their goal was to keep people with *migiro* (curses) who might hurt the newborn baby at a distance.

The Surgeon

The Meru, who spent so many years on their historical journey from *Mbwaa* to their current region, proved to be skilled traditional experts in all kinds of surgery. There are reported cases in some parts of Meru today of men whose intestines had been slashed open by an angry opponent who had attacked them with a knife. In such cases, a local surgeon is consulted to put the intestines back in place and stitch the wounded parts together with wild thorns of locally known medicinal plants, leaving the victims to heal normally. The common surgical practices performed among the Meru people are *gukuura nkuuro* (tattooing), *gutura matu* (ear piercing), and *gutana* (circumcision). *Nkuro* (*lo*) (Tattoos) were performed on girls aged between 13 - 16 years of age to prepare them for circumcision. The candidates were supposed to show how brave they were by not moving, winking

their eyes or crying during the operation, which was usually carried out by a male surgeon This operation involves piercing, pulling and cutting the skin, making two rows on both sides of the stomach of a candidate from the level of the umbilical cord to the bottom of the breasts. In order to facilitate the healing process, traditional medicine was applied, after which the girls were ready for the next operation, circumcision, which transformed her from a girl to a woman. This practice has now been abandoned during the last few decades (*cf.* Rimita 1988).

Gutura matu was a practice in the past of incising, slicing and splitting the ears neatly with a sharp instrument, leaving them to heal by inserting some wood with medicinal properties hanging in the ears for as long as was required. Currently, ear piercing is done by the use of a thorn from some *Acasia* plant, which is inserted into the ears until they recover. Others prefer modern ear-piercing methods in which a small ear-gun shots through the ear and inserts earrings into place, which are kept on until the healing is complete.

Rutano (circumcision) refers to an operation which formed 'a rite of passage' from girlhood to womanhood, without which a female could not be married, as they would still have been regarded as children. It used to be a major event which required the candidate to inform all her relatives, while the actual operation involved the surgical removal of the clitoris and the inner parts of the vaginal canal. This operation was usually performed by a female specialist called *mutaani* (circumciser). Female circumcision was meant to prevent young women from being tempted to indulge in immoral behaviour by reducing their sexual desire. In such a drastic operation medical treatment was required and this was usually prepared from traditional herbs. Besides such treatment, the girls were supposed to smear themselves with *maguta ja mbariki* (castor oil) as a lotion, and such plants as *njogu ya iria* (*Blumea mollis*) and *mukandu* (*Ocimum gratissimum*) were burnt in the room where the girls were secluded. These plants produced an aroma to safeguard the *ngutu* (girls in seclusion after circumcision). Indeed, the aroma was used to trap men who would sneak into the girls healing houses, since the smell was highly pungent, betraying such intruders and provoking the wrath of older women who would reward them with thorough beating. Female Genital Mutilation (FGM) as female circumcision is called today has largely disappeared in most parts of Meru. It is practiced only in secret among some families in *KK Lumbi* and *Kagera* villages. According to the laws of Kenya, it is nowadays illegal to circumcise girls, but the practice is still difficult to ban since it is practised in great secrecy among certain families which collude to cover up the act. Nevertheless, generally speaking these traditional initiation ceremonies have virtually died out in the Meru region.

Male circumcision is one of the most important initiation ceremonies among the Meru, and is regarded as marking the passage from boyhood to manhood. As mentioned earlier, circumcision determines a man's *nthuki (age-group*) and prepares him for warrior-hood and subsequent marriage. The field where the circumcision is performed is blessed by *mukiama*, and the candidate receives the personal blessing of his parents before the operation. The surgery is performed for many boys together in a season when there is plenty of food, so that the newly circumcised boys will not starve during their one month's seclusion after the ceremony. All the boys who are circumcised together belong to the same *nthuki*. The actual operation used to be performed near a river, very early in the morning when the water was still cold, as the penis had to be washed clean with cold water. After cleaning, the *Mutaani* takes over and performs the operation, which has been documented by Rimita (1988) who notes: *'The operation itself is complicated. The circumciser pushes the skin of the penis backwards and separates the sheath from the actual penis by use of his knife. He then pulls the skin towards him and puts his finger or a small stick inside. He makes a hole on top of the sheath. He pushes the penis through this new hole until the head up to the neck is outside. What remains of the old sheath is operated and joined together and after healing it forms a skin appendix in Kimeru called 'Ndigi'. After healing the results are surprising as everything looks very natural. The*

circumciser applies no medicine and the appendix has to be held and pressed in the hands of the candidates until it joins. The circumciser must anoint the candidate with era (white soil) and his knife must be cleaned with milk. The candidates are taken back to their respective homes and are confined in huts prepared for the purpose. They are kept separately from other people. No woman, uncircumcised boy or man is allowed to see them. No candidate should speak loudly and must whisper. The candidates are fed well to regain the lost blood and to be strong warriors.

It is significant to note here that the wooden stick used in the operation is carefully identified as possessing healing properties for fresh wounds, and would not have poisonous sap or cause any infection afterwards. The candidate is given time to heal, as he is fed with very nutritious local foods, some of which have been classified in Chapter VIII. After circumcision, the candidate undergoes a series of ceremonies which are supposed to transform him into a man. These ceremonies include the *kioro* (mock burning) of the penis a practice hidden from women and children and uncircumcised males. A rod is heated hot and handled by the mock burners who apply a sap from the *muchamaru* (*Grewia similis*) plant to their hands so that they do not burn, which makes the practice more mysterious to the candidate. Moreover, certain leaves of such plants as *miraa* (*Catha edulis*) and *muthara* (*Indigofera swaziensis*) are thrown into the fire since they crackle - without the candidate seeing – in an effort to make him confess any immoral acts which he may have committed.

When the *miraa* leaves crackle in the fire, it indicates that the candidate is lying, forcing him to confess every sin and reveal the names of all the women with whom he may have had sexual intercourse. Thereafter, these women are jeered at and mocked to embarrass them in order to keep them off from having sex with a *mwiji* (uncircumcised boy) in the future. Recently, however, the Meru traditional surgeons have been gradually replaced by Western-trained surgeons, making the operation less complicated and the sheath - formerly pulled by the *mutaani* - is now removed completely, in contrast to the past where it formed the *ndigi*. In addition, circumcision of males is increasingly being performed in local clinics and hospitals.

7.4.2 Integration of Traditional and Modern Medicine

In the past, traditional herbal medicine and healing practices in Kenya were regarded by the colonialists and missionaries from the West as the work of 'magicians' and 'witch doctors', of whose practices were 'evil' and as such unwelcome in a civilized society. The healing practices were also viewed as mischievous and sinful, prompting many local people to shy away from these local healers. None the less, these accusations did not prevent the herbalists from continuing their services of preparing medicines for their patients, albeit in secret. Nowadays, however, in Meru - as elsewhere around the world – there has been a reorientation towards traditional medicine, and many clients and patients are using herbal medicine even more than before, although the veil of secrecy has not yet completely been pulled aside. Research carried out in Meru has shown that many wild plants continue to be used as the major source of herbal medicine. The results are in step with the recent upsurge in the utilization of plant-based traditional medicines in other developing countries, where about 80.0 per cent of the population depends on herbal medicine for their primary health needs (*cf.* WHO 1994, 2000). This increase in the use of herbal medicine has been reported amongst Kenyan communities all over the country. For instance, in Shimba Hills, located in Kware District, a group of women are preparing and selling herbal medicine to the local population. Also, several registered clinics in the country including *Makini*, *Wamirithu* and *Miguye.* Private clinics are also providing their patients with herbal medicine, sometimes complementary to modern drugs. It is clear from the increasing numbers of herbal medicine clinics and private practices in Kenya that the

Government and the church have began to mitigate their standpoint on the use of traditional medicine. In addition to international policies and guidelines from such organizations as WHO, FAO and UNICEF, a major consideration in Kenya can be traced to the increase of such incurable diseases as HIV/AIDS, hepatitis and other 'new' diseases, in particular the sexually transmitted diseases (STD) which have forced the authorities to accept traditional and complementary and alternative medicine.

Apart from the overriding practical advantages of the use of certain forms of traditional medicine for specific illnesses, the philosophical considerations of revitalization and revaluation of indigenous knowledge systems (IKS) as the basis of local peoples' cultural heritage is playing a major role in the reassessment of indigenous peoples and their knowledge systems in various sectors of the society, ranging from traditional health care to local use and conservation if wild useful plants. In this context, the Government of Kenya has allowed herbal medicine research to be carried out in many public universities and institutions, including the Kenya Medical Research Institute (KEMRI), Kenya Forestry Research Institute (KEFRI), and the National Museums of Kenya (NMK). Other institutions include the Kenya National AIDS Control Council (KNACC) and the International Centre for Research in Agroforestry (ICRAF). There are other institutions active in this field, among them the National Environmental Management Authority (NEMA) and Herbal International. Recently, a modern herbal medicine processing laboratory has been launched in Nyeri District in the Central province of Kenya. This has occurred in the midst of a raging debate on the Government's intention to introduce herbal drugs in public hospitals. The laboratory, one of this kind in the Common Market for Eastern and Southern Africa (COMESA), has been set up to enable herbal practitioners to update their traditional medicine as to match that of modern science.

Furthermore, the Government of Kenya is currently planning to introduce a Bill in Parliament which allows the prescription of herbal drugs in public hospitals. The Kenya Medical Research Association, however, has reservations about this initiative, as it is concerned about the efficacy of such drugs, which in some cases has not yet been proven 'scientifically'. However, the support of the Ministry of Health for the new Act has been echoed by both the former and the current Ministers of Health Professor Sam Ongera and Mrs Charity Ngiru respectively (2002 – 2007).

By paying special attention to the Meru people's indigenous knowledge of the classification of medicinal plants in relation to their classification of diseases, complemented by the documentation of their actual patterns of conservation and utilization behaviour, this chapter has sought to contribute to the ongoing revaluation of and reorientation towards indigenous people's knowledge, wisdom and experience in the attainment of a more comprehensive and pluralistic system of integrated health care in Kenya in the future.

This chapter has therefore looked comprehensively at the Meru knowledge and use of medicinal Plants in relation to the people's indigenous knowledge in classification of both plants and diseases; their conservation practices and use in medicine; plus the preparation and administration of the same; the presentation of the Meru healers and community plants experts; and the integration of traditional and conventional medicine in modern Kenya. The next chapter therefore, will pay more attention to the non-medicinal use of plants and present the information gathered from plant experts of Meru in the qualitative and quantitative survey conducted in the 2002 -2003.

VIII Meru Knowledge and Use of Non-Medicinal Wild Plants

This chapter gives a detailed account of the Meru people's knowledge and practice relating to the local category of non-medicinal plants. It consists of qualitative information concerning the useful plant knowledge and related various categories of uses reported by the Meru local plant experts and subsequently by the respondents in the quantitative household surveys in the three sample villages. As is the case with similar information on the other aspects of Meru systems of indigenous knowledge and practice, the quantitative data provide information on the spread of such indigenous knowledge and practice throughout the three Meru Districts.

The *first part* of this chapter presents an overview of the wild plants used in food and nutrition, including their classification, the habitats where they are collected and a description of the food preparation practices. The *second part* discusses the use of material plants, fuel plants and environmental plants as a major form of non-medicinal wild plant use in the study area. The *third part* presents an overview of the local people's knowledge and use of wild social plants. The social uses are part of the cultural context of the Meru, and encompass ceremonial practices such as casting spells and invoking curses, marriage, childbirth, child discipline, and use of plants for leisure. The *final part* concentrates on the knowledge and use of wild non-vertebrate poisons plants and bee plants.

8.1 Wild Food Plants

8.1.1 Classification and Use of Wild Food Plants

Kenya is primarily an agricultural country where areas in the centre of the Republic, which include the Meru Districts and the whole of Central Province plus parts of the Rift Valley and Western Kenya, forms what might be referred to as the 'Granaries of the Republic'. Crops are extremely rain dependent. The rains are seasonal and come only twice a year in the months of April to June and October to December. Many traditional plant foods in Kenya are energy rich and play a crucial nutritional role during hungrier periods of time (*cf*. Maundu *et al.* 1999).

In the history of the country, these rains have been known to fail and droughts have at times devastated the food resources for centuries. Under such circumstances therefore the inhabitants of Meru will turn to every available resource for food. Although currently most vegetation has been cleared for cultivation, children in most parts of the country but particularly in Meru comb the available bushes as they herd their animals, collecting and eating wild berries and fruits. They dig up nuts and chew salty leaves and grass stems, all giving them energy to keep going until meals, which are sometimes taken only once a day, are prepared at home.

Wild vegetables are regarded as a delicacy in many family meals in the homes of the Meru people. In contrast to the preparation of medicine, where a number of parts are collected from several plants and used to prepare mixtures for medicines, the wild plant parts used in food preparation are from fairly distinctive plants and are mostly used singularly. Recently, however, some families have begun to appreciate the nutritional value of more wild food plants, and are now combining various wild plants as vegetables prepared and cooked together. A list of wild food plants of Meru is shown in Table 8.1.

Table 8.1 Distribution of the reported use of non-medicinal plants by the respondents in the previous year according to the Sample Survey Villages (N=75)

variable	Village						Total	
	KK Lumbi		*Kinoru*		*Kagera*			
Use	N	%	N	%	N	%	N	%
Food plant use								
low	1	4.0	-	-	1	4.0	2	2.6
average	1	4.0	4	16.0	-	-	5	6.7
high	23	92.0	21	84.0	24	96.0	68	90.7
Material plant use								
no use	1	4.0	7	28.0	8	32.0	16	21.3
low	5	20.0	5	20.0	8	32.0	18	24.0
average	14	56.0	3	12.0	8	32.0	25	33.3
high	5	20.0	10	40.0	1	4.0	16	21.3
Social plant use								
no use	13	52.0	22	88.0	17	68.0	52	69.3
low	8	32.0	1	4.0	4	16.0	13	17.3
average	3	12.0	1	4.0	4	16.0	8	10.7
high	1	4.0	1	4.0	-	-	2	2.7
Fuel plant use								
low	-	-	-	-	-	-	-	-
average	2	8.0	1	4.0	-	-	3	4.0
high	23	92.0	24	96.0	25	100.0	72	96.0
Environmental plant use								
no use	1	4.0	4	16.0	2	8.0	7	9.3
low	1	4.0	3	12.0	5	20.0	9	12.0
average	6	24.0	3	12.0	9	36.0	18	24.0
high	17	68.0	15	60.0	9	36.0	41	54.7
Non- Vertebrate Poison plant use								
no use	13	52.0	17	68.0	17	68.0	47	62.7
low	4	16.0	3	12.0	8	32.0	15	20.0
average	2	8.0	4	16.0	-	-	6	8.0
high	6	24.0	1	4.0	-	-	7	9.3
Bee Plant use								
no use	6	24.0	19	76.0	11	44.0	36	48.0
low	3	12.0	4	16.0	8	32.0	15	20.0
average	5	20.0	1	4.0	6	24.0	12	16.0
high	11	44.0	1	4.0	-	-	12	16.0
Total	25	100.0	25	100.0	25	100.0	75	100.0

Source: Household survey (2003).

The overview presented in Table 8.2, based on the information collected during the household surveys in the three villages of Meru, shows that all respondents (100.0%) in the quantitative survey had used wild plants for food in the year preceding the surveys. It is indeed clear that more than four-fifths (90.7%) of them report a 'high' level of use, while less than one-tenth (6.7%; 2.6%) scored 'average' and 'low' use respectively. The data for the three villages also indicate that more than four-fifths (92%) of the respondents from *KK Lumbi*, *Kinoru* (84.0%), and *Kagera* (96.0%) respectively had used wild food plants in the previous year, a consequence of their tradition of dependence on the wild for fruits, nuts, roots and seeds which is concomitant with the ancient cultural history of the Meru showing a great reliance, management, conservation and respect for their natural environments. The use of wild plants for food among the Meru is clearly part of their way of life as agricultural and pastoral peoples, who continue to depend upon these resources, also

in many other parts of the country even to the present. A number of reasons were given by respondents to elucidate why they have resorted to wild plants for food during the previous year. Various respondents indicated that wild plant-based foods were readily available and more nutritious, greater energy-boosters and more appetizing than imported foods and consequently favoured as their staple food.

Table 8.2 List of wild food plants and plant parts used as reported by the Meru Plant experts

Vernacular name	Scientific name	Part used
Gatunguru karia gaceke	*Allium annuloprason*	leaves, stem
Gicibi	*Leonotis nepetifolia*	nectar
Gituu	*Unkown*	tuber
Kaiaba	*Dovyalis*	fruit
Kajoo, Igerema	*Zehneria scabra*	leaves
Kalema ntiiri	*Cucumis dipsaceus*	fruit
Kaungu njue	*Unknown*	leaves
Kigonko	*Oxygonum sinuatum*	leaves
Kilantana	*Lantana camara*	seeds
Kithunku (ngu), Kijogu	*Solanum nigrum*	leaves
Managwi, Managu	*Gyndropsis gynandra*	leaves
Mang'ua	*Sclerocarya birrea*	fruit
Mang'ua	*Sclerocarya birrea*	fruit
Mbotwa, Nathi, Mukabakabu	*Physalis peruviana*	fruits
Menywa	*Afromomum augustifolia*	seeds
Mpumpu, Kithorokwe	*Vigna unguiculata?*	leaves/seeds
Muakwa	*Vernonia auriculifera*	roots
Mubaki	*Symphytum officinale*	leaves
Mubiru (ro), Mwiru (lu)	*Vangueria infausta*	fruit
Muburu, Muuru	*Vitex doniana*	seeds
Mubutu	*Erythrina abyssinica*	fruit
Muchurai	*Rhus natalensis*	fruit
Mugaiguna	*Rumex abyssinicus*	stem
Mugumo	*Ficus thonningii*	fruit
Muiimbi, kaimbiya	*Allophylus sp.*	fruit, leaves
Mukambura, Muro	*Dovyalis abyssinica*	fruit
Mukinduri	*Croton dichogamus*	stem
Muko uri iuu	*Asystasia gangetica*	leaves
Mukoko	*Vigna sp.*	seeds
Mukomere	*Rothmannia urcelliformis*	fruit
Mukongolo juria Mweru	*Trichilia sp.*	fruit
Mukongolo juria Mwiru	*Trichilia emetica*	fruit
Mukuthuku	*Unkown*	fruit
Mukuu	*Calotropis procera*	fruit
Mukuuru	*Flueggea virosa*	fruit
Mukwego	*Bridelia micrantha*	fruit

Table 8.2 (cont'nd) List of wild food plants and plant parts used as reported by the Meru plant experts

Vernacular name	Scientific name	Part used
Mumilinchui	*Acacia mellifera*	roots
Munamulia	*Carissa edulis*	fruit
Munyaliko, Mululu	*Grewia similis*	fruit
Murema	*Unknown*	leaves
Muriaria	*Emilia discifolia*	leaves
Mutanda mboo	*Toddalia asiatica*	fruit
Mutenderuka na mpwii (upesi)	*Cardamine obliqua*	leaves
Muthandunku juria mwiru	*Acacia mearnsii*	gum
Muthigio	*Rhus longipes*	seeds, fruit
Muthiriti	*Lippia ukambaensis*	leaves
Muthithi	*Piliostigma thonningii*	fruit
Muthongiru	*Lantana trifolia*	seeds
Muthunka, Muthunga	*Lactuca capensis*	leaves
Mutongu	*Solanum incanum*	roots
Mutoo	*Azanza garckeana*	fruit
Mutuja	*Myrianthus holstii*	fruit
Mutuuma	*Colocasia antiquorum*	leaves
Muukula	*Dregea sp.*	roots
Mwiteeria	*Periphrea linariifolia*	roots
Njiira	*Coriandrum sativa*	leaves seeds
Nkenkeyia	*Commelina sp.*	leaves, buds
Nkiloloti	*Acacia nilotica*	gum
Ntamba na ruci	*Commelina benghalensis*	leaves
Ntaratare (cia rwego), Mutare	*Rubus volkensii*	fruit
Ntaratare iria nceke	*Rubus apetalus*	fruit
Ntarimukia	*Erucastrum arabicum*	leaves
Rukwa Karukwaci	*Ipomoea batatus*	tuber
Rukwa, nduru	*Dioscorea minutiflora*	tuber
Runduti, Muthuti	*Dyschoriste sp.*	leaves
Rungoo	*Tephrosia sp.*	stem
Rwoga, terere iria nini	*Amaranthus sp.*	leaves
Terere iria nene	*Amaranthus hybridus*	leaves
Thaa	*Urtica massaica*	leaves

Source: Fieldwork (2002)

In addition to the ample collection and use of nutritious wild plants growing in the fields, some respondents reported that they also used wild plants which sprang up quite quickly around their farms immediately after the rains. These wild plants are available before the other crops begin to

mature, and hence provide food at times when the people's yield from the previous harvests is finished. Wild plants used for food include herbs which are found growing wild in fields, bushes and on forest edges.

8.1.2 Plant Parts Used for Food Preparation

As Maundu *et al*. (1999) note: *'Leafy vegetables collected from the wild play an important role in traditional diets in rural areas',* emphasizing the selection of particular plants for their nutritional parts for consumption as complementary or as common foods in the diet. Data from the field surveys in Meru show that most wild plants used for food include herbs (35.0%), trees (25.2%), shrubs (24.4%), creepers and climbers (14.5%) and corms (0.9%). In general, herbs provide leafy vegetables, trees and shrubs seeds and fruits and creepers and climbers provide mainly fruits. It is therefore possible to document which leaves, fruits, seeds and tubers in that order form the major categories of the wild food plants that are useful and the parts of the plants used. In general, a total of one hundred and forty food plants were collected belonging to sixty nine species *(cf.* Table 8.2)



Figure 8.1 *Matuja* picked from *mutuja* (*Myrianthus holstii*), a traditional favourite fruit among the Meru.
Photograph: A.K Ibui (2002).

Apart from vegetables and tubers, most fruits are eaten when they are ripe, and are picked directly from the parent plant. It was observed that fruits gathered and kept at home for ripening often shrivelled up and never ripened at all, or were eaten by worms. This finding seems to contradict the hypothesis of some pre-historians that early human ancestors gathered fruits and other plant products only to consume at a later date. All fresh wild plant parts - particularly fruits are collected fresh from the living plant and eaten immediately. For instance, it was noticed during the field surveys, that some rather juicy fruits which were kept for a day or more, tended to hatch out little

worms which emerged once taken out of their ripening bag. The intrusion of these parasites is a well-known problem of *matuja* fruits of *mutuja* (*Myrianthus holstii*), a traditional favourite of the Meru (*cf.* Figure 8.1)

8.1.3 Food Preparation Practices of Wild Plants

Traditionally, the preparation of the traditional Meru dishes is an art in itself which requires the training of girls by their mothers or grandmothers. Some leafy vegetables, for instance, such as the *managu* (*Gynachopsis gynandra*) are known to be very bitter, and without proper training, this vegetable would be extremely unpalatable. Normally, leafy vegetables are washed, cut into small pieces and cooked together with other foods. Sometimes they are boiled first to soften them, especially when they are used in stews. In certain cases, they are cooked together with bananas or potatoes, to which some pre-cooked maize and beans have been added. Such a mixture is sometimes cooked with old people's favourite grain, *ncabi* (*Lablab purpureus*) or *ncugu* (*Cajanus cajan*) and mashed to make the most widely known Meru dish called *irio*. Nowadays *irio* is a delicacy found in most hotels in Kenya, but the pre-cooked dry maize and beans have been replaced by green peas and maize, and some traditional wild vegetables have been replaced by such a domesticated vegetable as the *kahurura* (*Cucumis ficifolia*).

In some cases, wild vegetables are boiled in water, with salt added and mixed with maize flour to prepare another traditional dish, known as *mukinde*. *Mukinde* or *kithanda kia mutu* can be prepared from domesticated sorghum, commonly grown near their homes by the Meru. Several vegetables are used as ingredients to make stews for *nkima* and *chapati*. The traditional dish of *nkima* (*ugali*- Kiswahili) is made by mixing boiling water with corn flour to form hard dough which is cooked in low heat for about fifteen minutes. *Chapati* is a pancake which is made from wheat flower. As said, most wild fruits are eaten either with or without the skin. If they are too big for consumption, the seeds are often discarded or crushed. Seeds are also cooked when they are green or dry, or, as mentioned above, mixed in *irio*. Tubers are normally peeled, washed and boiled, or cooked first and then peeled before consumption. Most roots are used to make soups which are generally served as appetizers. The only plant (*mugaiguna* - *Rumex abyssinicus*) of which the soft stem was reported to be edible, is chewed by the local people for its salty juice, providing energy during the harsh daily round of farming and herding activities.

8.2 Wild Material and Social Plants

8.2.1 Wild Material Plants

Most plants used as materials are derived from woody plant vegetation, principally composed of trees and shrubs. In general, trees are used to provide poles for the construction of houses and animal sheds. They also supply wood for furniture and wooden utensils. In Meru, the felling of trees is prohibited and orders to enforce the law are carried out by the Chief's guards who are always on the alert for the sound of the commonly used diesel-powered saw. Grasses are mostly used as roofing for the traditional mud houses in Meru. Creepers and climbers are used to fix rafters in construction of walls. During the survey, seventy-nine plants were collected which were used for various material purposes, derived from forty-two species (*cf.* Table 8.3). It transpired less than a quarter (21.3%) of all respondents from the three villages reported 'no use' of material plants. In *KK Lumbi*, the highest percentage, more than half (56.0%) of its respondents, reported 'average' use,

and the majority of *Kinoru* respondents, two-fifths (40.0%), reported 'high use'. *Kagera* respondents' scores show a fairly even distribution over 'average', 'low' and 'no use' (resp. 32.0%, 32.0%, 32.0%)'. Figure 8.2 shows *muuru* (*Vitex doniana*) leaves and seeds. Its wood is used for construction.

Table 8.3 List of wild material plants and plants parts used as reported by Meru plant experts

Vernacular name	Scientific name	Use	Part used
Muthanduku juria mwiru	*Acacia mearnsii*	construction, tar, tanning, shoe polish	stem, bark
Mukutha	*Albizia sp.*	harvesting baskets	bark
Mukwego	*Bridelia micrantha*	construction	stem
Muringa	*Cordia africana*	construction of houses, bridges, plaster for fractured bone, fractured bone, ropes etc	stem, bark
Mukinduri	*Croton dichogamus*	construction	stem
Mutuntu, Muciri	*Croton macrostachyus*	banana ripening, construction of traditional huts	leaves, rafters,
Rungu	*Cucurbitaceae*	traditional calabashes, drinking instruments, drinking vessels (*twau*) and guards	fruit
Mwenjera	*Cussonia holstii*	traditional doors, *ikongolo*, traditional shields (*ngaa*) used by women in music	stem
Rukwa	*Dioscorea minutiflora*	mending calabashes, and sieving trays (*gitaru*)	roots
Muuti	*Erythrina abyssinica*	construction	stem
Mubaumauta	*Eucalyptus saligna*	construction	stem
Mururu	*Fagaropsis angolensis*	construction of houses	stem
Nyaki	*Hyparrhenia hirta*	thatching traditional houses	leaves (grass)
Muthaara	*Indigofera arrecta*	mole traps, bows, arrows	stem
Muthiriti	*Lippia ukambaensis*	rafters in traditional barns, houses, baskets for picking tea leaves	branches
Muthambiataru	*Melanthera scandens*	*sand paper* - cleaning and smoothening wood, cleans women's traditional bangles (*maturutia*) & utensils	leaves
Mukau	*Melia volkensii*	construction	stem
Muunkuma	*Monanthotaxis parvifolia*	traditional beds *(iriigi*) & doors	roots, branches
Makuri	*Ocimum gratissimum*	brooms	leaves, branches
Muthaiti	*Ocotea usambarensis*	construction	stem
Muriuntui	*Olea capensis*	tools for digging up yams (*mirwa*)	bark, branches, stem
Mutero	*Olea europaea L. ssp africana*	poles, roasted wood (air freshner)	stem,
Muugu	*Passiflora edulis*	grain storage baskets (*itaru)*and swings	stem
Muthithi	*Piliostigma thonningii*	sweet sugar (*sukari nguru - muturumbu*'), handles for axes, machetes and hoes	fruit, stem
Murugumbari	*Podocarpus latifolius*	timber used for construction	stem
Mwiria	*Prunus africana*	poles, construction of bridges, construction of bridges (*Ikongolo*) & houses	bark, stem, branches
Mwerere	*Rauwolfia caffra*	milky sap glues paper, feathers on hats and fixes arrows	fruit's
Mwariki	*Ricinus communis*	snuff, support for banana plants heavy with fruit, plane fuel!	seeds
Mwangua	*Senna siamea Lam.*	poles, handles for axes and *jembes*, spears, bows & arrows, *mwiko* (for mushing food), *kibiri* (for stirring porridge)	stem, branches
Mubunga	*Sida tenuicarpa*	brooms	stem, leaves
Muutu	*Tabernaemontana pachysiphon stapf*	wood for timber	stem
Muteletu	*Teclea simplicifolia*	construction	stem
Mururuku	*Terminalia brownii*	construction	stem
Mukongolo	*Trichilia emetica*	construction, poles, tooth brushes	stem, branches
Muthanje	*Unknown*	thatching, weaving baskets, mats, hats	leaves
Murigi wa kuthamba	*Unknown*	bathing sponge	fruit
Ngaii	*Unknown*	soap for washing clothes and bathing	leaves
Mukuthuku	*Unknown*	construction	stem
Mwinyu	*Unknown*	ropes from bark are very strong	bark
Mukuria mbungu	*Unknown*	construction	stem
Mwilu	*Vangueria infausta*	temporary constructions of traditional huts	branches
Muuru	*Vitex doniana*	construction	stem

Source: Fieldwork (2002).

During the quantitative surveys in the three villages, respondents reported a fairly substantial uses of wild material plant as shown in Table 8.1. During the interviews, it became clear that respondents used material plants in different categories.



Figure 8.2 Leaves and seeds of *muuru* (*Vitex doniana*) whose stem provides excellent wood for furniture.
*Photograph:*http://www.rsrg.unibonn.de/Projekte/kenya/dfg_rep/botanic_gallery/meru_oak/meru_oak1.html. Contacted 2nd November (2007).

The advantages which were adduced in favour of wild material plants were that they were: 'durable', 'of good quality', 'resistant to pests',' available and 'cheap'. The respondents' who did not report any use of wild material plants, gave as their explanation that they did not need them, or were afraid of the Chiefs who controlled the felling of trees on farmlands.

8.2.2 Wild Social Plants

Wild Social Plants Used for Invoking Curses
Among the total number of 567 useful wild plants collected in the survey, seventy-one plants consisting of fort-eight species were reported to be used as social plants, some of which go back to

the time of the flight from *Mbwaa*. Although some practices have now been abandoned, wild plants still play a major role in several social uses today. The names of these plants in conjunction with the reported practices and the particular plant parts used are presented Table 8.4. Social plants used on such occasions are mainly trees and shrubs, with climbers/creepers and herbs being mentioned a few times.

Table 8.4 List of wild social plants and plant parts used as reported by the Meru plant experts

Vernacular name	Scientific name	Use	Part used
Gikandakandu	*Ocimum gratissimum*	scent trap men/girls huts/broom	branches, leaves
Gitima	*Pennisetum clandestinum*	curse removal	whole plant
Gitorombolo	*Solanecio mannii*	massages when heated	leaves
Kaiaba	*Dovyalis abyssinica*	thorns remove chiggers	thorns
Kaimba na ncici	*Asparagus racemosus*	improves sexual desire	roots
Kariaria	*Emilia discifolia*	liquid said to clean the womb	roots
Kiaraka, Kijara, Mwogoya	*Plectranthus barbatus*	used as toilet paper	leaves
Kiariki	*Ricinus communis*	oil for special occasions/circumcision	seeds
Kibaki	*Nicotiana tabacum*	snuff for friendship/socialisation	leaves
Kiroo, Mwino, Kirao	*Senna didymobotrya*	engagement/wedding/cursing	branches, flowers
Moko, Gioko	*Senecio hadiensis*	detergent for special washing	leaves
Mugumo	*Ficus thonningii*	sacrifices/blessings	whole plant
Mujuri	*Unknown*	improves sexual desire	roots
Mujuthi	*Caesalpinia volkensii*	game (k*iuthi*)	seeds
Mukau	*Melia volkensii*	beverages and socialisation	bark, roots
Mukawa	*Carissa edulis*	reduces menstrual pains	roots
Mukongolo	*Trichilia emetica*	expression of admirable height	whole plant
Mukuananthi	*Ipomea sp.*	clears troubled stomach	whole plant
Mukuma, Kamugere	*Hibiscus fuscus*	chewing gum	roots
Mukuu	*Calotropis procera*	sacred - sacrifices	whole plant
Mumanko	*Euclea divinorum*	liquid cleans the womb	bark
Munanku	*Glycine wightii*	chewing gum	roots
Mungithia	*Clematis brachiata*	removes constipation	roots, branches
Munyithia	*Clausena anisata*	removes body aches	leaves, stem
Muraa	*Catha edulis*	bride price/circumcision (*kioro*)/leisure	bark, leaves
Murantina, Murigi	*Kigelia africana*	ferments brews used social functions	fruit
Murembu	*Ehretia cymosa*	improves sexual desire	roots
Muriiru	*Syzgium cordatum*	scent trapped men/girls huts	branches, leaves
Muringa	*Cordia africana*	prevents abortion	bark
Murogorogo	*Scheffleri abyssinica*	liquid *cleans* the womb	leaves
Muruiri	*Zanthoxylum chalybeum*	chases body aches	bark
Mutero	*Olea europaea L. ssp africana*	scent chases evil spirits	stem, branches
Muthaara	*Indigofera arrecta*	circumcision (*kioro*)/tooth brushing	roots, stem
Muthiriti	*Lippia ukambaensis*	cleaning *maturutia*	leaves
Mutuntu	*Croton macrostachyus*	removes mumps sickness (song)	whole plant
Muturutua	*Rhoicissus tridentata*	cleans the blood	roots
Mututu	*Clerodendron myricoides*	cleans womb	roots
Muu	*Markhamia lutea*	washing clothes for special occasions	leaves
Muuchwa	*Zanthoxylum chalybeum*	freshens the mouth	leaves
Mwatha	*Vernonia lasiopus*	sweeping/tooth brushing	branches
Mwithiruai	*Dodonaea viscosa*	tooth brush	branches
Ncani Mura	*Unknown*	improves sexual desire	roots
Ndago	*Cyperus articulatus*	chases invading spirits causing sickness	tuber
Njogu ya iria	*Blumea mollis*	scent trapped men/girls huts	leaves
Nthangari	*Digetaria abyssinica*	improves sexual desire/strength	rhyzome
Ntilikungi	*Pappea capensis*	improves sexual desire	roots
Rukuno	*Unknown*	sap removes thorns from body	stem
Thaa ya njogu	*Urtica massaica*	instrument of punishment/circumcision	leaves

Source: Fieldwork (2002)

Succulents, rhizomes and grass are mentioned as separate categories. Parts of the plant used include the stem, leaves, roots, the whole plant, branches, tubers, seeds and buds. General social uses of wild plants in Meru range from invoking curses on enemies to use in marriage, childbirth, discipline and leisure. How the plants are used in each of these practices is dilated upon in the next few sections, while the respondents' use of the plants in the previous year is given thereafter.During the qualitative survey, it was quite patent that the leaves and roots of *murao* (*Senna didimobotrya*) were used to curse or to remove curses among the Meru people in the past. When this happened, the parts of the plants were thrown onto the roof of the victim's house and into their compound while the curser (*murogi*), who would sometimes double up as a witch doctor (*muraguri*) utter the curses in the hearing of the victim during the night. The curses were focused specifically on the victim who subsequently suffered a troubled existence or sometimes was afflicted by a serious illness which in some cases led to death. The psychological effects of these curses (*mugiro*) on the mind of the victim threatened their health and well-being, and any calamity the victim happened to experience was attributed to the curse. The curse had to be removed in the same ceremonial way by the curser who threw the same plant parts onto the roof and compound of the victim while uttering special words to the effect that the *mugiro* would be removed so that the victim could live in peace.

The Meru community used to live in terror of these curses, and great caution was taken by all members not to cause any situation which might have led to them being cursed. In general, curses used to be a last resort to solve a problem, which could not be settled by the mediation or arbitration of the family elders or the local leaders of the community. This might happen should someone claim land which did not belong to him. The recalcitrant party would usually be faced with a curse if attempts to return the disputed land to its rightful owner failed. In some cases, curses were inflicted on a person by the ceremonial slaughter of an animal - usually a goat - forcing the victim to say that if he were guilty, he would be ready to die just like the goat.

Social Plants Used for Marriage, Birth and Discipline

In Meru, a special wild plant, *murao*, used to play a role in marriage. A branch of the *murao* would be planted in front of a girl's house by an interested suitor who would then come to visit in the evening, the only time young men were expected to make visits. If the girl accepted the boy as a suitor, she would talk to him, and the branch remained where it was during the entire evening. It was also a sign that a young suitor was visiting the house. If the boy displeased the girl, she would stalk out of the house, uproot the *murao* branch and throw it away. Anybody who had observed the girl emerging from her house would know what she had done. Keeping the *murao* branch indicated the girl's acceptance of a marriage proposal which could be followed by the payment of a dowry. On the wedding day, the flowers of this plant were strewn all over the bride in a similar manner to what is witnessed at modern weddings in Africa where rice is used as a symbol of fertility. *Miraa* is used as bride wealth, especially among the residents of Meru North District where it is believed that it blesses the womb of the wife to enable her to bear many children.

Another plant, the *mugumo* (*Ficus thouningii*), would play a role on the occasion of childbirth. After birth, a baby would be carried and placed under a *mugumo* tree, while the family chanted: 'may you live long; live for many years as this *mugumo* tree'; and 'May you prosper and have many children as the branches and leaves of this tree'. Such chants were repeated many times, while the spiritual leader of the community gave his blessing to the newly born member of the community. In Meru, wild plants were also used by the community to instil discipline to parents who inflicted injuries or wounds on children. In such cases, leaves of *thaa ya njogu* (*Urtica massaica*) were used as an instrument of punishment. It did not matter if the injury were accidental or otherwise. Injuries inflicted on boys, especially at the time of their circumcision, would earn their parents a thorough

rubbing with the leaves of this plant. This practice left the skin of the victim with a painful burning sensation, which often resulted in the swelling of the entire body. In such instances, the parents are surprised by the persons who are named by the circumcised boy, who would gather a group of sympathizers to help them expose their victim's legs and hands. Although such discipline-based ceremonial behaviour is more of a social prank and fun than actual punishment, it often left the victims suffering the 'heat' and pain from the plant.

Wild Social Plants Used for Leisure

To help pass moments of leisure *miraa* (*Catha edulis*) is a popular plant, which is chewed by most residents, but is especially popular in Meru North District (*cf.* Figures 8.3 and 8.4).

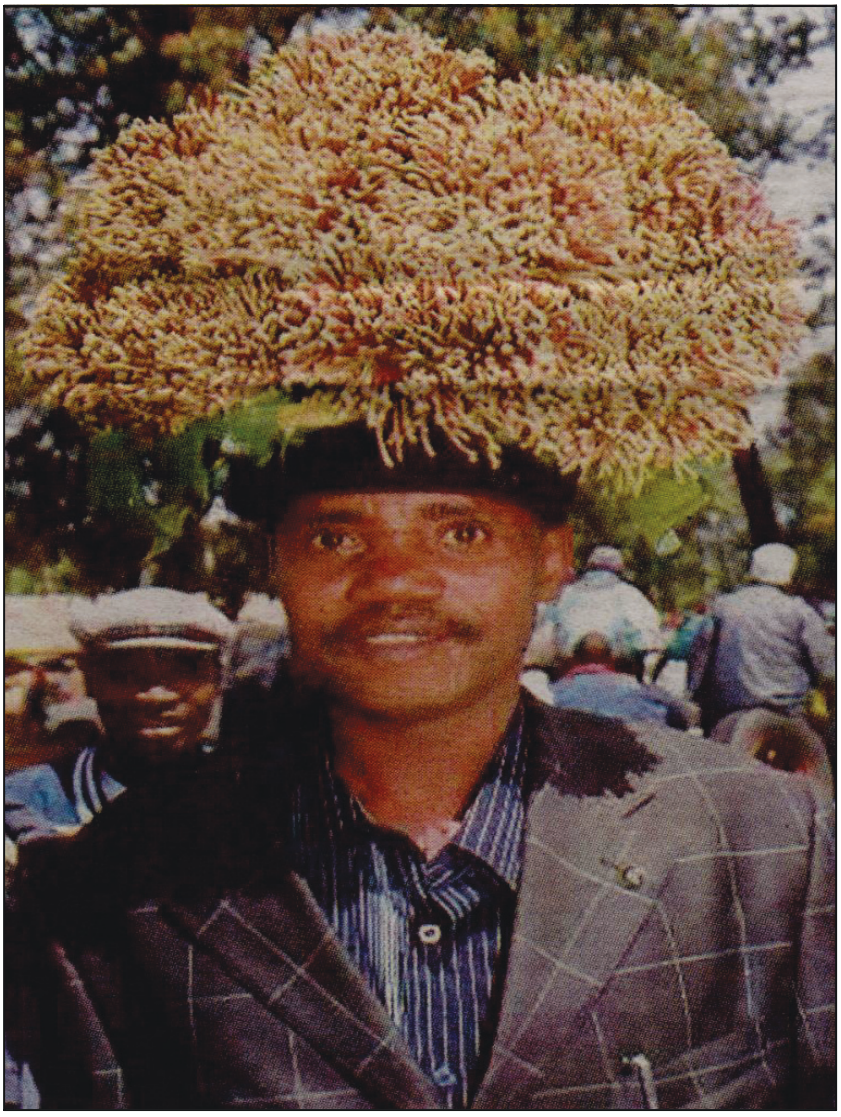


Figure 8.3 *Miraa (Catha edulis) harvested for export* in Meru North District, a newspaper report. *Source:* http://nationmedia.com/dailynation: 17 January 2006).

It grows in this District as a tree of which the branches tend to hang down when old. The young shoots of the plant are usually harvested, peeled and then chewed. It is a mild stimulant, slightly addictive and a favourite among many. The sap is usually swallowed, but the bits and pieces of the chewed peel are discarded. In certain Divisions of Meru North District, both young and old men all chew *miraa* for most of the day. Although this is a practice commonly associated with men, women have also been seen to chew it. Young boys are employed to harvest the young shoots, sometimes raising concerns about child labour and the related lack of education in the region. *Miraa* is now exported to most neighbouring countries, especially Somalia where the residents are often seen chewing the peels of the twigs. Although chewing it can stimulate its users to work on tirelessly, it can also cause sleeplessness. In the past, women in the North-Eastern Province of Kenya demonstrated against their husbands' use of *miraa* because it caused their husbands insomnia, making them unfit for their domestic duties as they spent the nights in towns and shopping centres pursuing their addiction. Watchmen and guards at night chew *miraa* to keep them awake at work. *Miraa* also has the effect of stilling hunger pangs, consequently making its chewers look thin and sickly as they waist away due to prolonged self starvation. According to the respondents of the surveys, *miraa* has medicinal properties, as it is known to cure acidity and heartburn. When questioned on their opinion on the chewing of it, both female and Christian informants agreed that it has a very negative effect on its users and their families. It is also regarded as unhealthy and is thought to be the source of many bad habits which the informants said were basically anti-Christian. Respondents who were fairly positive in their opinions about the use of *miraa* said that they regarded it as a medicine, good for pleasure and leisure, but also stimulating in terms of boosting hard work and encouraging feelings of sociability.



Figure 8.4 *Miraa* chewing in Meru, a newspaper report.
(*Source*: http://nationmedia.com/dailynation: 17 January 2006).

Other social plants, mentioned by the respondents included *mujuthi* (*Caesalpina volkensii*), used in games (*kiuthi*) and leisure time. Nevertheless a number of women indicated that they believed that

nobody gains anything out of chewing *miraa* or playing *kiuthi*. During the qualitative surveys, a number of respondents reported that they had not used wild plants for social purposes during the previous year. These were more than two-thirds (69.3%) of the total number of respondents. Less than one-fifth (17.0%) confessed a 'low' use, leaving a small minority of 10.7 per cent and 2.7 per cent claiming 'average' and 'high' use. Table 8.1 shows that more than half (52.0%) of the respondents in *KK Lumbi* claimed 'no use' of social plants in the previous year, while slightly more than a quarter (32.0%) of them reported 'low' use. On the other hand, in *Kinoru* more than four-fifth (88.0%) of the respondents had not used social plants nor did more than two-thirds (68.0%) of the respondents from *Kagera*. Various reasons were given for not using social plants. Most respondents interviewed indicated that they no longer follow most reported practices since these have become outdated, not useful, time- wasting, superstitious and anti-Christian.

8.3 Wild Fuel and Environmental Plants

8.3.1 Wild Fuel Plants

The distribution of energy in the Greater Meru Region varies from one District to another. For instance, there are about twenty-seven trading centres with electricity in Meru North District where the number of households connected to electricity grid is quite small. Virtually 100 per cent of rural households use firewood and charcoal, with less than 1.0 per cent using gas or kerosene. In Meru Central District, the total number of households with electricity is approximately 1.1 per cent and most trading centres have access to the electricity. The percentage of households using firewood and charcoal is 100.0 per cent, and households which use either, kerosene, gas or biogas or both are also 100.0 per cent. In Meru South District, 1.8 per cent of households have electricity connections as is also the case in some trading centres. Although some rural households use solar power, 94.0 per cent still use firewood and charcoal, while only about 5.0 per cent use kerosene, gas or biogas. It is interesting to note, that fuel, particularly firewood and charcoal, provide the most of the energy needed in the Meru households.

During the field surveys, carried out in 2002, thirty-seven plants, derived from twenty-six species from a total of 567 collected specimens were reported to be used for fuel, either as charcoal or firewood (*cf.* Table 8.5). It was also reported that the act of felling a tree for use as firewood or charcoal was generally regarded as unacceptable. As mentioned before, the larger part of the Greater Meru region has been reforested with *Grevillea robusta*, of which the quality for material purposes is poor, but excellent for use as firewood. The planted *Grevillea robusta* have saved most of the remaining indigenous trees on farms from near extinction. Immigrants into the Meru region, who settle in the towns, obviously have no trees or farms on which to grow *Grevillea robusta* and hence depend on charcoal bought from illegal loggers. Most people, who can afford to buy charcoal, use it instead of firewood as it cooks faster, requires less attention during cooking, and is less smoky.

It is therefore interesting to document that fuel - firewood or charcoal - is used locally to provide most of the required energy in the Meru households. For instance, all respondents (100.0%) interviewed during the household surveys, reported the use of wild plants either for firewood or for charcoal - or for both - during the previous year. Although some used charcoal less because of its cost, all respondents used firewood for fuel. Table 8.1 shows that more than four-fifths (96.0%) of the respondents used wild plants for fuel. All respondents (100.0%) from *Kagera* alone used it, and respondents in the other villages reported very high percentages: 92.0 per cent in *KK Lumbi* and 96.0 per cent in *Kinoru*. Figure 8.6 shows a Meru girl carrying firewood for fuel.



Figure 8.5 A young man tries to place a *Sufuria* with edible tubers on the fire to cook. *Photograph:* AK. Ibui, *Kinoru* (2006).



Figure 8.6 A Meru girl carrying firewood. *Photograph:* A.K. Ibui *Kinoru* (2006).

The form of vegetation most used to make charcoal is trees, while shrubs are also used to provide additional firewood. After independence, Kenya's forests used to be open to women and children to allow them to collect dead wood for firewood, but this practice later stopped because of the growing insecurity of deserted forests and fields.

Table 8.5 List of wild fuel plants and plant parts used as reported by the Meru plant experts

Vernacular name	Scientific name	Part used
Kijara	*Plectranthus barbatus*	stem
Mubiro, Mubiru	*Vangueria infausta*	stem
Mubutu	*Erythrina abyssinica*	bark, stem, branches
Mugenkagenka	*Senna singueana*	stem
Mugumo	*Ficus thonningii*	branches
Mukau	*Melia volkensii*	stem, branches
Mukuthuku	*Unknown*	stem
Mukwego	*Bridelia micrantha*	stem
Murama	*Unknown*	stem
Murathaiga	*Osyris lanceolata*	stem, branches
Muringa	*Cordia africana*	stem, bark
Muteletu	*Teclea simplicifolia*	stem
Muthaiti	*Ocotea usambarensis*	stem
Muthakwa	*Vernonia auriculifera*	stem
Muthanduku (juria mwiru)	*Acacia mearnsii*	stem, bark
Muthiriti	*Lippia ukambaensis*	leaves
Muthuguya	*Unknown*	stem
Mutuntu, Mukinduri	*Croton macrostachyus*	stem
Muu	*Markhamia lutea*	stem, branches
Muuru	*Vitex doniana*	stem
Mu'uti	*Aspilia mossambicensis*	stem
Mwangua	*Senna siamea Lam.*	stem, branches
Mwaraka	*Tetradenia riparia*	stem
Mwariki, Kiariki	*Ricinus communis*	seeds
Mwiria	*Prunus africana*	bark, stem
Mwithiruai	*Dodonaea viscosa*	branches

Source:Fieldwork (2002).

Looking at the plant parts used for fuel, generally the stem or trunk and woody branches are burnt to produce charcoal. Branches are mainly used for firewood. The custom when firewood is required is to prune only the branches so as to leave the tree itself to grow until more branches are available during the following season. If the local people do not plant trees for their future supply of firewood, they have to depend on dead wood collected when these fall from the living trees. Dry leaves, flowers and fruits are often used when kindling a fire. These small plant parts are also used by poor people who cannot collect or cut branches for firewood, especially if they do not own the trees. It is an accepted common practice for neighbours to gather small pieces of firewood on the others people’s farms.

8.3.2 Wild Environmental Plants

During the qualitative surveys, twenty-six out of the 567 plants collected were reported to be used as environmental plants. They were derived from fourteen species (*cf*. Table 8.6). The people of Meru living in their settlements on the eastern slopes of Mount Kenya, which until recently was covered with impenetrable forest, have been able to live in harmony with their natural environment, providing them with copious natural resources for food and medicine, as well as with such additional factors as clean air, pleasant temperatures and the like, all contributing to a valued quality of life in this part of Kenya. In their management and conservation of their environment, they also developed practices which used trees as environmental plants, including for the construction of hedges, wind-breaks, and for ornamental purposes.

Table 8.6 List of wild environmental plants and plant parts used as reported by the Meru plant experts.

Vernacular name	Scientific name	Use	Part used
Kaiaba	*Dovyalis abyssinica*	hedges	whole plant
Kiaraka, Mwaraka	*Tetradenia riparia*	hedges	whole plant
Kijara	*Plectranthus barbatus*	hedges	whole plant
Kithunju	*Aloe literatia*	ornamental	Whole plant
Muboru	*Plectranthus sp.*	hedges	whole plant
Mubuti	*Erythrina abyssinica*	ornamental	whole plant
Muchambi	*Strychnos henningsii*	windbreak	stem
Murangi	*Arundinaria alpina*	ornamental	whole plant
Muthuguya	*Unknown*	hedges	whole plant
Mutunguu	*Commiphora eminii*	beacon	whole plant
Mutura	*Solanum aculeastrum*	hedges	whole plant
Muu	*Markhamia lutea*	ornamental/windbreak	stem
Muutuutu	*Jatropa carcas*	hedges	Whole plant
Ntaratare	*Rubus volkensii*	hedges	whole plant

Source: Fieldwork (2002).

In this context, it has also been reported that most residents who have acquired a job in the towns and cities outside the District, often travel home at the weekends in order to 'get some fresh air'. It is common to find neatly trimmed hedges around compounds in which indigenous trees and shrubs have been planted to provide a pleasant atmosphere where the people can come together and socialize during their free time. Moreover, succulent plants and flowering trees complete the landscape as ornamentals. On many farms - especially on tea plantations - special trees are grown as wind and dust-breaks. Hedges serve to mark the boundaries between farmer's land. These trees are also used to prevent soil erosion during the heavy equatorial rain storms which sweep across the area during the two rainy seasons. Although in general, larger trees and shrubs are used as part of the main vegetation, large numbers of smaller shrubs are also used. The practice of controlled stem

cutting and pruning is also implemented to create protective hedges around farms and homesteads. Table 8.1 shows that more than half (54.7%) of the respondents from all three villages reported a 'high' use of environmental plants. Slightly less than a quarter (24.0%) used them on 'average', while slightly more than one-tenth (12.0%) reported 'low' use. Therefore, only less than one-tenth (9.3%) of the respondents from all three villages did not use wild plants for this purpose. A similar trend is found among the *KK Lumbi* respondents, where more than two-thirds (68.0%) of the respondents said they used these plants in the 'high' category, while about one-fifth (24.0%) used them on 'average', leaving a mere 4.0 per cent in the 'low' and 'no use' answer categories. Although *Kinoru* had two-thirds (60.0%) of its respondents reporting 'high' use, it had the majority of over a tenth (16.0%) appearing in the 'no use' category. *Kagera* has far fewer respondents in the 'high' (36.0%) than the other two villages, while slightly more than a quarter (36.0%) fell into the 'average', where a fifth (20.0%) in the 'low' and 'no use' category taking up less than one tenth (8.0%) of the total.

8.4 Wild Non-Vertebrate Poisons and Bee Plants

8.4.1 Wild Non-Vertebrate Poisons Plants

In the surveys, seven plants from six species were reported to be non-vertebrate poisons plants out of the total of 567 plants collected (*cf*. Table 8.7). The use of non-vertebrate poisons as insect repellents has decreased over the last few years, because of the availability of modern chemical insecticides found in many shops today. There are, however, several uses of wild plants which still persist. For instance, it is quite common to find branches of wild plants being used as traditional brooms. These are used to repel fleas, especially on dusty compounds and in traditional mud houses the floors of which are beaten earth. These are continually smeared with cow dung and ash, usually by the women (*cf*. Figure 5.1). Some other plants were dried, grounded into powder, and used as preservatives in barns where grains are stored, killing weevils which bore into the grains. Some of the other insects kept away by such poisons include mosquitoes and chiggers.

Table 8.7 List of wild non-vertebrate poisons plants and plant parts used as reported by the plant experts in Meru

Vernacular name	Scientific name	Part used
Ndago	*Cyperus articulatus*	roots
Kithuuri	*Euphorbia tirucalli*	stem
Kibaki	*Nicotiana tabacum*	leaves
Gikuri	*Ocimum gratissimum*	leaves branches
Mutura	*Solanum aculeastrum*	fruit
Mubangi	*Tegetes minuta*	leaves, stem, whole plant

Source: Fieldwork (2002).

The major parts used in these poisons are the branches and leaves of shrubs such as *gikuri* (*Ocimum suave*) of which the leaves were roasted on a fire to produce fumes which expelled mosquitoes. The stem of *kithuuri* (*Euphorbia tirucalli*) was dried and grounded into powder, which was used as an insect repellent with stored dry maize. Fruits of the *mutura* (*Solanum aculeastrum*) were also pulverized into powder, also used as pesticide during the storage of grains. The stem and leaves of the *mubangi* (*Tegetes minuta*) were dried and crushed into powder which is also used as an insect

repellent on stored grain. The sap from the fruit of *mutongu* (*Solanum insane*) was used to drip into the wounds in human feet in which chiggers like laying their eggs in order to kill them, preventing any further spread. More than five decades ago, chiggers used to be a real nuisance, and although this flea has substantially reduced in numbers since then, it still threatens to bury itself in the feet of its victims, whether young or old.



Figure 8.7 A Meru girl using dry branches of a non-vertebrate poisons plant to sweep the dusty compound.
Photograph: A.K.Ibui (2007).

Respondents' Use in the Previous Year

More than half (62.7%) of the respondents reported that they had not used wild non-vertebrate poisons plants in the previous year, while one-fifth (20.0%) report 'low' use, leaving less than one-tenth (8.0%) on 'average' and 'low' (9.3%) uses respectively (*cf.* Table 8.1). Data from the three sample survey villages also show that more than half (respectively 52.0%, 68.0%, 68.0%) of the respondents from each village reported 'no use', and there are no reports on 'average' or 'high' use

in *Kagera.* However, a fifth of the respondents from *KK Lumbi* reported 'high' use, while only 4.0 per cent reported the same from *Kinoru*. More than one-tenth (16.0%) of the respondents from *Kinoru* though reported 'average' use'.

8.4.2 Wild Bee Plants

Since the days of the historic journey of the *Ngaa* from the island of Manda in the Indian Ocean, more than 300 years ago the hunt for honey has continued. Modern Meru farmers have even commenced the production of their own honey by setting up modern beehives to collect the honey from bees passing their farms. Today, this practice is found in many parts of the Greater Meru region. Beehives, carved in the traditional way from such indigenous trees as *muringa* (*Cordia africana*), are placed on branches of tall trees on farms to attract bees which deposit honey. Meru North District leads the other two Districts in beekeeping. Plant experts expressed difficulties in pinpointing specific plants which wild bees use for nectar. There is, however, general agreement that the wild bees collect nectar from all flowering plants in the area. Others agreed that it was not possible to know whether a bee hovering over a plant was actually collecting nectar or just checking whether it liked the nectar. The two species of plants collected in this category are those used to attract bees to hives or to repel them during honey harvesting. These species are *makuri* (*Ocimum gratissimum*) and *muthiriti* (*Lippia ukambaensis*).

Most respondents in the sample surveys did not possess the expertise to make the local bee-hives, but indicated that they would love to use them if they were available. Other respondents claimed that wild honey harvesting requires great courage and commitment, particularly as it is often carried out in the total darkness of the night. Table 8.1 shows that more than two-thirds of the respondents from all three Districts reported either 'no use' (48.0%) or 'low' use (20.0%) of bee plants, leaving slightly below one-fifth (16.0%) 'average' and 'high' use respectively. Respondents from *KK Lumbi* reported increased use, where nearly half (44.0%) of its respondents reported 'high', one-fifth (20.0%) 'low' and slightly more than a tenth (12.0%) reporting 'no use' use respectively. More than two-thirds (76.0%) of the respondents in *Kinoru* reported 'no use', and less than a fifth (16.0%) of them scored in the 'low', and 4.0 per cent each in 'average' and 'high' categories respectively. The respondents in *Kagera* reported between the margins of 'average' and 'low' use, while the majority of them (44.0%) reported 'no use' of bee plants.

The main tree used to make beehives as mentioned before is the *muringa* (*Cordia africana*). Construction requires a groove be incised in the middle of a piece of trunk. The traditional beehive is hung on a tree about fifteen or more feet above the ground by strong wires. Branches of the *gikuri* (*Ocimum suave, Makuri* – pl.) are then used to smoke the hive leaving a scent which attracts wild bees. Later, the honey is collected after being deposited by the bees, a practice demanding skill as branches and leaves of the same plant are used to fill the hive with smoke to chase the bees out. There are other plants which are also used for bee-keeping, such as the leaves of *muthiriti* (*Lippia ukambaensis*) which are usually crushed and rubbed into the hive to attract the wild bees.

In a nutshell, this chapter has presented data about the Meru knowledge and use of non-medicinal wild plants, documenting the plants collected in the field, their names, classifications and descriptions, as well as their various uses. Thereafter, various ways in which these plants are used as food plants were described. Special emphasis was laid on the classification and use of edible plants, plant parts used and local food preparation practices. Material, fuel, and environmental plants have also been documented. Looking at social plant uses among the Meru, particular attention has been paid to such local practices as invoking curses, their use in marriage, childbirth and in discipline,

besides their use in leisure. Finally the chapter has presented information on use of wild non-vertebrate poisons plants and bee plants, describing the local practices.

Chapter IX will seek to analyse the role of the various interacting factors which influence the people of Meru in the use of both medicinal and non-medicinal plants in order to determine the patterns of wild plant use behaviour of the Meru in the context of their daily interaction with their vegetation environment. The complex analysis will be carried out by the use of bi- and multi-variate analyses of data, leading up to the construction of the model of this study' use behaviour of medicinal and non-medicinal wild plants use in Meru.

IX Bi- and Multivariate Analysis of Medicinal and Non-medicinal Plant Use

9.1 Bivariate Analysis

9.1.1 Preparation of Analysis: Data Sets and Variables

The previous chapters indicate that the patterns of wild plant use behaviour for both medicinal and non-medicinal plant use in Meru is influenced by various factors both 'hard' and 'soft', in addition to the well-known socio-demographic factors. Also included are the socio-economic, environmental, conservation and intervening factors as reported by the respondents in the Meru survey. The 'soft' factors are supported by the results of the qualitative data which included knowledge, belief, attitude and experience on wild plant use.

To substantiate the results of the qualitative survey more securely, additional analyses have been deemed necessary to confirm the relevance of the factors identified. Greater understanding of the influence exerted by the various factors is enhanced by examining the reported scores obtained in the analyses in the patterns of wild plant use behaviour. The first step executed was to make the bivariate analysis which led to an understanding of the general influence the independent factors weighed against the two dependent factors of both medicinal and non-medicinal plant use in wild plant use behaviour. To be able to do this quantitative analysis, data concerning useful wild plants of Meru described in chapters VII and VIII, with the analysed results are given in Tables 9.1-9.5 below, were analysed using of the Statistical Program for Social Sciences (SPSS), version 12.5 in pre-coded response categories of the structured questionnaire.

Responses from all the seventy-five questionnaires were entered into the database and a series of steps taken to prepare the data for final analysis. Preliminary tests were made on the consistence and corrections. Answers which seemed to give the same results were regrouped and the various categories inserted into the data set. For example, a household head who answered 'don't know' to the question 'do your children acquire the same knowledge from you on wild plants use?' and another respondent who answered 'no' in a literal sense, both of these responses meant that they had not made any effort to pass this knowledge down to their children. Variables which included 'sub-tribe', 'religion' and 'until class---', were excluded from the data set since all the respondents in the survey belonged to the same 'sub-tribes' as the birth place or 'environment' which corresponded with the villages in which they lived. When asked about 'religion', all respondents claimed to be Christians, revealing no differentiation in the answer categories in this question. The variable 'until class ---' again had the same answers as in 'formal education', showing duplication which did not need to be included in the analysis. The original data consisted of the answer scores to 134 questions which were reduced to twenty-six variables, of which a number were recalculated into five-answer categories. These variables are described below with the labels assigned them also included. Through a series of steps, the frequency of the data sets, the determination of the single responses for multi-answer questions, the re-grouping of questions and labelling, and the final calculation of factors into model-based variables, it was possible to take the first step in the bivariate analysis, venturing into the complex analysis to assess the relative influence of predisposing, enabling, environmental, conservation and intervening variables on wild plant use, sub-divided into medicinal and non-medicinal plant use behaviour. The manner in which the construction of the non-medicinal plant use variable was executed will be explained below.

The difference between the bivariate analysis and the multi-variate analysis which is then presented is that the former provides a general overview of the direct relationships between each of the twenty-four independent variables and each of the two dependent variables, while the subsequent analysis (OVERALS) explores the internal interaction between the independent, intervening and the dependent variables. Thereafter, the multiple regression analysis examines the values of the correlations between the various 'blocks' of the model. In other words, it assesses the interaction among the twenty-six variables in the two data sets.

To gain a better understanding of the interaction between the independent variables and each of the other seven uses identified in the survey: food, materials, social, fuel, environmental, non-vertebrate poisons and bee plants, a second multivariate analysis (OVERALS) was executed to assess similar internal relations existing among variables for each of seven individual uses; that is the interaction of the twenty-four independent variables against each one of the seven dependent variables respectively. This meant assessing the interaction of twenty-five (twenty-four for material plant use) variables in the two sets, seven times, whereby the *knowledge, belief, attitude* and *experience* of each of the uses replaced the variables analysed earlier, summed up as knowledge, belief, attitude and experience on non-medicinal plant use. The multiple regression analysis was not executed in this case. The following sections will describe the preparations made in detail.

Data sets

Set 1: Independent variables

Predisposing variables:	socio-demographic variables (6)
Predisposing variables:	psycho-social variables (12)
Enabling variables:	socio-economic status variables (1)
Environmental variables:	*KK Lumbi* village, *Kinoru* village, *Kagera* village variables (1)
Conservation variables:	Cutting and planting of trees variables (1)
Intervening variables:	Intervening awareness, encouraging policies, discouraging policies variables (3)

Set 2: Dependent variables

1st Analysis (bivariate)	
Medicinal plant use behaviour variables:	medicinal plant use behaviour variable (1)
Non-medicinal plant use behaviour variables:	food, material, social, fuel, environmental, non-vertebrate poisons, and bee plant use variables (1)
2nd Analysis (OVERALS only)	
Food plant use behaviour variables:	food plant use variable (1)
Material plant use behaviour variables:	material plant use variable (1)
Social plant use behaviour variables:	social plant use variable (1)
Fuel plant use behaviour variables:	fuel plant use variable (1)
Environmental plant use behaviour variables:	environmental plant use variable (1)
Non-vertebrate poisons plant use behaviour variables:	non-vertebrate poisons plant use variable (1)
Bee plant use behaviour variables:	bee plant use variable (1)

Belief in material plant use was deleted from the data set since it shows no differentiation in the second OVERALS analysis on the use of wild material plants. Hence the data set in this particular analysis consists of 23 independent variables instead of 24 as stated above against one dependent variable. The 24 independent variables and the 2 dependent variables which have been used in the final analysis in the *first step* are therefore as follows:

Socio-demographic variables:

Variable 'household size' (label 'hhsize') Regroupings were done as follows: '1 - 3 members', '4 - 6 members', '7-9 members', '10 + Members'.

Variable 'sex of household head' (label 'sexhhhd'). No calculations were made, original categories were used. That is 'male', 'female'.

Variable 'age in years' (label 'age'). There were no recalculations made in the analysis but the original responses were regrouped as follows: '21 – 30', '31 – 40', '41 – 50', '51 - 60', '61 - 70', ' 70+'.

Variable 'formal education' (label 'formed'). No calculations were made, the original categories are regrouped and the category 'don't know' dropped since no one was found in it. The categories were therefore as follows: 'none', 'primary', 'secondary', 'tertiary'.

Variable 'marital status' (label 'mstatus'). Original responses were used. These are 'married mg', 'married pg', 'divorced', 'widowed', there were no singles, and hence the category was dropped.

Variable 'profession of household head' (label 'prof'). The category of 'profession of household head' was moved from 'Block 2' to 'Block 1', because it became clear that it was more a socio-demographic variable than an enabling one. The original responses were regrouped and certain others were brought together under a more inclusive category; for example, a farm-worker and a home watchman are put together as in Meru context as house servants. Sometimes their roles interchange. The new categories in the analysis are therefore: 'farmer', 'herdsman', 'civil servant', 'entrepreneur', 'pensioner', 'landlord' and 'house servant'.

Psycho-social variables:

Variable 'knowledge of medicinal plant use' (label 'knm'). The original responses were renamed after the answer category 'don't know' and regrouped as follows: 'low', 'average', 'high'

Variable 'knowledge of wild plants among children' (label 'kntranch'). There were no calculations made on these responses, some regrouping of the responses was made in which the response 'don't know' was grouped together with response 'no'. The answer categories in the analysis are as follows: 'N/A (not applicable)', 'no', 'partly', 'fully'.

Variable 'belief in medicinal plant use' (label 'bfm'). The original responses were regrouped and renamed as follows: 'low', 'average', 'high'.

Variable 'attitude towards medicinal plant use' (label 'attm'). The original responses were regrouped and renamed as follows: 'low', 'average', 'high', as explained earlier.

Variable 'awareness of plant environments' (label 'awareness'). Variable 'awareness of plant environments' was moved from enabling variables 'Block 3' to psycho-social block since it was more a knowledge-related question than one to determine the socio-economic status of the household head (SES). The total number of correct answers given by the household heads about what was good for their vegetation environment were counted and categorized accordingly. Labels were given from 1-4, where 'low' was equal to zero or 'don't know' answers, 'average' was equal to one to two correct answers, 'high'

was equal to three to four correct answers and 'very high' was any answer above five. The answer categories in the analysis were consequently: 'low', 'average', 'high', 'very high'.

Variable 'preparedness to pay' (label 'wiltopay'). The variable 'preparedness to pay' was moved from 'block 3' to 'block 2', since it was more of a psycho-social variable than an enabling one. It was decided that it could not be used to estimate the economic status of the household head. The original responses are regrouped as follows: 'no', 'yes'. No one answered, 'don't know'.

Variable 'perceived need of plant resources' (label 'wishmp'). No calculations were made but a regrouping of the single response 'don't know' was made, which put it together with the answer category 'no' as explained earlier. The new labels are therefore: 'no', 'yes'.

Variable 'experience in medicinal plant use (label 'expm'). Regrouping was executed according to the renamed answer categories based on the original responses. The new categories are: 'low', 'average', high'.

Variable 'knowledge of non-medicinal plant use' (label 'knnm'). Computations were made on the sum of all the seven non-medicinal plant uses which include: food, material, social, fuel, environmental, non-vertebrate poisons and bee plants. The frequencies of the new variable (non-medicinal plant use) were run and their maximum and minimum values recorded. With the three step computation ('min to min + x)', ('min + x to min + 2x'), ('min + 2x to min + 3x'), three answer categories were realized and which are used in the analysis. These answer categories are: 'low', 'average', 'high'.

Variable 'belief in non-medicinal plant use' (label 'bfnm'). Similar computations of the variable 'belief' were made as explained in the variable above and the answer categories used in the analysis are given as: 'low', 'average', 'high'.

Variable 'attitude towards non-medicinal plant use' (label 'attnm'). Computations were made as explained in the above variable but for 'attitude' and the response categories used: 'low', 'average', 'high'.

Variable 'experience in non-medicinal plant use' (label 'expnm'). Computations were made as explained above in this case for experience and the answer categories were given as follows: 'low', 'average', 'high'.

Enabling variables:

Variable 'socio-economic status' (label 'SES'). Computations were made on the sum of all the answer categories given in the original responses on all the variables used to assess socio-economic status (SES) after initial regrouping and recalculations. The frequencies of the new variable (SES), were tested and their maximum and minimum values recorded. By finding the difference between these two values and dividing it by 5 a value was obtained making it possible to define a five-step answer category. These categories were defined as 'very poor' = ('min to min + x)', 'poor' = ('min + x to min + 2x'), 'average'= ('min + 2x to min + 3x'), 'rich' = ('min + 3x to min + 4x) and 'very rich' = (min + 4x to min + 5x) and finally used in the analysis as follows: 'very poor', 'poor', 'average', 'rich', 'very rich'.

Environmental variables:

Variable 'environment' (label 'environ'). The variable originally referred to the respondents' 'birth place' in the questionnaire, which meant the same as 'village where respondents live' and finally used as variable 'environment' in the analysis. The original responses are used in the analysis as follows: '*KK Lumbi*', '*Kinoru*, '*Kagera*'.

Conservation variables:

Variable ‘conservation’ (label ‘conserv’). The responses are regrouped and answer categories used as follows: ‘low’, ‘average’, ‘high’.

Intervening variables:

Variable ‘intervening awareness’ (label ‘institaw’). The original responses are regrouped giving the answer categories used in the analysis as follows: ‘no’, ‘yes’.

Variable ‘encouraging policies’ (label ‘encpol’). The original responses and answer categories given in the analysis are as follows: ‘don’t know’, ‘no’, ‘yes’. Here and in the variable below the answer category ‘don’t know’ is included since it indicates a genuine lack of knowledge concerning the policies in question.

Variable ‘discouraging policies’ (label ‘discpol’). The original responses are used and answer categories used in the analysis given as follows: ‘don’t know’, ‘no’, ‘yes’.

Dependent Variables:

Variable ‘medicinal plant use behaviour’, (label ‘usemd’). The answer categories are regrouped based on the original responses and computed into five answer categories which are used in the analysis as follows: ‘very low’, ‘low’, ‘average’, ‘high’, and ‘very high’. Although the answer category ‘very high’ is included, there are no respondents who scored in this category.

Variable ‘non-medicinal plant use behaviour’ (label ‘usenm’). Mathematical computations which involved summing up all the scores of the seven uses of food, material, social, fuel, environmental, non-vertebrate poisons and bee plants was executed and regrouping done to conform to five category answers used in the analysis which are: ‘very low’, ‘low’, ‘average’, ‘high’, and ‘very high’.

Independent variables in second step (ii) analysis:

Variables ‘knowledge of food plant use' (label knfd); ‘knowledge of material plant use’ (label ‘knmat’); ‘knowledge of social plant use’ (label kns); ‘knowledge of fuel plant use’ (label ‘knf’); ‘knowledge of environmental plant use’ (label ‘kne’); ‘knowledge of non-vertebrate poisons plant use’ (label ‘knnvp’); ‘knowledge of bee plant use (label ‘knbp’) replaced variable ‘knowledge of non-medicinal plant use’ (label ‘knnm’) in each of the data sets for each use. The original answer categories for each variable was regrouped and the original responses used in the analysis set out as follows: ‘low, ‘average’, ‘high’.

Variables ‘belief in food plant use’ (label bffd); ‘belief in material plant use’ (label ‘bfmat’); ‘belief in social plant use’ (label bfs); ‘belief in fuel plant use’ (label ‘bff’); ‘belief in environmental plant use’ (label ‘bfe’); ‘belief in non-vertebrate poisons plant use’ (label ‘bfnvp’); ‘belief in bee plant use (label ‘bfbp’) replaced variable ‘belief in non-medicinal plant use’ (label ‘bfnm’) in each of the data sets for each use respectively. The original answer categories for each variable were regrouped and the original responses used in the analysis set out as follows: ‘low, ‘average’, ‘high’.

Variables ‘attitude towards food plant use’ (label attfd); ‘attitude towards material plant use’ (label ‘attmat’); ‘attitude towards social plant use’ (label atts); ‘attitude towards fuel plant use’ (label ‘attf’); ‘attitude towards environmental plant use’ (label ‘bfe’); attitude towards non-vertebrate poisons plant use’ (label ‘attnvp’); ‘attitude towards bee plant use (label ‘attbp’) replaced variable ‘attitude towards non-medicinal plant use’ (label ‘attnm’) in each of the data sets for each use respectively. The original answer categories for each variable were

regrouped and the original responses used in the analysis set out as follows: 'low, 'average', 'high'.

Variables 'experience in food plant use' (label expfd); 'experience in material plant use' (label 'expmat'); 'experience in social plant use' (label exps); 'experience in fuel plant use' (label 'expf'); 'experience in environmental plant use' (label 'expe'); 'experience in non-vertebrate poisons plant use' (label 'expnvp'); 'experience in bee plant use (label 'expbp') replaced variable 'experience in non-medicinal plant use' (label 'expnm') in each of the data sets for each use respectively. The original answer categories for each variable are regrouped and the original responses used in the analysis set out as follows: 'low, 'average', 'high'.

Dependent variables in second step (ii) analysis:

Variables 'food plant use behaviour' (label 'usefood'), 'material plant use behaviour' (label 'usemat'), 'social plant use behaviour' (label 'usesoc'), 'fuel plant use behaviour' (label 'usefuel'), 'environmental plant use behaviour' (label 'useenv'), 'non-vertebrate poisons plant use behaviour' (label 'usenvp') and variable 'bee plant use behaviour' (label 'usebee') were used as they were in the second analysis; the OVERALS to assess the relationships between all variables of independent Set One and the dependent Set Two which related to each of the seven uses analysed separately but brought together in the first bivariate analyses as 'non-medicinal plant use behaviour'. All original answer categories were regrouped according to original responses leading to the categories used in the analysis as follows: 'did not use', 'low', 'average', 'high'. There were no original responses given as 'did not use' in; 'food plant use' or in 'fuel plant use', but this answer category was found in all the other six use categories.

The distribution of the twenty-four independent variables which include socio-demographic psycho-social, enabling, environmental, conservation and intervening variables over the two dependent variables which included medicinal and non-medicinal plant use behaviour formed the basis of the bivariate analysis which was carried out using cross-tabulations. Tables 9.1 - 9.5 represent the combination of forty-eight cross-tabulations which resulted from this first step in the analysis. As indicated earlier, the second step in the analysis of the other seven uses of wild plants which includes food, material, social, fuel, environmental, non-vertebrate poisons and bee plant uses was carried out in the extended multivariate analysis which was undertaken to examine the significance of each variable in interaction with the other variables in the model.

In general, a tendency is observed in the recent past in which the use of wild plants for medicine has a downward trend. The survey data from all the three villages in the larger Meru region, for instance, indicate that not one single respondent reported 'very high' medicinal plant use, so that the 'empty' answer category was deleted from the Tables 9.1 - 9.5 and that more than half (56.0%) reported 'low' or 'very low' medicinal plant use. Conversely, about a tenth (13.3%) of the respondents reported 'very high' non-medicinal plant use and a total of slightly more than half (51.3%) report above 'average' use.

In order to determine the statistical significance which would indicate the relationships between the two variables, it was necessary to analyse the value of the *Pearson Chi-Square* based on the criterion of 95.0 per cent. In such case, a value of .05 is established for each variable in the bivariate Tables 9.1 - 9.5, on which *Cramer's V* is also shown. On the basis of statistical calculations, the *Chi-Square* assisted in the determination of whether an association between two variables is significant or not. The subsequent multivariate and multiple regression analyses provide deeper insights into the

coherence and interaction between all variables in the model. The significance in the cross tabulations is a first expression of the degree of the probability which could not just have occurred by pure chance in a recorded association among variables.

9.1.2 Dependent Variables

First and foremost, it was important to understand how the dependent variables of medicinal and non-medicinal plant use were constructed after the initial qualitative survey which was completed in 2003. Naturally, the indication of the concept of 'use of wild plants' among the Meru people usually led to an unconscious and systematic classification of groups into medicinal plant use first and the other uses (food, material, social, fuel, non-vertebrate poisons and bee plants) next. The order of the other kinds of uses vary from person to person, for example, medicinal, fuel; material, social, food and so on, confirming the dominance of medicinal plant use among the people. It soon became clear that most respondents indicated that wild plants were used basically for medicine, unless they were prompted to name other kind of plant uses. In order to discourage the plant experts from referring to medicinal plants only - as these provided the greatest variety - it was agreed among the research assistants to encourage them to point out the same number (maximum twenty-five plants in each use) for all kinds of uses with which the respondents might be familiar. Even this way, it was interesting to note that those plants named for other uses were actually medicinal plants as well.

The general recording of the knowledge of the useful plants was eventually followed by the collection and the documentation, of which the methods are explained in Chapter III. The plants collected and their uses are presented in Chapters VII and VIII. During collection, a representative of every category of plant use in a certain locality was documented and preserved, thereby providing data which were later analysed and a chart generated which confirm the order in the kinds of plant use of Meru's wild flora, helping to identify more closely the two dependent variables referred to in the final analyses (*cf.* Figure 7.3). Non-medicinal plant use was analysed individually (OVERALS) as a Second Step (ii) analysis, allowing the examination of variable significance of the relevant independent variables in interaction with a single dependent variable. Subsequently, it was possible to formulate questions to provide the basis for the quantitative surveys from which the actual data from the household heads was collected in relation to their predisposing, enabling, environmental, conservation and intervening factors, reported over the preceding twelve months.

Medicinal Plant Use Behaviour

The construction of dependent variable *medicinal plant use behaviour* relies heavily on several factors indicated in both the qualitative and quantitative surveys. *The first major step* involves the knowledge, wisdom and understanding scored by the plant experts in the field through: *firstly* the choice of the particular part of plant used, since parts of the same plant sometimes contain different concentrates of the medicinal properties. It is clear that a plant with certain medicinal properties derived from its roots may also possess poisonous leaves which rules out its use as medicine. At the same time, plant experts knew that these concentrates vary even within non-poisonous parts, necessitating that the user possesses a practical understanding of the particular part to collect. Plant parts with weaker concentrates are used to prepare medicine for children or to treat minor illnesses, while stronger concentrate parts are used to prepare medicine for adults or for more serious diseases. Plant parts are also known to be used to treat either external or internal ailments only, rendering the practical understanding of these properties vital for medicinal plant use.

Secondly, the plant from which the parts are collected is vital because not all plants are medicinal. It is crucial to be able to identify each tree and its medicinal properties by shape, leaf arrangement, colour of the flowers and fruits, and secondarily by smell and taste. Plant experts demonstrated this expertise by plucking parts of the root or bark, scraping it slightly and smelling it or tasting it. Even if plants resemble each other, these characteristics would differentiate them, a practice which is very important if the safety of alternative medicine is to be guaranteed. In several cases, herbal medicine is prepared from several parts of different plants or trees. These too are carefully identified, plucked, cleaned, either dried or smoked and stored for future use.

Thirdly, in addition to the selecting power of the part and plant required for a particular medicine to treat a certain sickness, the habitat of a particular plant is vital to medicinal plant use purposes. Plants found in waterlogged habitats are treated like those available during rainy seasons, whose medicinal content is said to be diluted. A knowledgeable user would not necessarily pick the nearest plants available without surveying their habitat. On the whole, the habitats of plants can be quite definitive and hence the user is normally expected to know where to find the required plants.

Fourthly, the preparation and the dissemination of the medicine reveals the adherence of the plant experts to their age-old traditional use-behaviour which makes them experts in identifying various sicknesses and in knowing how to treat them, revealed in the way in which the local people - who never attended any medical training - could identify and classify most of the known illnesses, and prescribe herbal medicine as treatment. Although most herbal medicine is said not cause any problems even when taken as an overdose, the process is governed by the amounts to be administered at specified times. The actual treatment of specific ailments including external problems indicates the wisdom of a unique group of herbalists (‘doctors’), who display their unquestionable understanding of the treatment of both internal and external ailments, including the skilful treatment of broken bones.

The analysis and the charting out of the various uses as shown in Figure 7.3 is *the second major step*. Here by analysing all the uses recorded, it was possible to generate a pie chart showing the percentages of the various uses documented from the database. This presents indisputable evidence of the overall use of wild plants in Meru, where medicinal plant use alone scored 53.8 per cent and non-medicinal plant use 46.2 per cent of total use, a fact that is used to confidently assign the various uses into two main groups which finally became the dependent variables in the final analysis.

The third major step is the final analyses of the quantitative data collected in questionnaires. These examined the factors related to the understanding of the practices involved in the overall process of medicinal plant use, ranging from knowledge of the plants parts used, the habitats where such plants are collected and season in bloom, the preparations and the dissemination and also the application of the correct dosages as well the determination of overdose and poisoning levels. The extent to which a person would go to acquire such plants, even if this required buying from those who grew them, or planning a private garden and the repeated use, all contributed to defining the medicinal plant use variable conclusively.

The sum of the answers given in relation to the use of medicinal plants in the quantitative survey was then distributed on a scale ranging from ‘did not use’, ‘low’, ‘average’ and ‘high’ use. These answer categories were later computed into the five answer categories of ‘very low’, ‘low’, ‘average’, ‘high’ and ‘very high’. There are no respondents who qualified for the ‘very high’ medicinal plant use category and from the bivariate tables, it is possible to notice its conspicuous omission as this column was deleted. The ‘did not use’ group were all re-categorized into the category of ‘very low’ use. The five answer category provided a more exact and true spread of the reported scores making it possible to understand more clearly the concept of wild plant use

behaviour in the preparation of medicine in Meru, giving more confirmation of medicinal plant use behaviour as a dependent variable in both the bivariate and the multivariate (OVERALS) analysis.

Non-medicinal Plant Use Behaviour

The first step was to identify the various uses which constituted the *non-medicinal plant use behaviour* variable as in *medicinal plant use behaviour*. This was done during the qualitative study done in 2002. Here various stages of expertise were demonstrated by the plant experts on various degrees of knowledge of wild plants use. As explained above data collected and analysed indicate that besides the use of these plants for herbal medicine in Meru, there are other uses which include food, material, social, fuel, environmental, non-vertebrate poisons and bee-keeping. These have been fully analysed in Chapter VIII and charted in Figure 7.3. In relation to the data collected, the use-order given is vividly revealed, although some of the practices reported are slowly dying out as they have been overtaken by a predilection for the modern products available in shops and supermarkets. In the subsequent quantitative study done a year later, it is possible to identify factors used in the questionnaire which measure this *non-medicinal plant use behaviour*. The questions which were constructed with the help of these factors were used to extract information from the household heads on non-medicinal wild plant use as these helped to analyse the various uses known, the parts of the plants used, and the way preparation and dissemination of the various products was carried out. The answer categories which were initially obtained in the household surveys as 'did not use', 'low', 'average', and 'high' use were recalculated and later distributed equally over a scale ranging between the reported margins of 'very low' use on one extreme to 'very high' use on the other, in the five use categories previously explained. The practices related to each of the seven uses of wild plants analysed is basically similar to that noted in medicinal plant use behaviour, especially in the choice of plants and parts and identification of habitats.

In *food plant use behaviour* in particular, exceptional expertise was displayed in the identification of food plants, parts used, preparation, and recipes relating to what combines with what, the subsequent action of the cooking of the food and even the way it was eaten. The plant parts consumed, including leaves, roots, fruits or seeds, were identified, actual seasons when these are ready and the colours described with clarity as factors taken into consideration during the construction of the dependent variable. Again in material plant use behaviour, expertise was displayed in the choice of the plant or tree and the parts used, over and above the skills of craftsmanship required to transform a piece of wood into a drinking vessel, a tool for gardening, a fine hut or house (shelter) and so on. Practical demonstrations of basket weaving, bathing and washing activities with plant parts, use of saps for glues and so on confirmed the respondents' expertise, a legacy built up over many generations. In *social use behaviour*, besides identifying the plants, the parts used and the habitats, the socio-cultural behaviour was seen in actual demonstrations of plant use in weddings, rituals and games. In engagements, girls knew how to identify their suitors by recognizing particular branches of culturally significant plants which were 'planted' at the entrance of their huts. The suitor knew he was accepted if the girl pulled the branch down and took it into her hut. During weddings, it is the custom the throw flowers at the bridal procession. The flowers chosen were from plants believed to bless and give health to the couple and their future offspring.

The practices involved in disciplining a child using recognized branches of plants now and even before lies in the hands of parents and guardians, who have the knowledge and experience of what part of the body to spank and how to do it without hurting the feelings of the child. In childbirth, the expertise related to rubbing particular plants on the mother of the child and the solutions used for bathing are the preserve of the most experienced.

Fuel plant use behaviour has been acquired through many years of experience in identifying correct plants for firewood and charcoal and the parts useful for this. The general practice in fuel use in the greater Meru region prohibits cutting of indigenous trees, but encourages growth of exotic ones for fuel. Smoky wood is distinguished from types which burn cleanly. Wood which provides good fire is identified and used.

Environmental use behaviour encompasses the use of the whole plants or tree. The cogent attributes looked at include knowledge of actual identification of the plant as ornamental, land markers, wind- and dust-breaks and so on, which prompt the use of the particular plants. The contribution of the plant to the fertility of the soil is also taken into account. For instance, many plants can serve as boundary-markers, but those specifically used are known not to wither or be killed by drought years.

Non-vertebrate poisons plant use behaviour was measured through factors which encapsulated information about the parts of the plants used, documenting the knowledge of the respondents on the plant itself, its habitats and the seasons when it is in bloom. As are those sorts of insects or pests which might be eliminated by its use. Preparation and disposal of the drug was and is a requirement for anyone administering pesticides on food products especially maize and other grains. The use of plant juices to remove ticks and chiggers is left to someone with the approved knowledge and experience. In *bee plant use behaviour*, the identification of those plants and trees which are used and the art of using them constitute factors to measure their knowledge and use. The knowledge of what plants attract or repel bees, plus the appropriate times to do this and how they should be used, provide evidence of practical use of the plants. All these factors plus the outright grouping on the use of plants recorded and charted in Chapter VII (*cf.* Figure 7.3) were analysed. The total sum of all the seven uses was divided by seven to give one single dependent variable which was used to measure the *non-medicinal plant use behaviour* finally forming the second variable applied in the wild plant use behaviour assessment for both the bivariate and the multivariate (OVERALS) analyses given in Tables 9.1-9.10 and in Figures 9.1-9.2.

9.1.3 Predisposing Factors

The predisposing factors were a composition of socio-demographic variables which included: *household size, sex of household head, age, formal education, marital status and profession of household head* and such psycho-social variables as *preparedness to pay, awareness of plant environment, perceived need of plant resources, knowledge of wild plants among children, knowledge, belief, attitude* and *experience* on both medicinal and non-medicinal plant use. Table 9.1 shows the distribution of these variables over the reported scores on medicinal and non-medicinal plant use behaviour in the three villages of Meru, in which the *Pearson Chi-Square* values indicate the relevant significance existing between the bivariate relationships. The distribution table shows clearly that only relationships with a certainty of 95.0 per cent, resulting in a *Pearson Chi-Square* of .05 and below, show significance, and are therefore included in the discussion.

Socio-demographic variables:

Household Size and Gender of Household Head

Data on 'household size' reveal a significant relationship with non-medicinal plant use behaviour with a *Pearson Chi-Square* of .018, but the variable is weakly significant with a *Pearson Chi-Square* of .069 towards medicinal plant use behaviour. In general, there is a significant shift

from all categories shown by the majority of the respondents with '1 - 3 members' to '1 - 9 members' from 'average' and 'below' use both in medicinal and non-medicinal plant use, revealing a shift towards low medicinal and non-medicinal plant use behaviour. Simultaneously, the distribution among respondents in the '10 + members' category, reveal a shift from 'high' medicinal (57.1%) to 'average' non-medicinal plant use, a significant shift from 'high' medicinal to 'average' non-medicinal plant use behaviour indicating even more the declining dependence on the wild plants even among large families in the wake of diminishing cultural values and alienation from the vegetation environment in contrast to the close relationship the community had known previously, leading to families who find themselves defenceless even against very minor ailments when the remedy is sometimes just within their reach.

Gender of Household Head

The variable 'sex of household head' in the distribution in Table 9.1 reveals a significant relationship with medicinal plant use behaviour, but none with non-medicinal plant use behaviour. The *Pearson Chi-Squares* are .031 and .069 respectively. The category 'male', for instance, reveal a total of more than half (27.8% & 24.1%) of the respondents appearing at below 'low' medicinal plant use. A total of slightly more than half (31.5%, 13.0% & 13.0%) of the respondents show 'average' and above non-medicinal plant use. On the other hand, the female category depicted the majority of its respondents at 'low' (61.0%) medicinal plant use and 'very low' (38.1%) non-medicinal plant use, revealing a shift from below 'low' to above 'average' medicinal plant use in non-medicinal plant use among males and a shift towards 'low' for both medicinal and non-medicinal plant use behaviour, showing contrasting behaviour between males and females. Men tend to shift more from low medicinal plant use behaviour to average and to high non-medicinal plant use behaviour; women shift more towards low in both medicinal and non-medicinal plant use behaviour.

Women feel culturally more restricted in relation to wild vegetative areas as they can only access these for such simple tasks as finding firewood or gathering fodder for domestic animals. Men are at liberty to go to same environments for raw plants for material plant use, social and environmental uses as well as for 'bee plants' without any restriction at all. Most female respondents from *KK Lumbi* appeared more competitive than women in the other two villages especially in outdoor activities and appeared quite knowledgeable about wild plants, especially those for medicine, materials, environmental uses, and bee plants which are largely a domain of the men, but chiefly surpass men in their knowledge of wild food plants and others used as social plants. Both sexes proved knowledgeable on use of non-vertebrate poisons plants and fuel plants. Looking at fuel plant uses, women are ahead in knowledge of wood for firewood, while men are best at determining best wood for charcoal. Traditionally women are never allowed to log trees for fear that they might hurt themselves. It is claimed that they can never tell the direction a tree would fall, since they tend to 'shield themselves on the direction of the falling tree'. When a tree is being felled, the women and children are always kept at a safe distance.

Age and Formal Education

Table 9.1 shows the distribution of the variable 'age' of the household head over the reported medicinal plant use behaviour as being weakly significant and lacking significance at all in relation to non-medicinal plant use behaviour where the *Pearson Chi-Squares* are .090 and .366 respectively. The majority of respondents within age brackets '31 – 40', '41 – 50' and '61-70' register highest percentages (70.0%, 35.3%, 38.9%) in the 'average' and below medicinal plant use in their respective categories, revealing a significant shift towards low medicinal plant use

behaviour. The distribution of the variable 'formal education' of the respondents in the household surveys data given in the bivariate Table 9.1 is very strongly significant in relation to medicinal plant use behaviour with a *Pearson Chi-Square* of .008, while there is no significance seen towards non-medicinal plant use behaviour. A significant shift towards 'low' and 'very low' medicinal plant use is observed among all respondents in the sample, revealing a below 'average' medicinal plant use behaviour as can be seen from the data where the percentages of the majority, whose education level is 'none' (50.0%) and 'primary' (46.7%) are centred on the 'low' while those with 'secondary' (40.0%) and 'tertiary' (37.5%) fall in the 'average' and 'very low' categories respectively, again bringing out the fact put forward during the qualitative surveys that currently formal education is powerfully affecting the use of wild plants in Meru.

It has been noted from the outset that Kenya's current *formal education* system does not offer an education which allows its scholars the scope to gain knowledge and experience from parents as parents spend less and less time with their children who spend most of their time in school. When these children are finally at home they are loaded down with so much homework to try to help them keep up with the heavy subject burden, and hence they have very little time with their parents. In the former times parents gave children guidance on good behaviour and the way to live life properly, but this has now been forgotten, resulting in generations of the young who tend to look down on their parents and assume them to be illiterate and incapable of teaching them anything. For this reason, former traditions on the use of wild plants escape their attention and may continue to do so for generations to come if the trend is not reversed. All the same, it might have been expected that people of higher formal education would be more friendly to their vegetation environment since they are assumed to know more, especially about the nutritional value of food plants, medicinal values and best qualities of wood for fuel and materials, good trees for the environment which act as wind- and dust- breaks and also of ornamentals.

It is clear that current education system in Kenyan schools has borrowed heavily from the colonial system in which topics learned were and still are not necessarily relevant to the Kenyan student. They have a tendency to turn out *apers* of foreign ideologies and cultures which are regarded to be for the 'civilized' people. In this atmosphere education regarding wild vegetation is relegated to the 'uneducated', meaning those lacking formal education. For instance, this was observed during the qualitative study when assistants with a degree from the country's top universities could not imagine working, collecting and drying plants (*Makamba*) in the bush, as this was a job better done by domestic servants who have never been exposed to school. It is clear therefore from these results that a change in the education system towards appreciation of these indigenous plants would go a long way towards promoting their use, culminating in positive wild plant use behaviour among the Meru people.

Profession of Household Head

As shown on Table 9.1, the distribution of the variable 'profession of household head' over the reported medicinal and non-medicinal plant use behaviour has the *Pearson Chi-Squares* of .007 and .127 respectively, revealing that this variable is highly significant towards medicinal plant use behaviour, but reveal only an indication of significance towards non-medicinal plant use behaviour. The highest score on medicinal plant use behaviour among the 'landlord' category (100.0%) for both medicinal and non-medicinal plant use behaviour depict a shift towards 'low' medicinal and non-medicinal plant use. The percentages in the categories of 'herdsmen' (66.7%), 'farmer' (51.2%), 'civil servant' (50.0%) and 'house servant' (50.0%) reveal a similar shift towards 'low' medicinal plant use, hence depicting a 'low' to 'very low' use behaviour. It is worrying that the professionals in the greater Meru region show so little regard for the use of wild plants. Since the

colonial times it has been common to find land developers clearing huge chunks of land in order to pave way for construction of rental premises. In such instances, monetary gain takes precedence in their minds. Civil servants and farmers think it more fashionable to opt for modern crops for their daily needs as this is 'civilized behaviour', leading them to disregard the role wild plants might play in their lives, especially as sources of food, medicine and so on. Herdsmen, who might have been expected to turn to the wild for most of their resources in medicinal and non-medicinal requirements, look at these as sources of fodder for their animals, which they could milk, sell or butcher so as to earn money for hospitals and to buy medicine and foods from the supermarkets. It is not surprising to find most professionals buying *sukuma wiki* (kale) and other vegetables when they have *terere* (*Amaranthus hybridus*), *ntarimukia* (*Erucastrum arabicum*), *mathungu* (*Solanum nigrum*) and *thaa ya njogu* (*Urtica massaica*) in their indigenous fields and on farms. Education and sensitization about the value of the traditional sources of food, medicines and others seems to be lacking in almost all professions.

Psycho- Social Variables:

Awareness of Plant Environment

Table 9.1 shows that the distribution of the variable 'awareness of plant environment' over medicinal plant use behaviour is highly significant and only weakly significant towards non-medicinal plant use behaviour with *Pearson Chi-Squares* of .037 and .057 respectively. The highest scores are observed among the category of 'low' (75.0%) awareness revealing 'low' medicinal plant use behaviour. The scores for non-medicinal plant use behaviour is highest at 'low' (75.0%) awareness, revealing a shift in reported scores from 'low' medicinal plant use behaviour to 'high' non-medicinal plant use behaviour in this category.

While 'low' awareness interact with low medicinal plant use, it does not influence non-medicinal plant use behaviour, which means that to use wild plants a person does not necessarily need to be aware of what is good for vegetation environment, a must in medicinal plant use since the prevailing good or bad environment would affect medicinal plants significantly. For instance, during the qualitative study it was observed that medicinal contents in plants was diluted in floods or rainy seasons, while higher and drier habitats tended to produce plants in which the medical properties were highly concentrated.

The distribution of the variable 'perceived need of wild plant resources' of the household heads shown in Table 9.1 over the reported medicinal plant use behaviour was strongly significant with *Pearson Chi-Square* of .040. However, it showed no significance towards non-medicinal plant use behaviour. The highest scores are observed among the category of 'no' (50.0%) perceived need of plant resources depicting 'very low' medicinal plant use behaviour, while the score on non-medicinal plant use behaviour (66.7%) also scores 'very low'. It is not surprising to note that respondents who do show perceived need of plant resources scored low on both the two major uses of wild plants. This can be translated as a reflection of their lack of care for the environment and hence lack of understanding of its usefulness. This may reflect very negatively not only on plant use but also on conservation, because if a person cannot see the point of improving their environment, they would automatically see no point in conserving it. Nevertheless, some respondents seemed negative on this aspect, not because they did not care about their environment but because they lacked the space on their small and crowded plots to conserve trees. The next four variables, 'knowledge', 'belief', 'attitude' and 'experience' discussed in the next few paragraphs refer to these factors in *medicinal plant use*. These four are discussed again, but this time in relation to *non-medicinal plant use* to understand the behaviour in both uses.

Table 9.1 Distribution of pre-disposing variables in medicinal (usemd) and non-medicinal (usenm) uses of wild plants in the three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
household size																						
1 - 3 m	3	18.8	7	43.8	4	25.0	2	12.5	16	100.0	2	12.5	7	43.8	4	25.0	3	18.8	-	-	16	100.0
4 - 6 m	7	25.9	9	33.3	7	25.9	4	14.8	27	100.0	10	37.0	2	7.4	9	33.3	2	7.4	4	14.8	27	100.0
7 - 9 m	3	12.0	10	40.0	7	28.0	5	20.0	25	100.0	2	8.0	10	40.0	3	12.0	6	24.0	4	16.0	25	100.0
10 + m	1	14.3	2	28.6	-	-	4	57.1	7	100.0	1	14.3	1	14.3	3	42.9	-	-	2	28.6	7	100.0
(Pearson Chi-Square .397/Cramer's V .397)											**(Pearson Chi-Square .018/Cramer's V .018)**											
sex of household head																						
male	13	24.1	15	27.8	15	27.8	11	20.4	54	100.0	7	13.0	16	29.6	17	31.5	7	13.0	7	13.0	54	100.0
female	1	4.8	13	61.9	3	14.3	4	19.0	21	100.0	8	38.1	4	19.0	2	9.5	4	19.0	3	14.3	21	100.0
(Pearson Chi-Square .031/ Cramer's V .031)											(Pearson Chi-Square.069/Cramer's V .069)											
age																						
21 - 30	-	-	2	33.3	3	50.0	1	16.7	6	100.0	1	16.7	2	33.3	1	16.7	2	33.3	-	-	6	100.0
31 - 40	3	30.0	7	70.0	-	-	-	0.0	10	100.0	3	30.0	4	40.0	1	10.0	2	20.0	-	-	10	100.0
41 - 50	1	5.9	6	35.3	5	29.4	5	29.4	17	100.0	2	11.8	4	23.5	3	17.6	3	17.6	5	29.4	17	100.0
51 - 60	2	15.4	3	23.1	2	15.4	6	46.2	13	100.0	3	23.1	3	23.1	2	15.4	2	15.4	3	23.1	13	100.0
61 - 70	4	22.2	7	38.9	5	27.8	2	11.1	18	100.0	2	11.1	4	22.2	9	50.0	2	11.1	1	5.6	18	100.0
70 +	4	36.4	3	27.3	3	27.3	1	9.1	11	100.0	4	36.4	3	27.3	3	27.3	-	-	1	9.1	11	100.0
(Pearson Chi-Square .090/Cramer's V .090)											(Pearson Chi-Square .366/Cramer's V .366)											
formal education																						
none	1	8.3	6	50.0	-	-	5	41.7	12	100.0	5	41.7	1	8.3	3	25.0	1	8.3	2	16.7	12	100.0
primary	2	6.7	14	46.7	6	20.0	8	26.7	30	100.0	3	10.0	8	26.7	8	26.7	6	20.0	5	16.7	30	100.0
secondary	8	32.0	6	24.0	10	40.0	1	4.0	25	100.0	6	24.0	10	40.0	4	16.0	3	12.0	2	8.0	25	100.0
tertiary	3	37.5	2	25.0	2	25.0	1	12.5	8	100.0	1	12.5	1	12.5	4	50.0	1	12.5	1	12.5	8	100.0
(Pearson Chi-Square .008/Cramer's V .008)											(Pearson Chi-Square .350/Cramer's V.350)											
marital status																						
m. mg	11	21.6	16	31.4	14	27.5	10	19.6	51	100.0	8	15.7	15	29.4	16	31.4	7	13.7	5	9.8	51	100.0
m. pg	1	16.7	1	16.7	1	16.7	3	50.0	6	100.0	1	16.7	1	16.7	-	-	1	16.7	3	50.0	6	100.0
divorced	-	-	2	66.7	1	33.3	-	-	3	100.0	1	33.3	1	33.3	-	-	1	33.3	-	-	3	100.0
widowed	2	13.3	9	60.0	2	13.3	2	13.3	15	100.0	5	33.3	3	20.0	3	20.0	2	13.3	2	13.3	15	100.0
(Pearson Chi-Square .367/Cramer's V .367)											(Pearson Chi-Square .323/Cramer's V .323											
profession of household head																						
farmer	3	7.3	21	51.2	7	17.1	10	24.4	41	100.0	8	19.5	9	22.0	11	26.8	8	19.5	5	12.2	41	100.0
herdsman	-	-	2	66.7	-	-	1	33.3	3	100.0	-	-	2	66.7	1	33.3	-	-	-	-	3	100.0
c. servant	-	-	2	50.0	2	50.0	-	-	4	100.0	1	25.0	-	-	3	75.0	-	-	-	-	4	100.0
entrep.	3	33.3	-	-	4	44.4	2	22.2	9	100.0	1	11.1	3	33.3	-	-	2	22.2	3	33.3	9	100.0
pensioner	6	42.9	2	14.3	5	35.7	1	7.1	14	100.0	2	14.3	6	42.9	4	28.6	-	-	2	14.3	14	100.0
landlord	2	100.0	-	-	-	-	-	-	2	100.0	2	100.0	-	-	-	-	-	-	-	-	2	100.0
h servant	-	-	1	50.0	-	-	1	50.0	2	100.0	1	50.0	-	-	-	-	1	50.0	-	-	2	100.0
(Pearson Chi-Square .007/Cramer's V .007)											(Pearson Chi-Square .127/Cramer's V .127)											
knowledge of medicinal plant use																						
low	10	34.5	13	44.8	4	13.8	2	6.9	29	100.0	10	34.5	9	31.0	7	24.1	2	6.9	1	3.4	29	100.0
average	2	6.7	12	40.0	11	36.7	5	16.7	30	100.0	4	13.3	8	26.7	6	20.0	7	23.3	5	16.7	30	100.0
high	2	12.5	3	18.8	3	18.8	8	50.0	16	100.0	1	6.3	3	18.8	6	37.5	2	12.5	4	25.0	16	100.0
(Pearson Chi-Square .001/Cramer's V .001)											(Pearson Chi-Square .085/Cramer's V .085)											
knowledge of wild plants among children																						
N/A	1	11.1	4	44.4	3	33.3	1	11.1	9	100.0	2	22.2	3	33.3	1	11.1	3	33.3	-	-	9	100.0
no	2	20.0	7	70.0	-	-	1	10.0	10	100.0	4	40.0	3	30.0	1	10.0	1	10.0	1	10.0	10	100.0
partly	10	21.3	14	29.8	11	23.4	12	25.5	47	100.0	6	12.8	13	27.7	15	31.9	5	10.6	8	17.0	47	100.0
fully	1	11.1	3	33.3	4	44.4	1	11.1	9	100.0	3	33.3	1	11.1	2	22.2	2	22.2	1	11.1	9	100.0
(Pearson Chi-Square .297/Cramer's V .297)											(Pearson Chi-Square .405/Cramer's V.405)											

Table 9.1 (cont'nd) Distribution of pre-disposing variables in medicinal (usemd) and non-medicinal (usenm) uses of wild plants in the three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
belief in medicinal plant use																						
low	1	25.0	2	50.0	1	25.0	-	-	4	100.0	1	25.0	1	25.0	-	-	2	50.0	-	-	4	100.0
average	3	50.0	2	33.3	1	16.7	-	-	6	100.0	4	66.7	1	16.7	-	-	-	-	1	16.7	6	100.0
high	10	15.4	24	36.9	16	24.6	15	23.1	65	100.0	10	15.4	18	27.7	19	29.2	9	13.8	9	13.8	65	100.0
(Pearson Chi-Square .393/Cramer's V .393)											(Pearson Chi-Square .052/Cramer's V. 052)											
attitude towards medicinal plant use																						
low	5	50.0	3	30.0	1	10.0	1	10.0	10	100.0	3	30.0	2	20.0	3	30.0	1	10.0	1	10.0	10	100.0
average	3	20.0	7	46.7	5	33.3	-	-	15	100.0	5	33.3	2	13.3	4	26.7	3	20.0	1	6.7	15	100.0
high	6	12.0	18	36.0	12	24.0	14	28.0	50	100.0	7	14.0	16	32.0	12	24.0	7	14.0	8	16.0	50	100.0
(Pearson Chi-Square .037/Cramer's V.037)											(Pearson Chi-Square .662/Cramer's V.662)											
experience in medicinal plant use																						
low	7	35.0	9	45.0	2	10.0	2	10.0	20	100.0	7	35.0	4	20.0	5	25.0	2	10.0	2	10.0	20	100.0
average	2	11.1	10	55.6	5	27.8	1	5.6	18	100.0	5	27.8	7	38.9	3	16.7	2	11.1	1	5.6	18	100.0
high	5	13.5	9	24.3	11	29.7	12	32.4	37	100.0	3	8.1	9	24.3	11	29.7	7	18.9	7	18.9	37	100.0
(Pearson Chi-Square .017/Cramer's V.017)											(Pearson Chi-Square .238/Cramer's V.238)											
Preparedness to pay for wild plants																						
no	2	25.0	5	62.5	1	12.5	-	-	8	100.0	4	50.0	2	25.0	1	12.5	1	12.5	-	-	8	100.0
yes	12	17.9	23	34.3	17	25.4	15	22.4	67	100.0	11	16.4	18	26.9	18	26.9	10	14.9	10	14.9	67	100.0
(Pearson Chi-Square .262 /Cramer's V .262)											(Pearson Chi-Square .211/Cramer's V .211.)											
awareness of plant environment																						
low	1	25.0	3	75.0	-	-	-	-	4	100.0	-	-	1	25.0	-	-	3	75.0	-	-	4	100.0
average	1	12.5	4	50.0	-	-	3	37.5	8	100.0	3	37.5	2	25.0	1	12.5	-	-	2	25.0	8	100.0
high	6	15.0	9	22.5	15	37.5	10	25.0	40	100.0	5	12.5	13	32.5	11	27.5	6	15.0	5	12.5	40	100.0
very high	6	26.1	12	52.2	3	13.0	2	8.7	23	100.0	7	30.4	4	17.4	7	30.4	2	8.7	3	13.0	23	100.0
(Pearson Chi-Square .037/Cramer's V .037)											(Pearson Chi-Square.057/Cramer's V.057)											
Perceived need of wild plant resources																						
no	3	50.0	1	16.7	1	16.7	1	16.7	6	100.0	4	66.7	-	-	1	16.7	-	-	1	16.7	6	100.0
yes	11	15.9	27	39.1	17	24.6	14	20.3	69	100.0	11	15.9	20	29.0	18	26.1	11	15.9	9	13.0	69	100.0
(Pearson Chi-Square.225/Cramer's V .225)											**(Pearson Chi-Square .040/Cramer's V.040)**											
knowledge of non-medicinal plant use																						
low	2	11.8	1	5.9	5	29.4	9	52.9	17	100.0	1	5.9	3	17.6	6	35.3	2	11.8	5	29.4	17	100.0
average	7	16.7	20	47.6	10	23.8	5	11.9	42	100.0	8	19.0	11	26.2	12	28.6	6	14.3	5	11.9	42	100.0
high	5	31.3	7	43.8	3	18.8	1	6.3	16	100.0	6	37.5	6	37.5	1	6.3	3	18.8	-	-	16	100.0
(Pearson Chi-Square .002/Cramer's V.002)											(Pearson Chi-Square .074/Cramer's V.074)											
belief in non-medicinal plant use																						
low	6	12.2	18	36.7	14	28.6	11	22.4	49	100.0	7	14.3	10	20.4	14	28.6	10	20.4	8	16.3	49	100.0
average	6	30.0	8	40.0	3	15.0	3	15.0	20	100.0	6	30.0	7	35.0	4	20.0	1	5.0	2	10.0	20	100.0
high	2	33.3	2	33.3	1	16.7	1	16.7	6	100.0	2	33.3	3	50.0	1	16.7	-	-	-	-	6	100.0
(Pearson Chi-Square .559/Cramer's V.559)											(Pearson Chi-Square .268/Cramer's V.268)											
attitude towards non-medicinal plant use																						
low	2	5.7	11	31.4	11	31.4	11	31.4	35	100.0	5	14.3	9	25.7	7	20.0	7	20.0	7	20.0	35	100.0
average	10	31.3	13	40.6	6	18.8	3	9.4	32	100.0	7	21.9	8	25.0	10	31.3	4	12.5	3	9.4	32	100.0
high	2	25.0	4	50.0	1	12.5	1	12.5	8	100.0	3	37.5	3	37.5	2	25.0	-	-	-	-	8	100.0
(Pearson Chi-Square .048/Cramer's V.048)											(Pearson Chi-Square .468/Cramer's V.468)											
experience in non-medicinal plant use																						
low	3	9.1	8	24.2	9	27.3	13	39.4	33	100.0	3	9.1	9	27.3	7	21.2	6	18.2	8	24.2	33	100.0
average	8	24.2	16	48.5	8	24.2	1	3.0	33	100.0	7	21.2	9	27.3	11	33.3	4	12.1	2	6.1	33	100.0
high	3	33.3	4	44.4	1	11.1	1	11.1	9	100.0	5	55.6	2	22.2	1	11.1	1	11.1	-	-	9	100.0
(Pearson Chi-Square .006/Cramer's V.006)											**(Pearson Chi-Square .050/Cramer's V.050)**											
Gen.Total	14	18.7	28	37.3	18	24.0	15	20.0	75	100.0	15	20.0	20	26.7	19	25.3	11	14.7	10	13.3	75	100.0

Table 9.2 Distribution of socio-economic status variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
socio- economic status																						
very poor	-	-	4	36.4	2	18.2	5	45.5	11	100.0	1	9.1	3	27.3	3	27.3	2	18.2	2	18.2	11	100.0
poor	4	12.1	15	45.5	7	21.2	7	21.2	33	100.0	9	27.3	7	21.2	6	18.2	7	21.2	4	12.1	33	100.0
average	3	18.8	6	37.5	5	31.3	2	12.5	16	100.0	1	6.3	7	43.8	5	31.3	1	6.3	2	12.5	16	100.0
rich	3	37.5	3	37.5	1	12.5	1	12.5	8	100.0	2	25.0	-	-	4	50.0	-	-	2	25.0	8	100.0
very rich	4	57.1	-	-	3	42.9	-	-	7	100.0	2	28.6	3	42.9	1	14.3	1	14.3	-	-	7	100.0
(Pearson Chi-Square .053/Cramer's V.053)											(Pearson Chi-Square .419/Cramer's V.419)											
Gen. Total	14	18.7	28	37.3	18	24.0	15	20.0	75	100.0	15	20.0	20	26.7	19	25.3	11	14.7	10	13.3	75	100.0

Table 9.3 Distribution of environmental variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
environment																						
KK Lumbi	1	4.0	9	36.0	4	16.0	11	44.0	25	100.0	2	8.0	4	16.0	7	28.0	6	24.0	6	24.0	25	100.0
Kinoru	12	48.0	4	16.0	8	32.0	1	4.0	25	100.0	7	28.0	8	32.0	5	20.0	1	4.0	4	16.0	25	100.0
Kagera	1	4.0	15	60.0	6	24.0	3	12.0	25	100.0	6	24.0	8	32.0	7	28.0	4	16.0	-	-	25	100.0
(Pearson Chi-Square .000/Cramer's V.000)											(Pearson Chi-Square .085/Cramer's V.085)											
Gen. Total	14	18.7	28	37.3	18	24.0	15	20.0	75	100.0	15	20.0	20	26.7	19	25.3	11	14.7	10	13.3	75	100.0

Table 9.4 Distribution of conservation variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
conservation																						
low	3	9.7	9	29.0	12	38.7	7	22.6	31	100.0	8	25.8	6	19.4	8	25.8	5	16.1	4	12.9	31	100.0
average	9	28.1	12	37.5	5	15.6	6	18.8	32	100.0	7	21.9	8	25.0	7	21.9	5	15.6	5	15.6	32	100.0
high	2	16.7	7	58.3	1	8.3	2	16.7	12	100.0	-	-	6	50.0	4	33.3	1	8.3	1	8.3	12	100.0
(Pearson Chi-Square. 123/Cramer's V.123)											(Pearson Chi-Square .506/Cramer's V.506)											
Gen. Total	14	18.7	28	37.3	18	24.0	15	20.0	75	100.0	15	20.0	20	26.7	19	25.3	11	14.7	10	13.3	75	100.0

Table 9.5 Distribution of intervening variables over medicinal (usemd) and non-medicinal (usenm) use of wild plants in three villages of the greater Meru region (N=75)

Variable	medicinal plant use										non-medicinal plant use											
	very low		low		average		high		Total		very low		low		average		high		very high		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
intervening awareness																						
don't know	5	16.1	14	45.2	9	29.0	3	9.7	31	100.0	9	29.0	9	29.0	7	22.6	4	12.9	2	6.5	31	100.0
Yes	9	20.5	14	31.8	9	20.5	12	27.3	44	100.0	6	13.6	11	25.0	12	27.3	7	15.9	8	18.2	44	100.0
(Pearson Chi-Square. 219/Cramer's V.219)											(Pearson Chi-Square .352/Cramer's V.352)											
encouraging policies																						
don't know	5	62.5	1	12.5	2	25.0	-	-	8	100.0	5	62.5	1	12.5	1	12.5	-	-	1	12.5	8	100.0
No	1	8.3	5	41.7	-	-	6	50.0	12	100.0	2	16.7	4	33.3	2	16.7	2	16.7	2	16.7	12	100.0
Yes	8	14.5	22	40.0	16	29.1	9	16.4	55	100.0	8	14.5	15	27.3	16	29.1	9	16.4	7	12.7	55	100.0
(Pearson Chi-Square. 001/Cramer's V.001)											(Pearson Chi-Square .173/Cramer's V.173)											
discouraging policies																						
don't know	4	50.0	2	25.0	2	25.0	-	-	8	100.0	5	62.5	1	12.5	2	25.0	-	-	-	-	8	100.0
no	9	16.1	21	37.5	14	25.0	12	21.4	56	100.0	10	17.9	15	26.8	17	30.4	5	8.9	9	16.1	56	100.0
yes	1	9.1	5	45.5	2	18.2	3	27.3	11	100.0	-	-	4	36.4	-	-	6	54.5	1	9.1	11	100.0
(Pearson Chi-Square. 269/Cramer's V.269)											**(Pearson Chi-Square .000./Cramer's V.000)**											
Gen.Total	14	18.7	28	37.3	18	24.0	15	20.0	75	100.0	15	20.0	20	26.7	19	25.3	11	14.7	10	13.3	75	100.0

Knowledge of Medicinal Plant Use

The distribution of the variable 'knowledge' shown in Table 9.1 of the household heads on the reported medicinal and non-medicinal plant use behaviour is very strongly significant towards medicinal plant use behaviour and weakly significant towards non-medicinal plant use behaviour with *Pearson Chi-Squares* of .001 and .085 respectively. The highest score in this variable is reported among the 'high' (50.0%) knowledge category, which shows 'high' medicinal plant use behaviour. The scores in the same category are highest at 'average' (37.5%), indicating a shift from 'high' medicinal plant use behaviour towards 'average' non-medicinal plant use behaviour. Knowledge of medicinal plant use here which is vital when obtaining medicines from wild plants has already been confirmed and hence the significant influence in the results shown above. As mentioned before, without knowledge of medicinal plants, the useful parts, the application and dissemination of the medicine prepared, it becomes impossible to make use of these plants, the effects are revealed in the outcome variables of medicinal plant use behaviour.

Belief, Attitude and Experience in Medicinal Plant Use

The distribution of the variable 'belief' over medicinal and non-medicinal plant use behaviour shown in Table 9.1 show no significance (*Pearson Chi-Square* is .393), but it is weakly significant with a *Pearson Chi-Square* of .052 towards non-medicinal plant use behaviour and has the highest scores (50.0%, 66.7.0%) in categories ranging from 'low' to 'very low' belief in medicinal and non-medicinal plant use. The respondents' beliefs are mostly influenced by their spiritual inclinations (100.0% Christian) in the greater Meru region, earlier assumed to be of significant influence in the lives of the people in relation to medicinal plant use behaviour, but now proven to be otherwise. Knowledge of such cases play a determining role in whether to use plants for medicine or not, placing belief a distant last. Meanwhile, the distribution of the variable 'attitude' of the household head to medicinal plant use behaviour is strongly significant with a *Pearson Chi-Square* of .037. There appears to be no significance recorded towards non-medicinal plant use behaviour (*Pearson Chi-Square* .662). The highest score (50.0%) in medicinal plant use behaviour is found in the category of 'low' attitude, depicting 'very low' medicinal plant use. Positive or negative attitudes towards medicinal plant use depend heavily on the culture of the people. The sheer record of use of such plants for generations by parents and grandparents play major roles in shaping this attribute, creating a significant influence in the behaviour of the people. The distribution of the variable 'experience' is very strongly significant towards medicinal plant use as revealed by the *Pearson Chi-Square* of .017 in Table 9.1 on medicinal and non-medicinal plant use behaviour. There is no significance seen towards non-medicinal plant use behaviour as the *Pearson Chi-Square* is .238. The highest score on medicinal plant use is found in the 'average' (55.6%) experience depicting 'low' medicinal plant use behaviour.

Knowledge of Non-medicinal Plant Use

As regards variable 'knowledge' in non-medicinal plant use, Table 9.1 shows it is very strongly significant with a *Pearson Chi-Square* of .002 towards medicinal plant use behaviour and weakly significant towards non-medicinal plant use behaviour, where the *Pearson Chi-Square* is .074. The highest reported scores (52.0%) of 'high' medicinal plant use are recorded at 'low' knowledge of non-medicinal plant use, implying that there is little influence on the respondents' medicinal plant use behaviour where knowledge of the non-medical use of plants is significant in the use of the same for medicine. In other words, it is not necessary to know that a certain plant is useful for fuel, material or social purposes in order to use it for medicine. The distribution of the weakly significant variable 'knowledge of non-medicinal plant use on non-medicinal plant use behaviour has its

highest scores (37.5%) shifting from 'low' to 'very low' use, exposing the fact that knowledge of these uses is generally insignificant. This means that the knowledge of the individual use is vital to and influential in each use behavioural patterns as will be confirmed in the sections which will deal with each of the seven individual, non-medicinal plant uses later.

Attitude and Experience in Non-medicinal Plant Use

The distribution of the variable 'attitude' over medicinal and non-medicinal plant use behaviour in Table 9.1 is strongly significant with a *Pearson Chi-Square* of .048 towards medicinal plant use behaviour recorded through the household heads responses. The distribution over non-medicinal plant use behaviour is not significant at all since the *Pearson Chi-Square* is .468. The relationship of attitude and medicinal plant use behaviour has its highest score (100.0%) in the category 'high' attitude, depicting 'low' medicinal plant use. This means that a positive attitude towards non-medicinal plant use does not influence medicinal plant use behaviour among the respondents in the three villages in Meru.

The variable 'experience' in non-medicinal plant use is strongly significant as revealed by *Pearson Chi-Square* of .006 on the distribution Table 9.1 above on medicinal and non-medicinal plant use behaviour. The highest reported scores (48.5.%) by the household heads with 'average' experience in non-medicinal plant use and 'low' medicinal plant use, as well as 'high' experience in non-medicinal plant use (*Pearson Chi-Square* .050) indicate a shift from low medicinal plant use behaviour to very low non-medicinal plant use behaviour. In essence the results show that experience in *non-medicinal plant use* does not influence the behaviour of the respondents at all.

9.1.4 Enabling Factors (SES)

The description of the life of the respondents in the three communities of Meru in Chapter V reveal that most of the local people live below the poverty line and contributed a total of 5.01 per cent to the sum total of national poverty. It was patently seen that while certain members of the community were indeed abysmally poor, others were not. In Chapter III, enabling factors were demonstrated to include such variables at the individual level as monthly income, type of house and number of bedrooms, amount of land, both rural and urban, ownership of animals and assets, elements which were regarded as characteristic of the respondents' life in the survey and a reflection of the socio-economic wealth of the Meru society. These variables were recalculated into a single variable; the Socio-economic status (SES) during the preparation of data which finally resulted into the division of respondents into five main categories of: 'very poor', 'poor', 'average', 'rich' and 'very rich'. The determination of the five categories as explained in Chapter V was reached, after the quantitative survey revealed that there were some 'very poor' respondents in the true sense of the word, but there were also some who were 'very rich'. These two groups exceeded the mark set as the limit for both extremes. For example, if the limit for monthly income was Ksh. 10,000 with an allowance of Ksh 5,000 above, the respondents would earn ten times the amount; if the limit for grade cows for the 'rich', was six, those owning such cattle would have farms in the former white highlands of Timau with fifty grade cattle, they would have two cars, two telephones, two houses all stone/brick buildings, six or more bedrooms, tiled roofing and so on.

Socio-Economic Status (SES)

The distribution of the 'Socio-economic Status' variable over both medicinal and non-medicinal plant use behaviour of the respondents reported weakly significant responses as shown on Table 9.2

with a *Pearson Chi-Square* of .053. The relationship between socio-economic status and medicinal plant use behaviour score highest (57.1%) in the 'very rich' socio-economic category, revealing 'very low' medicinal plant use behaviour. There is no significant relationship exhibited in the distribution of this variable over non-medicinal plant use behaviour as shown in Table 9.2, where the *Pearson Chi-Square* is .419. Nearly half (45.5%) of the respondents who were categorized as 'very poor' showed 'high' non-medicinal plant use behaviour, while slightly less than a fifth (18.2%) had 'average', and more than one-third (36.4%) showed 'low' non-medicinal plant use behaviour. Generally there is a tendency of the 'very poor' respondents to register 'high' medicinal plant use behaviour, while the 'very rich' tend to shift towards 'very low' non-medicinal plant use behaviour according to the scores recorded from household heads' responses. This could be attributed to the fact that the 'very rich' could afford conventional medicine, a luxury far beyond the reach of the 'very poor'.

9.1.5 Environmental Factors

The distribution of the variable 'environment' representing the villages in which the respondents live in the three villages of Meru given in Table 9.3 above is one of the most strongly significant of all. Its distribution over medicinal plant use behaviour showed a *Pearson Chi-Square* of .000, while the distribution of the same over non-medicinal plant use behaviour according to the reported responses of the respondents is weakly significant, with a *Pearson Chi-Square* of .085. In relation to medicinal plant use behaviour, the highest score (60.0%) of a household head is reported in the '*Kagera*', village depicting 'low' medicinal plant use behaviour, whereas the '*Kinoru*' category reveal 'very low' medicinal plant use behaviour as seen in its highest score (48.0%).

On the other hand, the highest score (44.0%) for '*KK Lumbi*' is in the 'high' category, revealing high medicinal plant use behaviour. As was reported in the qualitative survey and also seen in the data in Chapters V and VIII, Meru North District is popularly known for its *miraa* (*Catha edulis*) farming. Young and old, male and female alike (see Figures 8.3 & 8.4) are known to chew the young twigs of this plant explaining the 'high' use rate. The environment which stands for the villages in which respondents who were interviewed live reveal a significant relationship with the behaviour of the people in the community, since this inexorably influence the type and access to education, health facilities, water and sanitation, transportation facilities, knowledge, experiences, attitudes and beliefs on the wild vegetation available within their setting and so on. For instance, the behaviour of the respondents living in rural *Kagera* village and those living in *Kinoru* in the municipality were subjected to different influences in their use of wild plants also depending on factors related to their socio-economic life.

9.1.6 Intervening and Policy Factors

Intervening and policy factors are variables found in the analysis at the system level which tend to influence the communities' medicinal and non-medicinal plant use behaviour, especially as a result of the influence which these factors have on the individual's plant use behaviour. These factors have already been described as including *intervening awareness* which do support or do not support wild plant use, plus *knowledge of encouraging* and *discouraging policies* on the use of these wild plant resources. While the variable 'intervening awareness' show no significance in both medicinal and non-medicinal plant use behaviour, with values of the *Pearson Chi-Squares* of .219 and .352

respectively, the other two variables - encouraging and discouraging policies - show very strong significance as indicated below

Encouraging and Discouraging Policies

The distribution of the variable 'encouraging policies' in Table 9.5 shows that there it has no significance in non-medicinal plant use behaviour where the *Pearson Chi-Square* is .173, but it is very strongly significant in relation to medicinal plant use behaviour with a *Pearson Chi-Square* of .001. The lowest score registered in distribution of the variable 'medicinal plant use' (62.5%) is registered for 'very low' use among the respondents who 'don't know' of the existence of any such policies. It is not clear whether their relatively low use of these plants is the result of a lack of encouragement or otherwise, but there is such a possibility. In fact some encouragement could go a long way in promoting the sustainable of wild plants. 'Discouraging policies' are reported mostly in relation to material plant use. The distribution of this variable noted in Table 9.5 confirm that there is no significance as recorded over medicinal plant use behaviour since the *Pearson Chi-Square* is .269, while it is most strongly significant, with a *Pearson Chi-Square* of .000, in non-medicinal plant use behaviour. The highest scores (62.5%) obtained of household heads' responses is in the category of respondents who reported that they 'don't know' about policies of this nature, consequently show 'very low' non-medicinal plant use behaviour. The respondents who reply that they were aware of such policies score highest (54.5%) registering 'high' non-medicinal plant use behaviour. This high use behaviour could be attributed to the fact that the discouragements chiefly target only trees used for material use. Actually, these discouraging policies in real sense are just verbal, not written into the law and leading to possible prosecution. It thereby tacitly conceded members of the community the right to use plants as they so wished, especially when it was confirmed that 100 per cent of all the respondents used firewood for fuel. Finally, it should be clear by now that several variables relate very strongly to both medicinal and non-medicinal plant use behaviour in the Meru Community. The variables which show significance through *Pearson Chi-Squares* in *medicinal plant use behaviour* are given in Table 9.6 below.

Table 9.6: List of variables showing significant associations with wild medicinal plant use behaviour according to the values of the *Pearson Chi-Squares* as reported by the respondents of the sample surveys.

Variable	Pearson Chi-Square
Environment *(environ)*	.000
Knowledge of medicinal plant use *(knm)*	.001
Encouraging policies *(encpol)*	.001
Knowledge of non-medicinal plant use *(knnm)*	.002
Experience on non-medicinal plant use *(expnm)*	.006
Profession of household head *(prof)*	.007
Formal education *(formed)*	.008
Experience in medicinal plant use *(expm)*	.017
Sex of household head *(sexhhd)*	.031
Awareness of plant environments *(awarness)*	.037
Attitude towards medicinal plant use *(attm)*	.037
Attitude towards non-medicinal plant use *(attnm)*	.048

Pearson Chi-Squares expressed in descending order.

Looking at medicinal plant use behaviour, for instance, predisposing variables which include 'knowledge' in both medicinal and non-medicinal plant use, 'profession of household head', 'formal education', 'experience', sex of household head', 'awareness of plant environment' and 'attitude' as well as environmental and intervening variables such as 'environment' and 'encouraging policies', respectively, reveal significant relationships. The variable 'environment', for instance, emerge as most strongly significant, confirming the role which it plays in the overall use of medicinal plants leading to the behaviour observed in the community. Conversely, such predisposing variables as 'household size', 'perceived need of plant resources' and 'experience' as well as 'discouraging policies' confirmed their significance in non-medicinal plant use behaviour. This testified to the important role wild plants play in the live of the Meru. Table 9.7 below shows the variables which are significant in *non-medicinal plant use behaviour*, as revealed in *Pearson Chi-Squares* values shown.

Table 9.7: List of variables showing significant associations with wild non-medicinal plant use behaviour according to the values of the *Pearson Chi-Squares* as reported by the respondents of the sample surveys.

Variable	Pearson Chi-Square
Discouraging policies *(discpol)*	.000
Household size *(hhsize)*	.018
Perceived need of plant resources *(wishimp)*	.040
Experience in non-medicinal plant use *(expnm)*	.050

Pearson Chi-Squares expressed in descending order.

As a conclusion to the bivariate analysis, the overall results generally reveal a marked downward shift from 'very high' to 'high', in very limited circumstances to 'low' and 'very low', medicinal and non-medicinal plant use, confirming relatively low medicinal and non-medicinal plant use behaviour among the communities in Meru. These results reveal that, although there is a variety of wild flora accessible to the community, its ability to use them is hampered and ridiculed and finally devalued to the sorry state that ailments thrive alongside other pressing needs, overwhelming the community and pushing it into abject poverty. Its members' experiences, beliefs and attitudes, coupled with their knowledge of their wild flora are wasted and not translated into practical solutions to their needs, partly because of Government failure to recognize the role these plants play in the society, and also its failure to put into place clear-cut policies which might encourage community members in the use of their vegetation resources. Unquestionably, sometimes the old-fashioned formal education system does not translate into solving the problems of its community. The general feeling that the use of alternative medicine is evil and sinful also makes any pharmacy using such native wild plants in this poor community ineffective.

It was deemed unsatisfactory to conduct just a bivariate analysis alone, to try to understand the relationship between variables and the two sets of behaviour in question, since it would require excessive numbers of tables, making the whole analysis extremely complicated, since there would be over 200 tables involved. Moreover, these tables would still not explain the fairly strong relationships existing between the predisposing, enabling, environmental, conservation and intervening variables on the one hand and the variables of the medicinal and non-medicinal plant use behaviour on the hand unequivocally. In the next sections therefore, yet another analysis is made (OVERALS) in order to examine the variations in medicinal and non-medicinal plant use behaviour through correlations and relationships among all variables of Sets One and Two.

9.2 Multivariate Analysis: OVERALS

The cross-tabulation tables presented above indicate the relationships existing between the independent variables of predisposing, enabling, environment, conservation and intervening and the dependent variables of medicinal and non-medicinal plant use behaviour. In the tables it is possible to observe that there are relationships between all six categories of factors and also between the dependent variables. To gain a deeper understanding of how the variables interact and relate to medicinal and non-medicinal plant use behaviour, an explanatory model is developed and implemented on the basis of the Conceptual Model and its Components which are earlier discussed in Chapter III. Previous contributions to the development and the success of this model of human behaviour were made by Kohn & White (1976), and later by Van der Burg, De Leeuw & Verdegaal (1983; 1988) at the University of Leiden, where related multivariate analysis have been tested and refined. Later, the model was used by Slikkerveer (1990; 2001) and Agung (2005) and adapted to trans-cultural health care use behaviour in Ethiopia, and conservation of biodiversity conservation Bali respectively, providing the basis of the analytical model of multivariate analysis of medicinal and non-medicinal behaviour: the non-linear correlation analysis.

9.2.1 OVERALS Canonical Correlation Analysis

The coherence between the categories of independent and dependent variables of *medicinal* and *non-medicinal plant use behaviour* in Meru can be determined through the non-linear canonical correlation analysis which subsequently makes it possible to interpret such coherence and finally to include it in the final study model. This particular method is called factor analysis. The Canonical Correlation (r) refers to the correlation between two sets of categories of variables in which the variable from the first set has the maximum correlation with the variable of the second set. All the twenty-four variables described at the beginning of this chapter and discussed in Chapter III, as factors in 'blocks', and again in Chapter V helping to understand the kind of life in the communities are subjected to quantitative analysis (OVERALS) and implemented in the canonical correlation model of medicinal and non-medicinal plant use. The analysis for variables of both Sets 1 and 2 by alternating least squares enables the number of sets with variables in each set as well as well as the number of solutions or Dimensions to be specified. Figure 9.1 shows the projection of variables onto the canonical space which indicates the category quantifications and the category coordinates.

The twenty-four variables and their labels have been categorized in the 'blocks' of the model as follows: *Block 1*: Socio-demographic variables such as 'household size' (label 'hhsize'), 'sex of household head' (label 'sexhhhd'), 'age' (label 'age'), 'formal education' (label formed'), 'marital status' (label 'mstatus'), and 'profession of household head' of household head (label 'profession of household head'). *Block 2*: Psycho-social variables consisting of 'preparedness to pay' (label 'wiltopay'), 'awareness of plant environment' (label 'awarness'), 'perceived need of plant resources' (label 'wishimp'), 'knowledge of wild plants among children' (label 'kntranch'), 'knowledge of medicinal plant use' (label 'knm'), 'belief in medicinal plant use' (label 'bfm'), 'attitude towards medicinal plant use (label 'attm'), 'experience in medicinal plant use' (label 'expm'); 'knowledge of non-medicinal plant use (label 'knnm'), 'belief in non-medicinal plant use' (label 'bfnm'), 'attitude towards non-medicinal plant use' (label 'attnm'), and 'experience in non-medicinal plant use' (label 'expnm'). *Block 3*: Enabling variables composed of 'socio-economic status' (label 'SES'. *Block 4*: Environmental variables comprising 'environment' (label 'environ'). *Block 5*: Conservation variables which include 'conservation' (label 'conserv'). *Block 6*: Intervening

variables including 'encouraging policies' (label 'encpol'), 'discouraging policies' (label 'discpol'). *Block 7* and *block 8* which comprise of the dependent variables: 'medicinal plant use behaviour' (label 'usemd') and non-medicinal plant use behaviour' (label 'usenm') respectively.

The last four variables wee replaced by knowledge, belief, attitude and experience of each plant use category in the OVERALS analysis related to the seven plant uses mentioned earlier. Although these were not incorporated into the final model, their variables and labels are as follows: Food plant use: 'knowledge of food plant use' (label 'knfd'), 'belief in food plant use' (label 'bffd'), 'attitude towards food plant use' (label 'attfd'), 'experience in food plant use' (label 'expfd'). Material plant use: 'knowledge of material plant use' (label 'knmat'), 'belief in material plant use' (label 'bfmat'), 'attitude towards material plant use' (label 'attmat'), 'experience in material plant use' (label 'expmat'). Social plant use: 'knowledge of social plant use' (label 'kns'), 'belief in social plant use' (label 'bfs'), 'attitude towards social plant use' (label 'atts'), 'experience in social plant use' (label 'exps'). Fuel plant use: 'experience in fuel plant use' (label 'expf'), 'belief in fuel plant use' (label 'bff'), 'attitude towards fuel plant use' (label 'attf'), 'experience in fuel plant use' (label 'expf'). Environmental plant use: 'knowledge of environmental plant use' (label 'kne'), 'belief in environmental plant use' (label 'bfe'), 'attitude towards environmental use' (label 'atte'), 'experience in environmental plant use' (label 'expe'). Use of non-vertebrate poisons plants: 'knowledge of non-vertebrate poisons plant use' (label 'knnvp'), 'belief in non-vertebrate poisons plant use' (label 'bfnvp'), 'attitude towards non-vertebrate poisons plant use' (label 'attnvp'), 'experience in non-vertebrate poisons plant use' (label 'expnvp'). Bee plant use: 'knowledge of bee plant use' (label 'knbp'), 'belief in bee plant use' (label 'bfbp'), 'attitude towards bee plant use' (label 'attbp'), 'experience in bee plant use' (label 'expbp').

Table 9.8 below shows the distribution of the Component Loadings (C) for both Dimensions between Sets 1 and 2 of the twenty-six variables in the survey (N=75) revealing that the independent variables in Set 1 and the dependent variables in Set 2 are significantly related for both medicinal and non-medicinal plant use behaviour. The relationship of the dependent variable, *medicinal plant use behaviour* is very strong (-0.933) in Dimension one, while that of *non-medicinal plant use behaviour* emerges strongly in the second Dimension (-0.800). Subsequently the relationship between independent variables in Set 1 and the dependent variables in Set 2 also interacted significantly with non-medicinal plant use behaviour (-0.531), adding support to the very close interaction between medicinal and non-medicinal plant use of wild plants. Similar relationships do not appear as strong between Set 1 of the independent variables and Set 2 of the dependent variables in medicinal plant use behaviour in Dimension 2, which could be attributed to weak relationships existing between certain uses of wild plants, for instance, in the social plant use as well as in the material plant use in relation to medicinal plant use behaviour

The Component Loadings also indicate that the variables which are strongest in the solution confirm the results of the bivariate analysis. Among the strongest socio-demographic variables were 'household size' (*Pearson Chi-Square* = .018 & Component Loading on Dimension 1 = -.197) expressing the determinant role it plays in non-medicinal plant use behaviour of the household heads, where the smallest households of one to three members and those of ten plus members dominate, confirming the low and average medicinal plant use behaviour respectively at the community level. The significance of the variable 'sex of household head' (*Pearson Chi-Square* = .018 & Component Loading on Dimension 2 = -.460) which is dominated by 'female' confirm the dominant role gender plays in medicinal plant use behaviour at the individual level, as female respondents with low medicinal plant use behaviour form the majority. The significance of variable 'profession of household head' (*Pearson Chi-Square* = .007 and Component Loading on Dimension 1 = .251) is dominant where those respondents who are landlords form the majority.

The 'soft' psycho-social variables in Set 1 in the analysis also betray their significance. Among these are the variable 'perceived need of plant resources' (*Pearson Chi-Square* = 040 & Component Loadings in Dimension 1 & 2 = resp. -.325, .241) where respondents who lack perceived need of plant resources are the majority, showing 'very low' medicinal plant use behaviour to be dominant. The significance of the variable 'knowledge' of medicinal plant use (*Pearson Chi-Square* = .001 & Component Loading on Dimension 1 = .412) where respondent with high knowledge and low medicinal plant use behaviour, dominate at the individual level in the community. The distribution of the Component Loadings for both Dimensions between Sets 1 and 2 of the twenty-six variables in the survey are given in Table 9.8.

Table 9.8 Distribution of the Component Loadings © for both dimensions between sets 1 and 2 of the 26 variables in the survey (N=75).

Set	variable	Dimension 1	Dimension 2
1	sexhhhd (a,b)	-0.115	-0.460
	hhsize (c,b)	-0.197	0.101
	age (c,b)	0.246	-0.005
	formed (c,b)	0.258	0.227
	mstatus (a,b)	0.032	-0.142
	prof (a,b)	0.251	-0.152
	wiltopay (a,b)	-0.164	0.252
	awarness (c,b)	0.002	-0.084
	wishimp (a,b)	-0.325	0.241
	kntranch (a,b)	-0.047	-0.026
	knm (c,b)	-0.412	0.137
	bfm (c,b)	-0.067	0.003
	attm (c,b)	-0.374	0.019
	expm (c,b)	-0.266	0.232
	knnm (c,b)	0.305	-0.174
	bfnm (c,b)	0.255	-0.079
	attnm (c,b)	0.374	0.058
	expnm (c,b)	0.259	-0.292
	SES (c,b)	0.340	0.128
	environ (a,b)	0.580	0.134
	conserv (a,b)	0.044	0.305
	institaw (a,b)	-0.051	0.239
	encpol (a,b)	0.285	0.023
	discpol (a,b)	-0.393	0.231
2	usemd (c,b)	-0.933	-0.258
	usenm (c,b)	-0.531	0.800

a = optimal Scaling Level: Single Nominal.
b = projections of the Single Quantified Variables in the Object Space.
c = optimal Scaling Level: Ordinal.

Meanwhile the significance of the variable 'knowledge' in non-medicinal plant use (*Pearson Chi-Square* = .002 & Component Loading on Dimension 1 & 2 = resp. .303, -.174) help to confirm the dominant role it exerts on 'medicinal plant use behaviour' of the respondent at the individual level.

The variable 'attitude' in both medicinal and non-medicinal plant use (*Pearson Chi-Squares* = resp. .037; .048 & Component Loading on Dimension 1 = resp. -.374, .374) is dominated by 'low' attitude & 'very low' medicinal as well as 'average' attitude and 'low' 'non-medicinal plant use behaviour' emphasizing its dominant role.

The variable 'experience' in medicinal plant use (*Pearson Chi-Square* = .017 & Component Loading on both Dimension 1 & 2 = resp. -.266, .233) dominated by average experience and low medicinal plant use behaviour confirm the relatively strong influence it exert on the lives of the household heads at the individual level within the community. Simultaneously, the same variable 'experience' on non-medicinal plant use (*Pearson Chi-Square* .006, & Component Loading on Dimension 1 & 2 = .259, .292) dominated by average experience and low medicinal plant use behaviour confirm its significance, and the same variable 'experience' in non-medicinal plant use towards non-medicinal plant use behaviour (*Pearson Chi-Square* .050 & Component Loading on Dimension 1&2 = .259, .292) affirm the dominant role this variable play, as high experience and low non-medicinal plant use behaviour predominated. The significance of one of the strongest variables 'environment' (*Pearson Chi-Square* = .000 & Component Loading on Dimension 1 = .580) confirm the dominant role of the environment where the respondents reported medicinal and a lesser extent non-medicinal plant use behaviour.

Intervening variables, among them variable 'encouraging policies' (*Pearson Chi-Square* = .001 & Component Loading on Dimension 1 = .285) where respondents who do not know of any discouraging policies form the majority is significantly weighted reflecting very low medicinal plant use behaviour at the community level. At the same time, the variable 'discouraging policies' (*Pearson Chi-Square* = .001 & Component Loading on both Dimension 1 & 2 = resp. -.392, .231) is dominant with the majority of respondents who were unaware of any policies of this nature, reflecting very low non-medicinal plant use behaviour at the community level in Meru.

OVERALS Canonical Correlation Analysis on the Other Seven Non-medicinal Plant Uses

Similarly, the calculated correlations represented as Component Loadings in Tables 9.9 & 9.10 show that independent variables in Set 1 and the dependent variable in Set 2 in Dimension 1 are highly correlated towards each individual form of food plant use, material plant use, social plant use, fuel plant use, environmental plant use, non-vertebrate poisons plant use, and bee plant use behaviour (resp. -0,970, -0,957, 0,934, 0,952, 0,978, 0,976, 0,980), buttressing the linkage between knowledge and practice in relation to different kinds of useful wild plants of the Meru household heads in the surveys. In addition, Component Loadings in the first Dimension indicate the variables with a significant relationship as the strongest in the solution. The Component Loadings already discussed confirm their strong relationships previously indicated by the values of the *Pearson Chi-Squares,* revealing the strongest correlations between variables. The next paragraphs will concentrate on the Component Loadings of the seven sub-divisions of non-medicinal plant use as part of the *non-medicinal plant use* variable in order to determine the correlations existing between the variables in Sets 1 and 2 in the first Dimension on the separate uses - food plant use, material plant use, social plant use, fuel plant use, environmental plant use, non-vertebrate poisons plant use and bee plant use.

Food Plant Use Behaviour

The calculated correlations represented as Component Loadings in Table 9.9, in Dimension 1 and also confirmed by *Pearson Chi-Squares* (the tables cannot all be presented here because they are too many and too cumbersome) confirm a very high correlation between Set 1 and Set 2 of both independent and dependent variables in 'food plant use behaviour' (Component Loading = .-.970),

confirming the close link between knowledge and practice of the Meru people as recorded from responses of household heads in the surveys. Furthermore, Component Loadings in the first Dimension over the various variables in Set 1 confirm the significant relationships between these and 'food plant use behaviour', in which those with strong relationships is shown to be the strongest in the solution. Among the variables with strong correlations are 'experience in medicinal plant use' (Component Loading = -.471) dominated by 'average' experience in food plant use and 'high' food plant use plant use confirming the relatively strong influence the practice in 'food plant use behaviour' at the individual level. As was made clear by the household heads in the survey, most food plants are also medicinal plants and experience is always born of long-time use of a product, and in this case use of food and medicine plants. Use in medicine in particular enabled the respondents who used wild plants for food to discover the difference between those which were poisonous and those which were not, hence providing safety precautions for the consumer whose experience in both, double their benefit.

Variable 'belief in medicinal plant use' (Component Loading = -.463) is dominated by 'high' belief in medicinal plant use and 'high' food plant use which once more emphasizes the significant relationship between this variables in 'food plant use behaviour' as reported by the household heads. The 'soft' variable belief is seen to play a significant role in the use of most wild plants for all categories and now particularly in use of these plants for food. The significance of the variable 'experience in food plant use' (Component Loading -.442) where the highest scores reported by the household heads lay in 'high' food plant use in all the categories of 'low', 'average' and 'high' reveal the very strong relationship this variable has with the 'food plant use behaviour' among the Meru people. The variable 'attitude towards food plant use' (Component Loading = -.398), dominated by an 'average' attitude towards food plant use and an 'average' food plant use as well as 'high' attitude and 'high' food plant use again reveal the strong relationships existing between the attitude of the people and 'food plant use behaviour'.

As was confirmed earlier, 'belief' in both food and medicine play very significant roles in the overall 'food plant use behaviour', reveal again in the variable 'belief in food plant use' (Component Loading = -.398), of which the highest score reported by the household heads is 'average' belief in food plant use and average food plant use again confirming the significant relationships existing towards the 'food plant use behaviour' at the community level. The significance of the variable 'preparedness to pay' (Component Loading = -.368) is dominated by respondents had 'yes' as the highest score and 'high' food plant use. This confirmed the relatively strong relationship towards 'food plant use behaviour' revealing the value the community places on food made from wild plants. The variable 'knowledge of food plant use' (Component Loading = -.306) dominated by 'high' to 'average' knowledge and 'high' in food confirm the significant relationship with 'food plant use behaviour'.

Furthermore, the significance of intervening variables is seen in the variable 'discouraging policies' (Component Loading = .372), of which the highest score is seen in the 'no' category of respondents. They show 'high' food plant use, claiming that there were not any policies discouraging them from the use of wild plants for food, adding confirmation to the significant relationship the variable pose towards 'food plant use behaviour'. The overall pattern seen in this behaviour confirm the significant correlations between the independent psycho-social and intervening variables in Set 1 and the dependent variable 'food plant use behaviour' in Set 2, showing a shift from 'average' to 'high' food plant use, confirming their relationship towards this behaviour.

Material Plant Use Behaviour

Wild plant use of materials in Meru reflected to a large degree the people's knowledge of the durability and quality of plants and materials and is confirmed and tested against their long use coupled with experience which enabled them to identify trees suitable for use. The calculated correlations represented as Component Loadings in Table 9.9 show Dimension 1 confirming relatively high correlation between independent variables in Set 1 and the dependent variable in Set 2 in 'material plant use behaviour' (Component Loading = -.957). The relationship is indicated by the respondents' experience, the environment in which they live, the knowledge of the use, the policies which discourage the use and the particular knowledge they portray both at the community and individual level. The distribution of the Component Loadings on food, social and fuel plant uses for Sets 1 and 2 in only one Dimension is given in Table 9.9 below.

Table 9.9: Distribution of the Component Loadings on wild food, material, social and fuel plant uses for sets 1 and 2 in Dimension 1 of the 25 (24 for material) variables (N=75)

Food plants			Material plants			Social plants			Fuel plants		
Set	Variable	D.1	Set	Variable	D.1	Set	Variable	D.1	Set	Variable	D. 1
1	hhsize (c,b)	.061	1	hhsize (c,b)	-.205	1	hhsize (c,b)	.030	1	hhsize (c,b)	.015
	sexhhhd (a,b)	- .004		sexhhhd (a,b)	.121		sexhhhd (a,b)	-.065		sexhhhd (a,b)	-.149
	age (c,b)	- .265		age (c,b)	-.157		age (c,b)	-.454		age (c,b)	.061
	formed (c,b)	.137		formed (c,b)	-.220		formed (c,b)	.050		formed (c,b)	-.251
	mstatus (a,b)	.028		mstatus (a,b)	-.084		mstatus (a,b)	-.158		mstatus (a,b)	.047
	Prof (a,b)	- .022		prof(a,b)	.165		prof (a,b)	.192		prof (a,b)	-.023
	wiltopay (a,b)	- .368		wiltopay(a,b)	-.164		wiltopay (a,b)	.197		wiltopay (a,b)	.175
	awarness (c,b)	- .141		awarness (c,b)	-.052		awarness (c,b)	.000		awarness (c,b)	-.077
	wishimp (a,b)	- .267		wishimp (a,b)	.069		wishimp (a,b)	.135		wishimp (a,b)	-.071
	kntranch (a,b)	- .207		kntranch (a,b)	.013		kntranch (a,b)	-.070		kntranch (a,b)	-.159
	knm (c,b)	- .184		knm (c,b)	-.376		knm (c,b)	.090		knm (c,b)	-.026
	bfm (c,b)	- .463		bfm (c,b)	-.180		bfm (c,b)	-.134		bfm (c,b)	-.066
	attm (c,b)	- .285		attm (c,b)	.163		attm (c,b)	-.012		attm (c,b)	.405
	expm (c,b)	- .471		expm (c,b)	.070		expm (c,b)	.037		expm (c,b)	.236
	knfd (c,b)	- .306		knmat (c,b)	-.302		kns (c,b)	.417		knf (c,b)	-.085
	bffd (c,b)	- .398		attmat (c,b)	-.216		bfs (c,b)	.402		bff (c,b)	-.028
	attfd (c,b)	- .398		expmat (c,b)	-.419		atts (c,b)	.516		attf (c,b)	-.028
	expfd (c,b)	- .442		SES (c,b)	.024		exps (c,b)	.623		expf (c,b)	-.028
	SES (c,b)	.114		environ (a,b)	.396		SES (c,b)	-.200		SES (c,b)	-.470
	environ (a,b)	- .184		conserv (a,b)	-.028		environ (a,b)	-.254		environ (a,b)	.168
	conserve (a,b)	.259		institaw (a,b)	-.124		conserv (a,b)	-.083		conserv (a,b)	.135
	institaw (a,b)	- .113		discpol (a,b)	-.351		institaw (a,b)	-.018		institaw (a,b)	.122
	discpol (a,b)	.372		encpol (a,b)	-.122		discpol (a,b)	.394		discpol (a,b)	-.105
	encpol (a,b)	.165		-	-		encpol (a,b)	-.129		encpol (a,b)	.095
2	usefood (c,b)	-.970	2	usemat (c,b)	-.957	2	usesoc (c,b)	.934	2	usefuel (c,b)	.952

a = optimal Scaling Level: Single Nominal
b = projections of the Single Quantified Variables in the Object Space
c = optimal Scaling Level: Ordinal

For instance, the significance of the variable 'experience in material plant use' (Component Loading = -.419) is dominated by 'average' and 'low' experience in material plant use and 'low' material plant use and this confirm the relatively strong influence this practice exert on 'material plant use behaviour' according to the reported responses by the household heads. The variable 'environment' (Component Loading = .396) is dominated by *KK Lumbi* with highest score at 'high' material plant use. This signified the relative correlation of the villages in which the respondent live with the 'material plant use behaviour'. The significance of variable 'knowledge of medicinal plant use (Component Loading = -.376) with the highest score according the recorded responses of the household heads at 'average' knowledge of medicinal plant use and 'average' medicinal plant use

confirm its relationship with 'material plant use behaviour'. Whereas variables 'discouraging policies' (Component Loading = .351) again confirm the significant correlation existing between the policies which encourage material plant use, confirming the correlations and the 'material plant use behaviour'. Table 9.10 shows the distribution of the Component Loadings on environmental, non-vertebrate poisons and bee plants for Sets 1 and 2 in Dimension 1 of the twenty-five (twenty-four for material) variables (N=75).

Table 9.10: Distribution of the Component Loadings on wild environmental, non-vertebrate poisons and bee plant uses for sets 1 and 2 in Dimension 1 of the 25 variables (N=75)

Environmental plants			Non-vertebrate poisons plants			Bee plants		
Set	Variable	D.1	Set	Variable	D.1	Set	Variable	D.1
1	hhsize (c,b)	.045	1	hhsize (c,b)	-.151	1	hhsize (c,b)	-.278
	sexhhhd (a,b)	-.123		sexhhhd (a,b)	.229		sexhhhd (a,b)	.233
	age (c,b)	-.052		age (c,b)	.193		age (c,b)	.142
	formed (c,b)	.019		formed (c,b)	.037		formed (c,b)	.251
	mstatus (a,b)	.389		mstatus (a,b)	-.438		mstatus (a,b)	.237
	prof (a,b)	.219		prof (a,b)	-.045		prof (a,b)	-.050
	wiltopay (a,b)	.100		wiltopay (a,b)	-.202		wiltopay (a,b)	-.092
	awarness (c,b)	.050		awarness (c,b)	.135		awarness (c,b)	.029
	wishimp (a,b)	-.079		wishimp (a,b)	.074		wishimp (a,b)	-.116
	kntranch (a,b)	-.123		kntranch (a,b)	.042		kntranch (a,b)	.120
	knm (c,b)	-.227		knm (c,b)	-.163		knm (c,b)	-.374
	bfm (c,b)	.080		bfm (c,b)	-.036		bfm (c,b)	-.032
	attm (c,b)	.036		attm (c,b)	-.222		attm (c,b)	-.267
	expm (c,b)	-.178		expm (c,b)	-.162		expm (c,b)	-.503
	kne (c,b)	- .182		knnvp (c,b)	-.507		knbp (c,b)	-.473
	bfe (c,b)	.041		bfnvp (c,b)	-.318		bfbp (c,b)	-.121
	atte (c,b)	-.115		attnvp (c,b)	-.333		attbp (c,b)	-.133
	expe (c,b)	-.306		expnvp (c,b)	-.424		expbp (c,b)	-.590
	SES (c,b)	-.052		SES (c,b)	.234		SES (c,b)	.160
	environ (a,b)	.147		environ (a,b)	-.001		environ (a,b)	.354
	conserv (a,b)	.006		conserv (a,b)	-.066		conserv (a,b)	-.076
	institaw (a,b)	-.060		institaw (a,b)	-.128		institaw (a,b)	-.303
	discpol (a,b)	.085		discpol (a,b)	-.007		discpol (a,b)	.007
	encpol (a,b)	-.237		encpol (a,b)	.082		encpol (a,b)	-.232
2	useenv (c,b)	-.978	2	usenvp (c,b)	.976	2	usebee (c,b)	-.980

a = optimal Scaling Level: Single Nominal
b = projections of the Single Quantified Variables in the Object Space
c = optimal Scaling Level: Ordinal

As was explained earlier in Chapter V, any noise (electric saw) heard from any quarter of Meru by the Chief or his *askaris* (guards) prompt them to take swift and fierce action on the offender, although this is a system which at times does not prove particularly efficacious in punishing those who sometimes want to bend the law for their own benefit. At times, the enforcement of the act is overstretched and double standards applied, whereby it is impossible even to cut down a person's own trees grown purposely to cater for their own needs. For instance, many residents planted the eucalyptus for material requirements but they could not even cut these down at will without informing the authorities, hence the significance of these policies towards material plant use behaviour. Finally the significance of variable 'knowledge of plant material plant use' (Component Loading = -.302) is dominated by 'average' 'knowledge of plant material plant use' and 'low' plant material plant use. Again this stresses the significant correlations of the household head's knowledge and practice and 'material plant use behaviour'.

Social Plant Use Behaviour

In the first Dimension, the Component Loadings shown on Table 9.9 reveals the significance of the independent variables in Set 1 and the one dependent variable in Set 2 in the first Dimension. The significance of the dependent variable 'social plant use behaviour' (Component Loading = .934) show a very high relationship with the dependent variables in Set 1. Among the independent variables which showed strong significance in this relationship are: 'experience in social plant use' (Component Loading = .623) dominated by a shift from 'low' to 'average' experience in social plant use and 'low' social plant use confirming the relative correlation which the experience of the household heads have on 'social plant use behaviour'. Whereas 'attitude towards social plant use' (Component Loading = .516 is dominated by 'low' attitude towards social plant use and 'low' social plant use exposing even more sharply the significant role these 'soft' variables exerted on 'social plant use behaviour'. The strong correlation seen in the only socio-demographic variable 'age' (Component Loading = -.454) dominated by the age category of '70+' did not use wild plants for social purposes, hence the strong correlation seen towards 'social plant use behaviour'.

The significance of variable 'knowledge of social plant use' (Component Loading = .417) dominated by 'low' knowledge of social plant use and 'low' social plant use again reveal the relationship towards 'social plant use behaviour' according to the responses of the household heads in the sample surveys. Variable 'belief in social plant use' (Component Loading = .402), in which the highest score according to the recorded responses of the household heads was again at 'low' belief in social plant use and 'low' social plant use, yield the correlation between the 'knowledge of social plant use' and the 'social plant use behaviour' of the household heads in the survey helping to confirm what had been discovered during the qualitative surveys as noted in Chapter VIII: namely that the majority of respondents did not use wild plants for social purposes in the year previous to the interviews, since most functions these used to perform have been taken over by improved products which are readily available in the shops. With increased health and hygiene standards some activities, especially in the use of traditional plant oils and the use of certain leaves for washing clothes, had become history. Certain rituals and ceremonies are slowly dying out too and so are the age-old ideas of believing a child could suffer simply because someone had looked at them with the evil eye. Notwithstanding some activities still remain profoundly engraved in the Meru culture.

Fuel Plant Use Behaviour

Component Loadings in the first Dimension shown in Table 9.9 again reveal that the independent variables have relative correlations with the dependent variable 'fuel plant use behaviour' (Component Loading .952). The independent variables showing significant correlations included 'socio-economic status' (Component Loading = -.470) dominated by 'high' plant fuel plant use within all the categories which ranged from 'very poor' to 'very rich', with no record of 'low' plant fuel plant use, hence confirming the strong correlation existing between socio-economic status (SES) and the 'fuel plant use behaviour'. This is unequivocal evidence of the role fuel plays in the lives of both the rich and the poor in the community in which alternative energy is unavailable.

Qualitative survey data in Chapter V already indicated that the majority of the respondents in the survey fell in the category of 'poor' and 'very poor' (58.7%), also confirmed by the District Development Plan (DDP 2002-2008) statistics which reported that the majority of Meru residents live below the poverty line, hence contributing a total of 5.01 per cent to national poverty. Data collected indicate that all respondents, regardless of their socio-economic status (SES), used wild plants especially for firewood. It is therefore not surprising to find out from the Component Loadings that 'SES' expressed the 'strongest' influence in plant fuel plant use behaviour as reported by the household heads in the sample survey. In addition, the significance of the psycho-social

variable ‘attitude towards medicine’ (Component Loading = .405) is dominated by ‘high’ attitude and ‘high’ fuel plant use, which again emphasized the relationship between ‘attitude towards medicine’ and ‘fuel plant use’, thereby revealing the significance this variable has towards ‘fuel plant use behaviour’.

Environmental Plant Use Behaviour

The Meru community has used wild trees and shrubs for a wide range of such environmental purposes as ornamental plants, shade trees, boundary markers and wind- and dust-breaks. It is not unusual to find neatly manicured hedges in most traditional compounds where men and boys tend the hedges and root out encroaching weeds which would otherwise destroy their uniformity. A homestead is therefore recognized by this enclosure, which automatically announces that a family lives there, in other words a married couple either monogamous or polygynous owns the homestead. Houses built by unmarried boys or girls outside this homestead will have no enclosing hedge, which gives the homestead a compound but one which will stand alone on the vast *shamba* (farm) of the parents until they are married. After marriage they will enclose their compound to make themselves private. It was therefore not surprising to note that marital status express the highest influence amongst all the other variables revealed by the Component Loadings on wild plant use for environmental purposes.

The independent variables showing significance are the strongest in the relationship between them and ‘environmental plant use behaviour’, which have a very high influence in the first Dimension (Component Loading = -.978) as seen in Table 9.10 above. This encompassed the socio-demographic variable ‘marital status’ (Component Loading = .389) dominated by ‘married pg’ with ‘high’ environmental plant use, while the ‘divorced’ show ‘low’ environmental plant use hence confirming the significance of environmental plant use behaviour in family structures in Meru. Meanwhile, the psycho-social variable ‘experience in environmental plant use’ (Component Loading = -.306) is dominated by ‘average’ experience and ‘average’ environmental plant use, which served to confirm the correlation existing between this variable and ‘environmental plant use behaviour’. Experience is an extremely telling factor because it was through years of observance and use of plants that this factor was acquired. By observing how these plants are used by past and current generations, experience is built up. Furthermore, the significance of the variable ‘encouraging policies’ (Component Loading = -.237) with the highest score for household heads who said ‘yes’, there were encouraging policies showing ‘high’ environmental plant use revealing the significant relationship this variable have with ‘environmental plant use behaviour’.

Non-vertebrate Poisons Plant Use Behaviour

The significance relationships between the socio-demographic and psycho-social variables in Set 1 and the dependent variable ‘of' non-vertebrate poisons plant use behaviour’ (Component Loading .976) in Set 2 of Dimension 1, represented by variables ‘marital status’ and ‘awareness on what is good for environment’ respectively, reveal a very high correlation between the two sets as shown in Table 9.10. The significance of the variable ‘marital status’ (Component Loading =.438) dominated by ‘married mg’ which score at ‘low’ non-vertebrate poisons plant use confirmed its relationship with ‘non-vertebrate poisons plant use behaviour’ at the individual family level. Among the psychosocial variables significance is noted in the ‘strongest’ variable ‘knowledge of non-vertebrate poisons plant use’ (Component Loading = -.507) dominated by ‘low’ knowledge of ‘non-vertebrate poisons plant use’ and ‘low’ plant use in the same. The variable ‘experience in ‘‘non-vertebrate poisons plant use’ (Component Loading = -.424) with the highest score according to the responses of the household heads at ‘low’ experience in ‘non-vertebrate poisons plant use’ likewise reflect

'low' on-vertebrate poison plant use hence confirming the close relationship existing between the variable and 'non-vertebrate poisons plant use behaviour'

As noted previously, the use of non-vertebrate poisons plants among the Meru communities has reduced over the years, also marked in the in the decline in social plant use because of the modern products easily available in the shops. Among the uses which have dropped in this category are the certain saps from such indigenous shrubs as the *ntongu* (fruit) from the *mutongu* (*Solanum nigrum*) plant which are formerly used to rid feet of chiggers. The victim feet, boy or girl (mostly children), whose feet are infested with jiggers first had the insects removed, after which this sap would be put in the gaping hole causing the victim tremendous pain. This sap acts both as medicine and poison. By killing all the eggs left behind by the adult chigger, it prevents others infecting the feet. The pain of the procedure itself is enough to ensure the victim keeps cleaner feet to avoid re-infection.

Bee Plant Use Behaviour

So far the distribution of the variable experience, especially in both the bivariate and multivariate analysis, has been seen to express significant relationships with most uses analysed. Turning to 'experience in bee plant use' (Component Loading = -.590) reveal it has a strong relationship with the psycho-social variables towards 'bee plant use behaviour' (Component Loading = -.980) as shown on Table 9.10. The highest score according to the respondents' answers is located at 'average' experience and 'low' bee plant use, showing the significant relationship of the variable with 'bee plant use behaviour' at the community level. Similarly, 'experience in medicinal plant use' (Component Loading = -.503), with the highest score at 'average' experience in medicinal plant use and 'low' bee plant use according to the reported data from the household heads, confirm its strong relationship with 'bee plant use behaviour', 'knowledge of bee plant use' and 'knowledge of medicinal plant use' (Component Loadings respectively = -.473 & -.374). This is dominated by 'low' knowledge of medicinal plant use and 'bee plant use' together with 'low' knowledge of medicinal plant use verses 'low' as bee plant use confirm the significant relationship these variables have with 'use as bee plant behaviour'.

The environmental variable 'environment' (Component Loading = .354) dominated by '*Kinoru*' with 'low' bee plant use helped to confirm the significance of the geographical location of villages in which the respondents live with 'bee plant use behaviour', since as is obvious that the rearing of bees is best done in environments which are less noisy, polluted and less settled. *Kinoru* village is in the municipality and most of the region has been cultivated and built over. There are therefore fewer areas which respondents could use for rearing bees without much disturbance. At the other extreme, *KK Lumbi* is less populated and more spacious with certain regions registering low densities of people. In such areas, beehives are put up to attract bees to provide honey for the farmers, hence the high use recorded in that environment.

9.2.2 Projection of Variables and Objects in the Canonical Space

A graphical representation of all the variables already described can be used to gain a better understanding of the complex coherence among all twenty-six variables, by placing the final projections of the correlations as points on the canonical space, as shown in the figures below ('Component Loadings'). The plot of all twenty-six variables, which included the two dependent variables of 'medicinal plant use behaviour' and 'non-medicinal plant use behaviour' and the twenty-four predictor variables, are projected onto the canonical space represented in Figure 9.1 This figure shows the divergence between *medicinal plant use behaviour* (usemd) and *non-*

medicinal plant use behaviour (usenm), and therefore supports the initial methodology of dividing these two, shown earlier in the qualitative surveys. The dependent variable *medicinal plant use behaviour* (usemd) express the strongest coherence with the independent variables in the first Dimension, while *non-medicinal plant use behaviour* (usenm) emerged most strongly in the second Dimension. The plot also exposed the significance in the first Dimension of variables environment (environ) which represent the villages in which the respondents live and *knowledge of medicine* (knm) towards *medicinal plant use behaviour*.

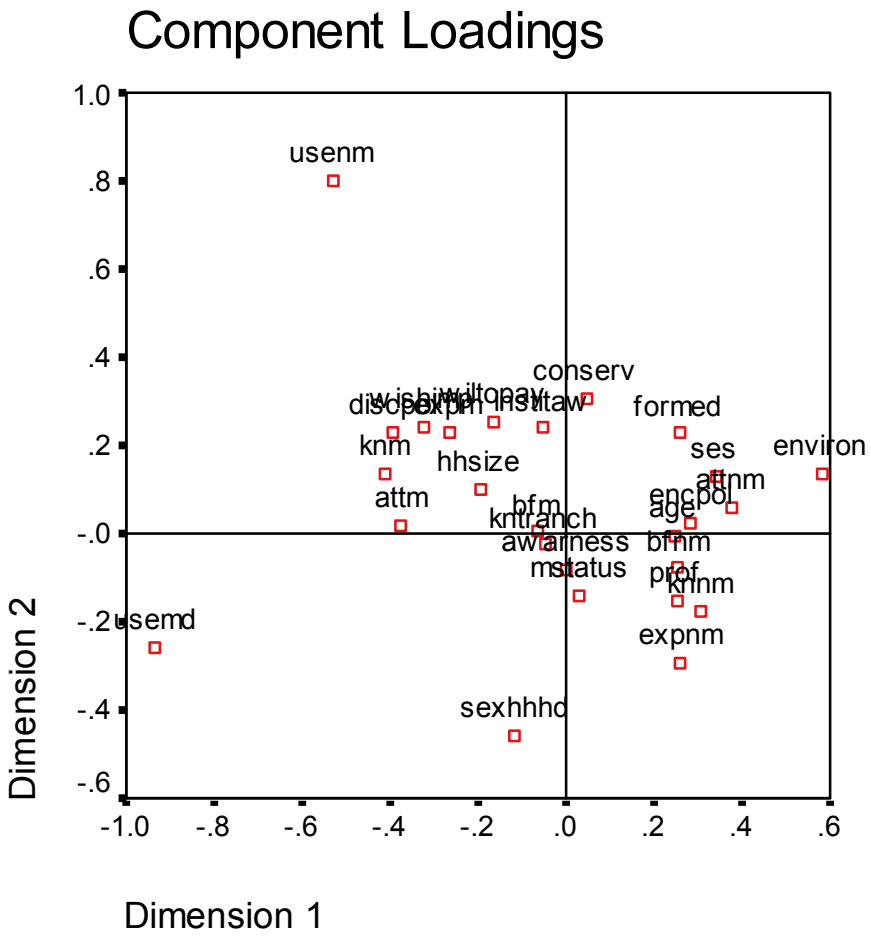


Figure 9.1 Projection of the 26 optimally scaled variables of sets 1 and 2 of wild medicinal and none medicinal plant use behaviour onto the canonical space.

As explained earlier, environment exerts an enormous influence on the use of wild plants in Meru, since the presence or absence of the plant are the initial determinants of the degree at which the community begins even to be aware that these are used. Moreover, knowledge of the particular plants which are useful for a particular need was handy in their selection and eventual use. Technical knowledge of the practical use also had to be brought into play. Other variables which reveal their significance towards both *medicinal plant use behaviour* (usemd) and *non-medicinal plant use behaviour* (usenm) in the first Dimension are *discouraging policies* (discpol), *attitude towards non-medicinal plant use* (attnm), *attitude towards medicinal plant use* (attm), *social economic status* (SES), perceived need of plant resources (wishmp) and *experience in medicinal plant use* (expm).

The independent variables in Set 1 which show a strong interaction with *medicinal plant use behaviour* (usemd) as well as with *non-medicinal plant use behaviour* (usenm) in Set 2 are sex of household head (sexhhhd), *conservation* (conserv), *experience in non-medicinal plant use* (expnm), *preparedness to pay* (wiltopay) and *perceived need of plant resources* (wishimp) among others. Moreover, several other variables reveal a strong interaction in the Second Dimension. These are *intervening awareness* (institaw), *experience in medicinal plant use* (expm), *discouraging policies* (discpol) and *formal education* (formed). Formal education which is the current schooling system in the country, has a strong relationship with both medicinal plant use behaviour (usemd) and non-medicinal plant use behaviour, bolstering the results of the qualitative survey carried out previously.

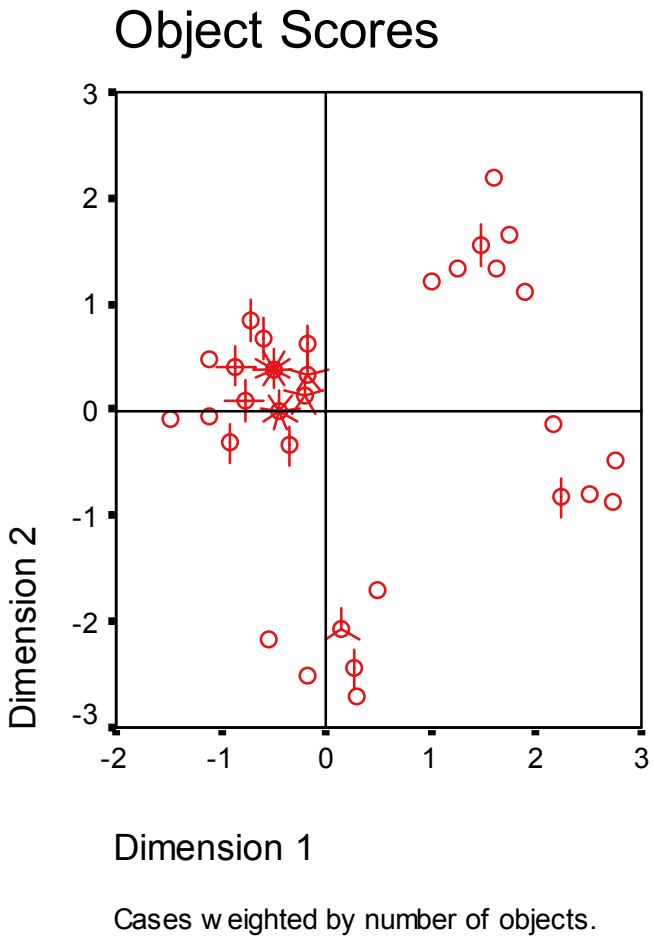


Figure 9.2: Projection of household heads in the sample survey as objects onto canonical space.

Consequently, Figure 9.1 reveals that variable *awareness of plant environment* (awarness), *marital status* (mstatus), *conservation* (conserv), *knowledge of wild plants among children* (kntranch) *intervening awareness* (institaw) and *belief in medicinal plant use* (bfm) do not show any interaction with *medicinal plant use behaviour* (usemd) and also *non-medicinal plant use behaviour* (usenm) in the First Dimension. Simultaneously, there is no significant interaction of the independent variables *belief in medicinal plant use* (bfm), *age* (age), *attitude towards medicinal plant use* (attm), *encouraging policies* (encpol) *and knowledge of wild plants among children* (kntranch) in the Second Dimension on *medicinal plant use behaviour* (usemd) and also on *non-medicinal plant use*

behaviour (usenm). Having determined the significant interaction of the independent variables in Set 1 with dependent variables in Set 2 in both the First and the Second Dimension, it is now possible to project the objects or individuals in the sample survey onto the canonical space (*cf.* Figure 9.2). In this figure the position of each respondent is the projection of each individual (N=75) as a function of their scores on all the twenty six variables of the model. The plot reveals a separation of the larger number of objects or individuals which represent household heads, concentrated on the upper left side plot on *non-medicinal plant use behaviour*, dominated by intervening variables of discouraging policies and intervening awareness plus those of knowledge which include *knowledge of medicinal plant use*, *experience in medicinal plant use*, *perceived need of plant resources* and *attitude towards medicinal plant use*. The socio-demographic variable household size is also in this division. In summary, the projection of the variables in Figure 9.1 and the projection of objects onto the canonical space in Table 9.2 help to confirm the strong relationship existing between medicinal and non-medicinal plant use behaviour in Meru, Kenya.

9.3 Analytical Model: Multiple Regression Analysis

9.3.1 Correlation Coefficients of Correlations

The last two sections have dealt with both the bivariate and multivariate analysis in which all the variables in Sets 1 and 2 have been treated from all the blocks without discrimination. It has been possible to determine the correlation and interaction and to analyse the predictability of the variables using canonical correlation analysis. The section below is intended to extend the multivariate analysis in order to see the cohesions existing between the various blocks to make a greater contribution to the development of the final analytical model, since this is the ultimate goal of the study. The constituent variables in each of the blocks which are to be analysed as explained in Chapter III are as follows: *Block 1*: Socio-demographic variables which included: 'household size' (label 'hhsize'), 'sex of household head' (label 'sexhhhd'), 'age' (label 'age'), 'formal education' (label 'formed'), 'marital status' (label 'mstatus'), and 'profession of household head' (label 'profession').

Block 2: Psycho-social variables which are composed of the 'preparedness to pay' (label 'wiltopay'), 'awareness of plant environment' (label 'awarness'), 'perceived need of plant resources' (label 'wishimp'), 'knowledge of wild plants among children' (label 'kntranch'), 'knowledge of medicinal plant use' (label 'knm'), 'belief in medicinal plant use' (label 'bfm'), 'attitude towards medicinal plant use (label 'attm'), 'experience in medicinal plant use' (label 'expm'); 'knowledge of non-medicinal plant use (label 'knnm'), 'belief in non-medicinal plant use' (label 'bfnm'), 'attitude towards non-medicinal plant use' (label 'attnm'), and 'experience in non-medicinal plant use' (label 'expnm'). *Block 3*: Enabling variables made up of 'socio-economic status' (label 'SES'). *Block 4*: Environmental variables which consist of the 'environment' (label 'environ'). *Block 5*: Conservation variables which include 'conservation' (label 'conserv'). *Block 6*: Intervening variables including 'encouraging policies' (label 'encpol'), 'discouraging policies' (label 'discpol' as well as *Block 7* and *Block 8* which consist of the dependent variables respectively, 'medicinal plant use behaviour' (label 'usemd') and non-medicinal plant use behaviour' (label 'usenm').

To determine the coherence between all the six independent blocks and also towards the two dependent blocks of the model, the analyses was carried out by means of a stepwise multiple regression analysis, on the basis of the calculation of multiple correlation coefficients with optimal

scaling from the OVERALS. To calculate the multiple correlation co-efficient (r), the formula r = (2´Ed)-1 where Ed = Eigenvalues (cf. van der Burg 1983) was used. The eigenvalues are the result of the summary of the analysis on the OVARALS results between the variables of the related blocks. The calculated multiple correlation coefficients are shown in Table 9.11 below. The calculated multiple correlation coefficients shown, reveal that there is a relatively very strong cohesion between the blocks in the model confirming the interaction between the blocks with each other as well as between them and medicinal and non-medicinal plant use behaviour blocks as already indicated in the bivariate and multivariate analyses and in the preliminary findings of the qualitative surveys.

The results of the calculations laid down in Table 9.11 therefore show the strongest coherence existing in both Dimensions between socio-demographic and psycho-social Blocks 1 and 2: 1 & 2 (respectively r1 = .906, r2 = .762), socio-demographic and enabling blocks: 1 & 3 (r1 = 840) and socio-demographic and environmental blocks: 1 & 4 (r1 = .832). The coherences explain the prediction of both medicinal and non-medicinal plant use behaviour resulting from the overall inter-linkage existing between the blocks of the independent and those of the dependent variables. Strong coherence is also observed between psycho-social and enabling blocks: 2 & 3 (r1 = .720), Psycho-social and environment blocks: 2 & 4 (r1 = .706), Psycho-social and intervening blocks: 2 & 6 (respectively r1 = .676, r2 .628) and Psycho-social and conservation blocks: 2 & 5 (r1 = .664), thereby revealing their moderately strong contribution to the overall outcome on medicinal and non-medicinal plant use behaviour in the Meru community.

Medium strengths are observed in the coherences between socio-demographic and intervening blocks: 1 & 6 (r1 = .558 & r2 .478), socio-demographic and conservation blocks: 1 & 5 (r1 = .530), enabling and environmental blocks: 3 & 4 (r1 = .446) and conservation and intervening blocks: 4 & (r1 = .436), while relatively weak cohesions are observed between enabling and conservation blocks: 3 & 5 (r1 = .182) and environment versus conservation blocks: (r1 = .138). In the meantime, the strong coherence between Block 1 and Block 7 indicates that the prediction of *medicinal plant use behaviour* in the first Dimension was strongly dominated by socio-demographic variables (r1 = .756), while the coherence between Block 2 and Block 7 in the first Dimension again confirm that the prediction of *medicinal plant use behaviour* is strongly dominated by psycho-social variables (r1 = 746) as well.

Similar domination though to a lesser degree is observed between Blocks 6 & 7 with intervening variables (r1 = .580) proving its dominion over the relative prediction of *medicinal plant use behaviour* in the First Dimension. The prediction of *medicinal plant use behaviour* is also dominated by socio-economic variables (r1 = .498) as indicated by the relative cohesion between Blocks 3 & 7 and also by conservation variables (r1 = .424) revealing cohesion between Blocks 5 & 7, while the least domination is observed between Blocks 4 & 7, showing that the cohesion between environmental variables (.376) has some prediction over *medicinal plant use behaviour* of the household heads in the sample survey.

Subsequently, Table 9.11 shows that the prediction of *non-medicinal plant use behaviour* in the First Dimension is also strongly influenced by socio-demographic variables (r1 = .706) as in Blocks 1 & 8, intervening variables (r1 = .652) as seen between Blocks 6 & 8, psycho-social variables (r1 = .640) existing between blocks 2 & 8, environmental variables (r1 = .430) as seen in Blocks 4 & 8 and to a lesser extent between Blocks 5 & 8 of the conservation variables (r1 = .384). Relatively weaker cohesion is observed between Blocks 3 & 8 with enabling variables (r1 = .188) offering a relatively weaker domination over the predictive outcome of non-medicinal plant use behaviour of household heads at the community level.

Table 9.11 Calculated multiple correlation coefficients (r) between the 8 blocks of the model

Block<->block	Dimension	calculation (ED)	multiple correlation coefficients (r)
1<------>2	I	(2 × .953) – 1=	.906
1<------>2	2	(2 × .881) – 1=	.762
1<------>3	1	(2 × .920) – 1=	.840
1<------>4	1	(2 × .916) – 1=	.832
1<------>5	1	(2 × .765) – 1=	.530
1<------>6	1	(2 × .779) – 1=	.558
1<------>6	2	(2 × .739) – 1=	.478
1<------>7	1	(2 × .873) – 1=	.746
1<------>8	1	(2 × .791) – 1=	.706
2<------>3	1	(2 × .860) – 1=	.720
2<------>4	1	(2 × .853) – 1=	.706
2<------>5	1	(2 × .832) – 1=	.664
2<------>6	1	(2 × .838) – 1=	.676
2<------>6	2	(2 × .814) – 1=	.628
2<------>7	1	(2 × .863) – 1=	.726
2<------>8	1	(2 × .820) – 1=	.640
3<------>4	1	(2 × .723) – 1=	.446
3<------>5	1	(2 × .591) – 1=	.182
3<------>6	1	(2 × .599) – 1=	.198
3<------>7	1	(2 × .749) – 1=	.498
3<------>8	1	(2 × .594) – 1=	.188
4<------>5	1	(2 × .569) – 1 =	.138
4<------>6	1	(2 × .718) – 1 =	.436
4<------>7	1	(2 × .688) – 1 =	.376
4<------>8	1	(2 × .715) – 1 =	.430
5<------>6	1	(2 × .645) – 1 =	.290
5<------>7	1	(2 × .712) – 1 =	.424
5<------>8	1	(2 × .692) – 1 =	.384
6<------>7	1	(2 × .790) – 1 =	.580
6<------>8	1	(2 × .826) – 1 =	.652

Note: The eigenvalues on the first and second Dimension of the solution in OVERALS between the various 'blocks' of the model are shown in the calculation.

9.3.2 The Final Model of Medicinal and Non-Medicinal Plant Use Behaviour

The current chapter has so far shown the whole process of data entry and analysis using both bi- and multivariate and multiple regression analysis with the calculation of the multiple correlation coefficients revealing the relative coherence existing between all the independent blocks of variables at one end and their coherent relationships between the dependent blocks at the other. By a step-by-step systematic analysis, it has been possible to understand the importance of the various variables which play the major roles in determining the overall medicinal and non-medicinal plant use behaviour among the Meru, initially by the determination of relationships through the *Pearson Chi-Squares* in the bivariate analyses which show a number of variables with significant relationships

with both medicinal and non-medicinal plant use behaviour, inferred from the reported responses of the household heads in the Meru sample survey. Furthermore, the *Component Loadings* confirmed the determinant roles played by various variables analysed in Chapter III during the methodological study.

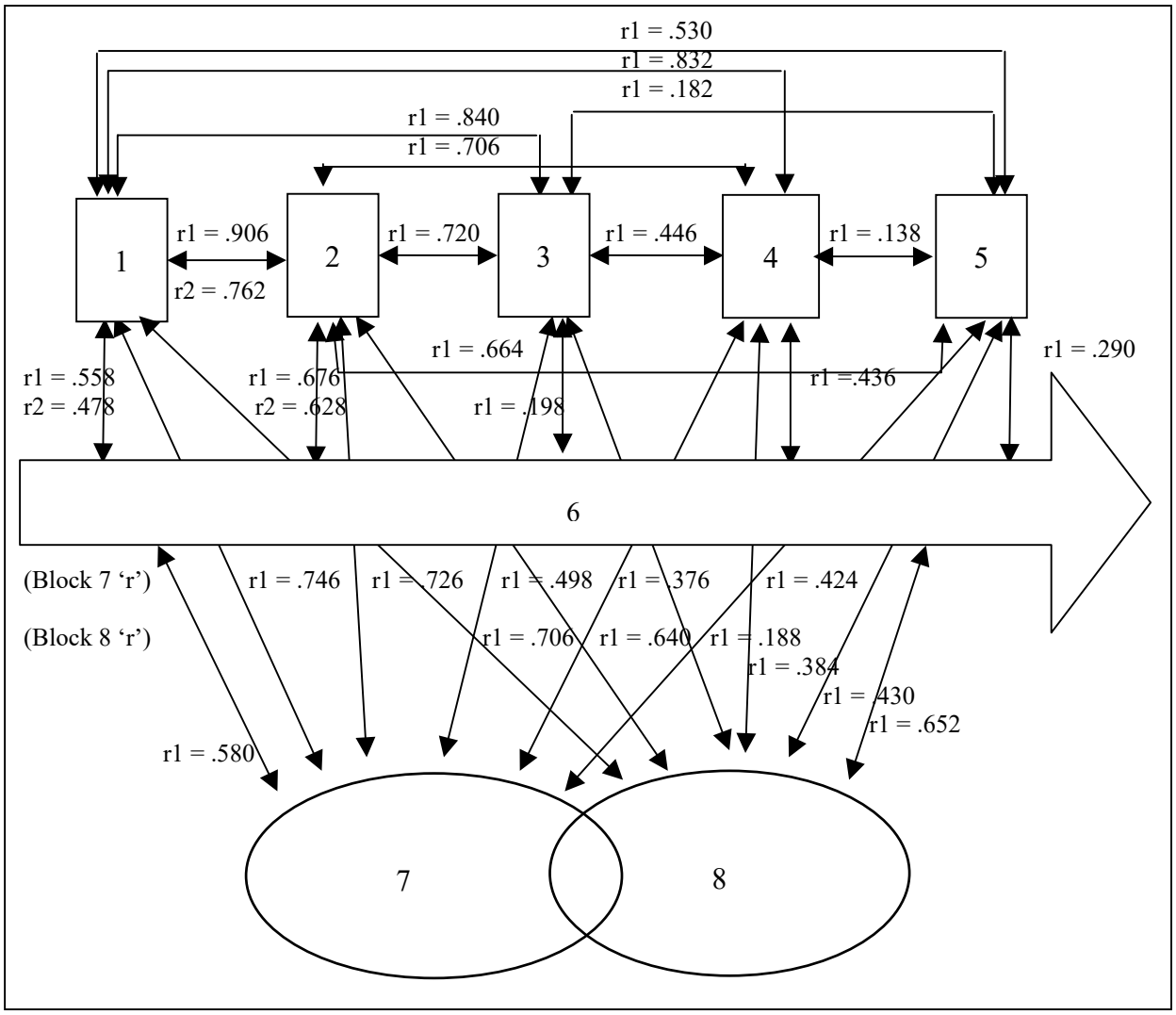


Figure 9.3: The Final Analytical model showing the calculated Multiple Correlation Coefficients on wild medicinal and non-medicinal plant use in Meru.

The previous section described in detail how the calculated multiple correlation coefficients contribute to the final analysis by the determination of the various blocks of variables which strongly influence and contribute to the possible prediction of medicinal and non-medicinal plant use behaviour among the people of Meru. The relative cohesions can now be represented graphically in the conceptual model which was initially visualized during the qualitative study and explained in Chapter III. The arrows represent the inter-relationship existing between the various blocks and the calculated multiple correlation co-efficient have been included in the model to show the relative cohesions existing within the independent Blocks 1 to 6 and dependent Blocks 7 to 8 figuratively. The overall purpose of the study has therefore been finally fulfilled through the construction of this

working model of medicinal and non-medicinal plant use behaviour in Meru, Kenya, a model which could operate anywhere in the globe given the same conditions and environments detailed in this dissertation. The model with all the calculations is made is given in Figure 9.3 below and its Components are as follows: *Block 1*: predisposing factors consisting of socio-demographic variables which include, 'household size', 'sex of household head', 'age', 'formal education', 'marital status' and 'profession of household head'. *Block 2*: predisposing factors composed of psycho-social variables – the 'preparedness to pay', 'awareness of plant environment', 'perceived need of plant resources', 'knowledge of wild plants among children', 'knowledge', 'belief', 'attitude' and 'experience' in both medicinal and non-medicinal plant uses.

Block 3: enabling factors: socio-economic status (SES) variables. *Block 4*: environmental factors made up of the '*KK Lumbi*', '*Kinoru*' and '*Kagera*' variables which represent the villages where the respondents live. *Block 5*: conservation factors consisting of the 'cutting and planting trees variables'. *Block 6*: intervening factors compose of 'intervening awareness', 'encouraging policies' and 'discouraging policies' variables. *Block 7*: medicinal plant use behaviour factors consisting of 'medicinal plant use behaviour' variables and *Block 8*: non-medicinal plant use behaviour factors compose of 'food plant use behaviour', 'material plant use behaviour', 'social plant use behaviour', 'fuel plant use behaviour', 'environmental plant use behaviour', ''non-vertebrate poisons plant use behaviour', and 'bee plant use behaviour' variables.

9.4 Interpretation of the Results of the Analyses

First and foremost the results of the bivariate analysis have contributed to the understanding of both the medicinal and non-medicinal plant use behaviour of the community living in the three villages or environments, Meru *KK Lumbi*, *Kinoru* and *Kagera.* An analysis of these has been made possible by an examination of the various factors initially formulated from a previous qualitative survey. The analysis made it possible to determine the variables which exert significant influence on medicinal and non-medicinal plant use behaviour. Among these variables are socio-demographic variables, including *household size*, *sex of household head*, *formal education*, and *profession of household head*.

The significant role of household size reveal how family composition influence medicinal plant use behaviour in the sense that smaller families tend to concentrate on low use, possibly because as there are fewer members of the family, their need is less. In contrast, as might be expected, very large families show some significant increases in use. Moreover, since smaller families are composed mostly of younger household heads, most of the members are very young children who under normal circumstances would not be given herbal remedies for treating ailments, since such children or babies are unable to explain where they hurt. Therefore, these would be taken to a specialist for treatment. Similarly, a significant differentiation is shown in both medicinal plant use behaviour and non-medicinal plant use behaviour between males and females. The latter tended to reveal much lower medicinal plant use behaviour than males, possibly because females interact much less with their wild vegetation environments as their defined roles, such as collecting firewood and fodder for domestic animals, limit their interactive opportunities with the wild flora, reducing the potential relating to its use.

Level of formal education showed significant influence on medicinal plant use behaviour. Although all household heads indicate significantly low use, those with no formal education at all, dominated, reporting a slightly higher plant use which confirms the results of the qualitative surveys. These indicate that Kenya's formal education is not geared to enabling its people to

understand the medicinal plant use value of wild plants which grow in their backyards. The Meru are a case in point. Similarly, the significant relationship of the profession of the household head brought to light the disparity and influence different professions might have on medicinal plant use behaviour. For instance, the domination of the category landlord in low medicinal plant use is understandable since this group live in predominantly urban environments and hence have little chance of interacting with wild plants. Significantly, their socio- economic status though weakly significant is much improved as the result of the incomes these household heads obtain from renting their premises.

Psycho-social variables with significant relationships are *awareness of plant environment*, *perceived need of plant resources*, *knowledge of* both *medicinal* and *medicinal plant use*, *attitude towards* both *medicinal* and *no-medicinal plant use* and *experience* in both *medicinal* and *non-medicinal plant use*. The majority of household heads with no need of environmental improvement and low *perceived need of plant resources* reveal the strong relationship this variable exert in determining the kind of behaviour which the respondent scored in medicinal plant use behaviour. Lack of awareness and the need of an improved vegetation environment can translate into a 'don't care' attitude influencing the low medicinal plant use behaviour in the larger Meru community, as revealed by the responses from respondents in the sample survey. Knowledge of both medicinal and non-medicinal plant use behaviour strongly indicates the significance of this variable in medicinal plant use behaviour. The dominant majority seen in both uses tended to reveal a shift from high knowledge of medicinal to average non-medicinal plant use, in which both categories registered average medicinal plant use behaviour and low non-medicinal plant use behaviour, revealing the significant influence knowledge have on wild plants use. These results again confirm the results of the qualitative study which indicate that knowledge is dying out in the community and this heralded the demise of the age-old culture of depending on the wild for remedies for ordinary ailments. Similar behaviour was observed in the variables on attitude and experience on wild plant use, also revealing the significant roles these 'soft' factors play in medicinal and non-medicinal plant use behaviour of the Meru. These too show 'low' attitude indicating 'low' plant use behaviour. Average experience did not improve the behaviour on plant use as it also registered low for medicinal plant use behaviour.

The bivariate analysis also reveal that the environmental variables composed of the three villages of *KK Lumbi*, *Kinoru* and *Kagera* showed significant relationships with medicinal plant use behaviour and was dominated by the more rural *Kagera* village, none the less with low medicinal plant use behaviour. The fact that relatively high plant use was reported in *KK Lumbi* village support the confirmation that these environments have a role to play in the overall determination of wild plant use, which in certain case could be influenced by the use of a particular plant. This was found in the case of the *miraa* (*Catha edulis*) plant whose presence has turned a majority of inhabitants of a village into chewers of the plant. The significance of intervening awareness was felt among the variables *encouraging policies* and *discouraging policies*. For encouraging policies, bivariate analysis show that the responses of the household heads who reported that there were no such policies dominated the scores, hence interacted with high medicinal plant use behaviour among them. Although the use of wild plants for medicine is not officially encouraged in Kenya, there are no rules or laws prohibiting its use, hence the high response of household heads who responded by saying they did not know of any discouraging policies at all. Therefore both variables reveal their strong relationship with medicinal plant use behaviour in the community.

Secondly, the results of the bivariate analysis are strengthened even more by the multivariate analysis (OVERALS) as significant relationships are observed in coherences between independent and dependent variables, revealing their strong influence on medicinal and non-medicinal plant use

behaviour. The independent variables are socio-demographic, and are composed of the *sex of household head* as well as psycho-social, consisting of *knowledge of medicinal plant use*, attitude towards *non-medicinal plant use* and attitude towards medicinal plant use. These gave further confirmation of the sentiments shared above on the significance of sex of household head, knowledge and attitude towards both medicinal and non-medicinal plant use behaviour. The variable *environment* now affirms its significant relationship, and conservation likewise reveals its significant relationship, particularly with non-medicinal plant use behaviour. The intervening variable of *discouraging policies* also re-affirmed its significance in medicinal and non-medicinal plant use behaviour.

The significance of the relationships between independent variables and non-medicinal plant use is uncovered to an even greater extent by analysing the variables which influence this kind of behaviour. In this case, individual coherences revealed in the seven other uses which make up *non-medicinal plant use behaviour* by multivariate (OVERALS) analysis are now presented. These are composed of the socio-demographic variables which include *age of household head* and *marital status*. The significance of *age of household head* was observed in its relationship with *social plant use behaviour* where the dominant scores according to household heads responses are registered among the 70+, who fell into the category of the 'did not use' of the *social plant use behaviour* could be interpreted in the sense that the social activities discussed in the qualitative survey in the previous year majored on such functions as engagements, weddings, births, games, discipline and the evil eye; all practices which are witnessed among the much younger members of the community.

The significance of the variable *marital status* was observed in *environmental plant use behaviour* and *non-vertebrate poisons plant use behaviour*. In the first case, the highest scores are seen among the 'married mg' who registered 'high' environmental plant use behaviour, and in the latter the 'divorced' showed a marked 'did not use' environmental plant use behaviour, confirming the significance of marriage institutions and the influence they exert on environmental plant use behaviour in the community. As mentioned above, the qualitative survey indicated that most divorced household heads were women. In Meru, the issue of environmental care especially, because it involved planting trees for land boundaries, wind- and dust- breaks and the hedges for home compounds, were all roles undertaken by males. With the divorced majority being women, the result is the significant low *environmental plant use behaviour* reported by household heads.

The significance of such psycho-social variables as knowledge, attitude, belief and experience in various plant uses also reveal their significant relationships. Knowledge discloses its significance in *food plant use, material plant use, social plant use*, *non-vertebrate poisons plant use* and *bee plant use* behaviours. *Knowledge of food plants use is* dominated by high *food plant use,* interacting with *high food plant use behaviour.* Average *knowledge of material plants*, low *knowledge of social plant use*, low *knowledge of non-vertebrate poisons plants* and low *knowledge of bee plants* all interact with the variable *did not use* behaviour towards their respective uses. Knowledge is very significant in all aspects of plant use, since the correct identification of useful parts, the method of preparation and application must be known if good results are to be achieved.

The significance of attitude confirmed its influence on *use of food*, *social,* and *fuel plants*. Average *attitude towards food plant use* interacting with average *food plant use behaviour*, low attitude towards social plant use interact with 'did not use' *social plant use behaviour,* and *high attitude towards medicinal plant use* interact with *high fuel plant use behaviour*, a strange attitude towards *fuel plant use* which is understandable since it shows that a high attitude towards medicinal plant use contribute to high fuel plant use behaviour, while a *low attitude towards medicinal plant use* interact with *low fuel plant use behaviour*. It is important to be aware of the medical (poisonous) properties of a plant if it has to be used in fuel. For instance, a plant which is poisonous could be

dangerous because of the smoke and toxic fumes it might produce if used for fuel. Some plants such as the African marigold (*Targetes erecta*) are generally known to produce toxic smoke and hence cannot be used as firewood. It is not known why the uprooting of African marigold plants is identified as causing nose-bleeding in some children of the respondents, a phenomenon that was confirmed by several villagers.

The significance of belief is revealed in food plant use as well as social plant use behaviour. Average belief in food plant use interact with average in food plant use behaviour, while a 'low' belief in social plant use interact with 'did not use' in social plant use behaviour. The significance of experience confirm its strong influence on various plant uses including: food plant use, material plant use, social plant use, environmental plant use, non-vertebrate poisons plant use and bee plant use behaviour. As might have been expected, high *experience in food plant use* interact with *high food plant use behaviour*, and a shift from 'average' to 'low' experience in material plant use interact with a shift from 'low use' of material plant use behaviour to 'did not use' *in material plant use behaviour*. Subsequently, *low experience in social plant use* interact with 'did not use' in *social plant use behaviour*. As is knowledge, experience is vital if any form of wild plant use is to materialize and, if this skill is lacking, the practice ceases or dies out altogether, as supported by the results of the qualitative survey revealing that belief, attitude and practices concerning wild plant use are diminishing.

Furthermore, the results of the OVERALS analysis show that the variable *environment* has a very significant relationship with and influence on *material plant use behaviour and bee plant use behaviour.* In the former case, *Kinoru* village dominate by exerting great influence on the outcome revealing high material plant use behaviour which can be understood as this is an urban environment which has the wealthiest landlords who own houses to rent reside. To have managed to do this, they must have used extensive amounts of wood which must have come from the wild. Here too lies a village which lies on the border of the Mount Kenya Forest. This is known to be diminishing at a high rate. In the later case, the same village dominate with 'did not use' *bee plant use behaviour,* which reflect on their urban environment which is not conducive to bee keeping.

The significance and influence of intervening variables is shown in the influence in both encouraging and discouraging policies. The highest significance, for instance, was observed in the variable *encouraging policies* towards *environmental plant use behaviour*. Positive responses confirming that there are encouraging policies are dominant in environmental plant use behaviour. However, the majority of these are verbal slogans which are normally floated politically, such a 'When you cut down one tree, plant two'. Although this may have had some influence in encouraging people in a higher environmental plant use behaviour, personal initiative observed in the community in planting boundary marker trees to distinguish between neighbouring plots of land on farms, planting beautiful hedges around homes, growing wind- and dust-breaking trees has contributed highly to this behaviour. The significant influence of variable *discouraging policies* was observed in *food plant use behaviour*, *in material plant use behaviour* and in *social plant use behaviour*. The domination of scores in responses of household heads who said that there were no discouraging policies on food plant use interact with 'high' *food plant use behaviour*, hence supporting the above-mentioned conclusion on encouraging policies which provide a sound environment for wild food plant use at the community level.

Thirdly, all independent and dependent optimally scaled variables, projected onto the canonical space emphasize the strength of the interaction between them, while also showing the directions at which variables' category quantifications are increasing. Strong coherence is observed among the socio-demographic and psycho-social variables which include in particular *profession of the household head* and *formal education* as well as *knowledge of medicinal plant use*, *experience in*

medicinal plant use, *experience in non-medicinal plant use*, *attitude towards medicinal plant use* and *experience in non-medicinal plant use* in general towards wild plant use behaviour. These results indicate and emphasize the role knowledge, attitude and experience as 'soft factors' are playing, while the current education system and profession also influence this behaviour significantly, as explained above. Environmental and intervening factors are other variables which emerged strongly in the projection, affirming their prominent role in both medicinal plant *use behaviour* and in *non-medicinal plant use behaviour*.

Finally the cohesions between the blocks of both independent and dependent variables confirm the inter-relationship within these blocks and the close linkage relationship existing within the two categories of behaviours, which can be interpreted as merging to form the unique pattern of behaviour of wild plant use in Meru.

X Conclusions and Implications

10.1 Conclusions

The Kenyan people, in particular the inhabitants of the communities in Meru, have been using their wild plants for many generations, since the days of their ancestors - the *Ngaa* - who inhabited the island of Manda in the Indian Ocean off the East African coast. They used to have a way of life governed by the traditional institution of age-sets which regulated the social, cultural and political life of the members of the community. Political conflict and turmoil on their original island life prompted them to leave and undertake a difficult journey through the wild forested lands inland into the centre of Kenya. On the way they accumulated great knowledge and experience about using and conserving their natural environment, including its wild plant resources.

The wild vegetation provided the migrants and their animals with medicine, food and shelter and, after their eventual settlement on the eastern slopes of Mount Kenya, the Meru were able to develop their indigenous system of use and conservation of their wealth of resources sustainably. After their journey through the arid lands, the densely forested mountains and bush strewn grass plains were the main reasons prompting them to settle in what is today the Greater Meru region. However over the years - as documented in this study - the vegetation has been threatened with loss and extinction, brought about by a number of factors such as overpopulation, cultivation, increased settlements, encroachment of ecological niches, invasion into natural forests for harvesting of materials and logging, accompanied by climatic changes caused by global warming (*cf.* Bennun *et al.* 1995; Maundu *et al.* 1999). The continuing loss of the planet's vegetation which is experienced in every corner of the earth now indicates a worrying trend, affecting the whole Kenyan population, but especially deleterious to the people in Meru where, in contrast to most parts of the world, the advantageous geographical location should ensure that the surface is covered with rich tropical vegetation.

The general aim of the current study therefore was to document, study and analyse the so far largely neglected, fast disappearing indigenous systems of wild plant knowledge and practice of the Meru, carried out by means of a comparative, ethnobotanical study of their human-plant relations which have evolved over many generations from the past up to the present in this unique cultural area. This kind of interdisciplinary research was focused on the Meru cultural heritage of traditional use, management and conservation of local floral resources, which are confronted with the threat of extinction. The study sought to document the critical contemporary phase in the complex human-plant relations, particularly useful wild plants with a view to increase the understanding of past, present and future processes of human adaptation in this part of East Africa, renowned as the 'Cradle of Humankind'. Furthermore, this study of the Meru region assessed the latent potential available for sustainable community development in this area and beyond, taking the theme of so far under-utilized wild plants. In this endeavour, the realization of the aim of the study was encapsulated by beginning with a strong theoretical orientation on the current state of research concerning wild plant use and practice in developing countries. This was followed by an assessment of appropriate theoretical approaches and strategies, which included the evolutionary ethnobotanical approach on the processual human-plant interactions, which go back to the prehistoric times of the Neolithic hunters and gatherers.

At the same time, the realization of the significant role which the indigenous peoples around the globe play, and have played unobserved, in the sustainable use, management and conservation of

their wild plant resources has clearly been demonstrated by the knowledge, wisdom and practice of local farmers, healers and plant experts in Meru. These people have accumulated a vast body of traditional ecological knowledge (TEK) in this part of East Africa. This new community-based orientation toward indigenous peoples and their knowledge systems unquestionably strengthened the interdisciplinary basis of ethnobotany in that, rare useful wild plants were identified and documented, and it also deepened the insight, understanding and respect for the art of local ethnobotanical knowledge and wisdom. The involvement of the indigenous peoples themselves - who previously were only 'used' as porters, facilitators and servants - in such research brings a whole new Dimension to the documentation and analysis of indigenous wild plant knowledge and use as part of the traditional culture.

As mentioned before, the adoption of the processual approach on human-plant relations as an evolutionary sequence, and the identification of the (pre)historical associations, which include the 'ethnographic analogy' in conjunction with the Leiden Ethnobotanical Knowledge System's (EKS) approach on the basis of the interactive 'Knowledge-Belief-Practice' Complex formed the basis for the documentation and understanding of such relations from the past through to present and the future, thereby emphasizing the significant role which plants have played in sustaining humankind. The choice of such appropriate theoretical approaches has been substantiated by the selection of advanced research methodologies and analytical techniques which pertain to the execution of both qualitative and quantitative methods to strengthen the research in Meru. Such methodologies were put into practice during the surveys in the three Meru Districts and the data collected from the field. The data sets were later re-arranged and subjected to a series of subsequent analyses which eventually culminated in the construction of the analytical model for the region. The complete model with the final calculations showing the relations and interactions between the various independent 'Blocks' of predisposing, enabling, environmental, conservation and the intervening 'Block' of policy and planning variables and the dependent 'Block' of variables concerning wild plant use behaviour confirm the significance of useful wild plants in the age-old processes of the life and survival of the Meru people. Following the realization of the general aim of the study in Meru on the basis of a review of the theoretical background and methodological considerations, it was possible to fulfil the specific objectives which consisted of putting the general aim into operation, set out at the beginning of the study which can be summarized as follows:

Firstly, a general description is presented of the sociography of the research setting, encompassing the background of the Republic of Kenya in the Horn of Africa, including information on the geographical location, climate and its history before and after independence. Thereupon, the specific setting of the Greater Meru region is documented, covering the geography, landscape and location, as well as the history of origin and culture of the pre-Meru people (*Ngaa*) and the current distribution of the Meru population on the eastern slopes of Mount Kenya, administratively subdivided in the three Districts of Meru North, Meru Central and Meru South.

Secondly, qualitative and quantitative data on Meru-plant relations are presented, providing an overview of the life of the Meru people in the three selected sample survey villages of *KK Lumbi*, *Kinoru* and *Kagera* in Meru North, Meru Central and Meru South Districts respectively. Following an overview of the general population distribution over the Districts, more detailed information is given about the profile of the three villages. In this, the socio-demographic and economic structures are described, followed by the household compositions, gender and age distribution and the socio-economic status and wealth of the household heads of the sample surveys. The Meru cultural methods of plant use and conservation are described as part of the indigenous resources management system. Although such conservation practices were crucial to the survival of the Meru, they were challenged by the invasion of colonial powers which confiscated their land and natural

resources, and then went on to dismantle their traditional institutions. The study indicates that the colonial era caused a serious depletion of natural resources, and introduced the onset of the disintegration of the informal education system of the Meru, in which local use and conservation practices used to be taught to every Meru child down through many generations.

Thirdly, an assessment is presented of the evolution of human-plant relations in Kenya, on the basis of a review of the subsequent periods of time of the hominins, the modern humans of the Neolithic and contemporary modern humans. As humans and their ancestors have used wild plants since prehistory, an assessment is given of the fossils of plants and this is illustrated in more depth by a discussion of the early hominins who used such plants for their survival. The material plant-based evidence - albeit as yet rather limited in this area - helped to reconstruct the process of human-plant interaction over a longer period of time. Besides fossil plants, microwear studies of tool surfaces and human dentition threw these early interactions into even stronger relief. Relevant material evidence from the past consist of such tools as hand-axes, scrapers, grinding stones, stone bowls, wooden drink vessels, complemented by the firstly retrieved, more recent carbonized seeds from progenitors of millet, thereby confirming the significance of a deeper diachronic study and understanding of wild plant use in the culture area of Kenya since prehistory.

This part of the study shows that so far, relatively less attention has been paid to the important evolution of human-plant relations, resulting in a certain paucity of material palaeo-ethnobotanical evidence. In addition to the understandably general focus on palaeo-anthropological and archaeological studies of the process of human evolution which produced a pioneering understanding of human origins in this significant part of East Africa, the attention paid to human-plant relations has been largely limited to the reconstruction of early plant and crop domestication in Sub-Saharan Africa. Similarly, the study shows that the fragmented collection of few material plant-related artefacts and tools from the area have so far been deemed as yet inadequate to implement the method of 'Ethnographic Analogy' successfully. Consequently, the assessment of human-plant relations in Kenya shows that more interdisciplinary research on both material and non-material evidence is needed to provide a better understanding of this intriguing process. The Leiden 'Ethnobotanical Knowledge Systems' (EKS) approach could contribute to the diachronic assessment of these complex relations and interactions, embarking from the present in a retrospective mode through the pre-contemporary period of time back to the past, and in this way also enabling projections from the present towards future processes.

Fourthly, the presentation of the results of the qualitative study, including the botanical collection, identification and preservation for future research of 567 useful wild plant specimens collected in Meru. Using these as a basis, the indigenous classification of useful wild plants is constructed and presented, encompassing both the vernacular and scientific names of the plants concerned.

As the inventory shows, these useful wild plants are traditionally subdivided by the Meru into two major categories, based on their distinctive use. In this way, the Meru useful wild plants are traditionally perceived as encompassing *medicinal plants* and *non-medicinal plants*. The indigenous, rather utilitarian division of useful wild plants was put into operation for the more elaborate study and analysis of the useful plants in the emic-oriented research strategy. The first category of *medicinal plants* made up 53.8 per cent of all the plants analysed. The other category of *non-medicinal plants* was composed of the remaining 46.2 per cent. The comprehensive list of various uses of wild plants for medicinal and non-medicinal purposes presented underlines the great significance which the local Meru place on the use and conservation of their rich wild plant resources.

Fifthly, the presentation of the indigenous classification of *medicinal wild plants* of the Meru as the first main category of wild plants used in traditional herbal medicine, on the basis of their plant-related knowledge, use and conservation practices. Besides the indigenous classification of medicinal plants among the Meru, the closely- related indigenous diseases classification is also presented. The study of Meru knowledge and use of medicinal wild plants palpably demonstrates the people's ability to identify and classify plants in relation to herbal remedies and dosages taken to treat diseases, complemented by their methods of conservation for future use. Although the majority of Meru residents is able to identify and use most medicinal plants at any time, when an emergency occurred, these complex practices are the domain of various types of traditional Meru healers and community plant experts, including , traditional midwives and birth attendants as well as indigenous surgeons.

These indigenous functionaries' detail local knowledge, skills, experience and practice in the use of wild medicinal plants show certain parallels with those of the Western-trained doctors, albeit with less formal education and fewer sophisticated tools and techniques. Integration of traditional and modern medicine, rejected for a long time, is now part of the policy of the Government of Kenya. Promoted by many international organizations such as WHO, FAO and UNICEF, this strategy is now also implemented in Kenya, albeit rather slowly in the wake of the virtual loss and threat of the disappearance of medical biocultural diversity. As licences to set up herbal clinics, some of which have been mentioned in this study, have begun to be issued by the Government in a bid to contribute to the process of revaluation of traditional medicine, these may therefore take a central role in the Kenyan integrated health care system in the near future.

Sixthly, the presentation of the indigenous classification of *non-medicinal wild plants* of the Meru as the second main category of plants used by the indigenous people in the research area, on the basis of their knowledge, use and conservation practices. This part of the study provided more information about the local sub-categories of the non-medicinal wild plants, including food plants, material plants, social plants, fuel plants, environmental plants, non-vertebrate poisons plants and bee plants. In greater detail, the identification of plants used for food and nutrition, plant parts used, and preparation practices is presented in greater detail, providing more evidence of the expertise of the indigenous Meru people in managing, using and conserving their wild food plant resources. Similar indigenous expertise is documented by noting the local identification, preparation and use of other natural products made from wild plants and trees. These include farming and household utensils, fuel for cooking and heating, boundary markers and windbreaks, not to mention plant-based insect repellents. The sub-division is complemented by information about wild plant used in such various social ceremonies as invoking curses, marriage, child birth, discipline and leisure.

Seventhly, the complex analysis of local people's wild plant use behaviour is - as described in Chapter III on the selected research methodology - based on three subsequent phases of quantitative analysis, namely the Bivariate Analysis, Multivariate Analysis (OVERALS), and Multiple Correlation Analysis. Embarking on the utilitarian classification of useful wild plants in Meru, the data collected were first operationalised into the two dependent variables - medicinal and non-medicinal wild plants - as conceptualized in the analytical model in order to reach an understanding of and explain wild plant use behaviour among the Meru. As a preparation, data which are collected from the three villages in the survey using structured questionnaires were initially subjected to a series of recalculations, followed by the three related phases of the analyses. These three analyses in sequence eventually led to the construction of the final analytical model.

The *first phase* of the comprehensive analyses of quantitative data included the bivariate analysis, which embarks on the operationalization of the twenty-one independent, three intervening and the two dependent variables, identified as potentially significant in the process during the

surveys in which all the variables were presented in cross-tabulations, in which the significance of associations between independent and intervening variables and dependent variables were measured on the basis of the values of the related *Pearson Chi-Squares.* The results of this analysis of the two main categories of wild *medicinal* and *non-medicinal plant* use actually confirmed the initial findings of the qualitative surveys, which had already identified a number of factors presumed to be significant in their influence on the local people's reported patterns of wild plant use behaviour. Therefore, according to the results of the bivariate analysis, significant relationships were found for the following variables: in the first category of *medicinal plant use behaviour,* four variables showing significant associations, namely the 'environment' of the independent variables, 'knowledge of medicinal plant use', 'knowledge of non-medicinal plant use' followed by the intervening variable of 'encouraging policies of the government'.

Indeed, in the process of *medicinal plant use behaviour*, the environmental variables - representing the geographical location in which the respondents live - show the most significant interaction with the pattern of medicinal plant use behaviour traceable to the urban, semi-urban and the rural settings. Respondents in the urban village of *Kinoru* reported much lower levels of use than the respondents in rural village of *Kagera*. While reduced vegetation in the wake of the encroachment on the land by increased settlement in the Meru municipality limits people's access to wild medicinal plants, the rural respondents are still able to use such plant resources from the ample vegetation of the region, despite the spread of modern clinics and hospitals which seem to reduce wild plant use for medicine in general. In *KK Lumbi*, respondents experienced serious security problems with cattle rustlers from the north, restricting the inhabitants of this semi-urban community from going into the forest edges to collect wild medicinal plants.

For the second category of *non-medicinal plant use behaviour,* four variables also show significant associations, namely the intervening variable of 'discouraging policies of the Government', followed by independent variables of 'household size', 'perceived need of plant resources' and 'experience in non-medicinal plant use'. Here, the discouraging policies of the Government tended to enforce regulations on wild plant use as part of the overall policy of protecting forest areas, without taking into account the indigenous wild plant conservation methods which the indigenous Meru have implemented over many generations in the area. These results of the significant associations with medicinal and non-medicinal; plant use behaviour are shown in Tables 9.6 and 9.7, in which additional variables with significant, albeit less substantial associations are also indicated.

The *second phase* of the comprehensive analyses included the multivariate canonical correlation analysis (OVERALS) which similarly embarked on the operationalization of the twenty-one independent, three intervening and two dependent variables in the analytical process. Following the bivariate analysis, the independent, intervening and dependent factors - reformulated as variables in the analytical model - were introduced to the multivariate analysis, measuring the interactions between the three categories of variables, and between the independent and intervening variables, as well as the dependent variables. The specifically developed multivariate analysis of such patterns of use behaviour, called OVERALS, showed a greater substantiation of the significant associations which previously emerged in the bivariate analysis.

In the *first step* in the multivariate analysis, the overall patterns of plant use behaviour were again divided into the two locally-oriented main categories of wild plant use, namely *medicinal* and *non-medicinal plant use behaviour*, also carried out in the bivariate analysis. In this first-step analysis, the results of the bivariate analysis generally gave confirmation, albeit they were definitely reinforced in their significance in the context of the interaction among all variables of the analytical

model. The results of this first step in the multivariate analysis can be conveniently described in accordance with the two 'user' categories as follows:

The interaction between independent variables of Set 1 and the dependent variables of Set 2 significantly interact with non-medicinal plant use behaviour, therefore adding support to the very close interaction between patterns of *medicinal* and *non-medicinal plant use* behaviour. This result points out the balanced position of both utilitarian categories of useful wild plants which share a central place in the cultural heritage of use and conservation of plant resources among the Meru in the research area. Furthermore, in this analysis, the strong position of the environmental variables, actually extend their significant interaction with wild plant use behaviour in the first Dimension. Moreover, the psycho-social variables of knowledge of medicinal plants and knowledge of non-medicinal plants as well as the intervening variable of encouraging Government policies come about through the strongly calculated component loading, as shown in Table 9.8. The component loadings of these variables in the first Dimension are respectively: 0.580; -0.412; 0.305; and 0,285. Interestingly, predisposing variables which show significant interaction with wild plant use in the second Dimension include, first and foremost, the sex of the household head, followed by the variable of conservation of wild plants and experience with non-medicinal plant use. As discussed earlier, women and men in Meru play different roles in the community, although this social phenomenon is slowly disappearing. Females tended to shy away from busy and forested areas since such places were regarded as places to which only men should go, with the exception of the collection of firewood or animal fodder. Interestingly, the strongly interacting conservation-related variables refer to the indigenous belief among the Meru that conservation practices of all natural resources is important to the sustained use and management for future generations.

Following the above mentioned bivariate analysis of wild plant use behaviour, conducted over the two main categories of dependent variables of *medicinal* and *non-medicinal plant use behaviour,* the *second step* in the multivariate analysis was refined to assess the role of the independent and intervening variables in each sub-division of non-medicinal plant use behaviour, for which each sub-category, the analysis was conducted separately, namely for respectively *food plant use behaviour*, *material plant use behaviour, social plant use behaviour fuel plant use behaviour, environmental plant use behaviour, non-vertebrate poisons plant use behaviour* and *bee plant use behaviour*.

In general, the analysis show that the independent variables in Set One and dependent variables in Set Two in Dimension One highly interact with each separate category of wild plant use: respectively food plant use (-0,970), material plant use -(0,957), social plant use (0,934), fuel plant use (0,952), environmental plant use (0,978), non-vertebrate poisons plant use (0,976), and bee plant use (0,980) behaviour, serving to support the linkage between knowledge and practice in relation to different kinds of uses of non-medicinal wild plants of the Meru household heads in the surveys.

In this way, the multivariate analysis show that in *food plant use behaviour*, ‘psycho-social variables dominate the significant interactions in the behaviour process, including 'experience in medicinal plant use’, ‘belief in medicinal plant use’, ‘experience in food plant use, and 'attitude towards food plant use’. In *material plant use behaviour*, the multivariate analysis indicate that the psycho-social variables ‘experience in material plant use’ and ‘knowledge of medicinal plant use', the environmental variable of ‘environment’, and the intervening variable ‘discouraging policies’ predominated in significant interactions in the behaviour process. The multivariate analysis of *social plant use behaviour* show that the psycho-social variables ‘experience in social plant use’, ‘attitude towards social plant use’ and ‘knowledge of social plant use’ score the highest significant interactions in the behaviour process.

The multivariate analysis also demonstrated that in *fuel plant use behaviour,* the enabling variable ‘socio-economic status’ of the respondents score the highest significant interactions in the

behaviour process. The multivariate analysis of *environmental plant use behaviour* reveal that the socio-demographic variable 'marital status', the psycho-social variable 'experience in environmental plant use', and the intervening variable leads the highest significant interactions in the behaviour process. The multivariate analysis also show that in *non-vertebrate poisons plant use behaviour,* the socio-demographic variable 'marital status', the psycho-social variables 'knowledge of non-vertebrate poisons plant use' and 'experience in 'non-vertebrate poisons plant use' discloses the most significant interactions in the behaviour process. Finally, the multivariate analysis indicate that in *bee plant use behaviour*, the psycho-social variables 'experience in bee plant use', 'experience in medicinal plant use' and 'knowledge of bee plant use' also show the highest significant interactions in the behaviour process.

In the *third step* in the complex analysis of quantitative data, a specific analysis is conducted to examine the cohesion between the various 'Blocks' of the analytical model by the implementation of a stepwise multiple regression analysis of the different 'Blocks' of the model. The strength of the cohesion in each Block is expressed in the result of the calculation of the multiple correlation coefficient (r) with optimal scaling from the OVERALS, where r = (2*Ed)-1. The 'Blocks' as presented in the methodology include Block 1: predisposing factors consisting of the socio-demographic variables; Block 2: predisposing factors composed of psycho-social variables; Block 3: enabling factors made up of socio-economic status (SES) variables; Block 4: environmental factors compose of *KK Lumbi*, *Kinoru* and *Kagera* variables; Block 5: conservation factors made up of the cutting and the planting of trees variables; Block 6: intervening factors including the intervening awareness, encouraging policies and discouraging policies variables; Block 7: medicinal plant use behaviour factors consisting of medicinal plant use behaviour variables and Block 8: non-medicinal plant use behaviour factors containing the non-medicinal plant use behaviour variables.

The results of the third step in the analysis are presented in Table 9.11, and the final construction of the analytical model of wild plant use behaviour in Meru for the study is given in Figure 9.3. The calculated multiple correlation coefficients (r) presented significant relationships both among the independent variables and between them and the dependent variables. For instance, strong cohesion in Dimension One is observed between Blocks 1 and 2 which, as expected, reveal that such predisposing factors as socio-demographic and psycho-socio behaviour, influence each other strongly in wild plant use behaviour. Simultaneously, in the First Dimension there is very strong cohesion indicated between Block 1 of the socio-demographic variables and Block 3 of the enabling variables of socio-economic status (SES). The other strong cohesions observed are between Blocks 1 and 4 on socio-demographic and conservation variables, Blocks 2 and 3 of psycho-social and enabling variables and Blocks 2 and 4 of psycho-social and environmental variables, all in Dimension One. Relatively strong cohesions are also observed in Block 2 of psycho-social and Block 6 of the intervening variables and between Blocks 2 and 5 of predisposing and conservation variables in both Dimensions One and Two. Indeed, all the twenty-one independent variables and the three intervening variables had some degree of strength in the cohesions and interactions which they revealed between each other.

Furthermore, strong cohesion is observed in Dimension One between the independent and dependent Blocks of variables, and that significant cohesion is seen between the independent variables of Blocks 1, 2, 3 and the intervening variable of Block 6 in interaction with Block 7 of the dependent variable wild medicinal plant use behaviour. Cohesion between Blocks 4 and 5 reveal some coherence, albeit lower in strength in interaction with Block 7 in Dimension One. This result can be used to predict medicinal plant use behaviour of wild plants in Meru. Turning to the cohesion between the blocks of independent variables and the block of dependent variable non-medicinal plant use behaviour, a similar interaction is likewise found. For instance, strong relationships are

observed between Blocks 1, 2, 4 and 6 of predisposing, environmental and intervening variables as opposed to Block 8 of dependent variable non-medicinal plant use behaviour, which also could be used in predicting the outcome of this kind of behaviour. Block 5 of the conservation variables also scores a degree of coherence, albeit smaller in interaction with Block 7 of the dependent variable of non-medicinal plant use behaviour, and as such can also be used as one of its predictor values.

In conclusion, it is important to explain that all the independent variables in Blocks 1, 2, 3, 4, and 5, and the intervening variables in Block 6 have clearly shown to exert a significant influence on each other, among in the blocks of variables. At the same time, each block of variables show significant coherence between its variables and with other blocks, interacting as well with the various categories of plant use behaviour among the Meru people. Such interactions are found to be rather significant in relation to reported patterns of medicinal and non-medicinal plant use behaviour. It is also important to note that all the blocks of variables in the model constitute a system which adjusts itself if any changes take place either in the individual variables of respondents or in he system variables of blocks as a whole. Since the configuration of 'blocks' in the analytical model and the various relationships in this determine the patterns of behaviour as expressed in the two user categories of medicinal and non-medicinal plant use behaviour, this ultimately confirm the intricate relationship between the various independent and intervening variables in interaction with the dependent variables of medicinal and non-medicinal plant use behaviour which can conclusively be referred to as a highly sophisticated and valuable system of wild plant use behaviour of the Meru. This deserves to be studied in much greater depth, analysed and revitalized for the sake of the health and well-being of future generations in Kenya and elsewhere around the globe.

10.2 Implications

10.2.1 Theoretical Implications

In principle, the theoretical implications of this study in Meru are based on the position of the indigenous people's way of visualizing their useful wild plant resources in relation to their traditional use, management and conservation system as studied, documented and analysed in complementary qualitative and quantitative surveys. Several underlying factors have been identified and operationalised into analytical variables representing a complex configuration of an indigenous system of useful wild plant knowledge, belief and practice as part of the cultural heritage of the Meru people in central Kenya. This has enabled them to live and survive in harmonious interaction with their natural environment. Incontrovertibly these variables constitute the tangible, empirical factors of primary interest to Western 'scientific' investigation, and also compose the 'invisible' factors, crucial to local people's behaviour, often ignored as 'insignificant' and 'non-scientific. Some of these intricate factors which contribute highly to shaping an individual's life and behaviour are also seen to play a significant role in the differential patterns of plant use behaviour, emerging in this study of human-plant relations as of vital importance for the survival of the Meru people in Kenya.

For a long period of time, the use of wild plants has been regarded as a 'primitive' practice of 'tribal' communities, 'old-fashioned', 'uncivilized' and not part of the current status of modern humans (*cf.* Harsberger 1896; Cotton 1998; Leakey 1982, 1991 & 1994). Although the Meru are in many respects a 'modern' people, they have used and conserved their unique plant resources for many generations, not because they are 'primitive' or 'old-fashioned', but because wild plants have provided them with an essential resource for both their *material* - medicinal, food, fuel,

environmental, invertebrate poison and bee uses - and *immaterial* needs - socio-cultural uses - for their livelihood and survival. With a few exceptions, ethnobotanical studies in East Africa have so far been conducted largely by foreigners who have tended to present their outsider's point of view (etic) of local plant-related processes - paying scant attention to local knowledge, belief and wisdom - in contrast to the insider's (emic) view on indigenous cultures. At present, however, a few local scientists have ventured into similar studies, promoting indigenous knowledge as well as the feed-back of their results to the local communities (*cf.* Leakey & Slikkerveer 1991; Meyerhoff 1991; Nafuna Wamalwa 1991; Kabuye 1995; Warren 1995; Maundu *et al*.1999).

In this context, the most important theoretical implication of the present study refers to the execution of additional, emic-oriented research which pays due attention to the role of the crucial 'invisible' factors as determinants of indigenous plant use and conservation systems, including local knowledge, belief, attitudes and experiences within the dynamic context of development and change. Such an orientation is encapsulated in the recent ethnoscientific approaches of Indigenous Knowledge Systems (IKS), Traditional Ecological Knowledge (TEK) and Ethnobotanical Knowledge Systems (EKS) which paves the way for such ethnobotanical research in Kenya and elsewhere in Africa.

Another theoretical implication of the present study indicates the fact that most of the unique indigenous wild plant knowledge systems of the Meru, as similar systems elsewhere around the globe, are currently threatened by loss and extinction. If no immediate action is taken, the older wise and experienced men and women of the community may take these valuable systems with them forever into their graves.

Even today, in the twenty-first century, the precious indigenous knowledge and wisdom of local people continues to be undervalued and ignored by a number of 'experts' working in Western institutions and industrial organizations, far away from the field (*cf.* Minnis 2000). Although a wide range of wild plants can be identified by the local people as having great economic and scientific value for the local people in Meru, the world still ignores such well-demonstrated knowledge, beliefs and wisdom as 'native', or even 'supernatural' or 'magic' (*cf.* Slikkerveer 1989: Warren 1989). The present effort to document and study the evolution of past and present human-plant relations in Meru seeks to place the local ways of sustained use and conservation of this unique cultural area in a global perspective, especially as this kind of emic-oriented research had not been conducted in Meru before.

Indeed, only a number of development-oriented studies have concentrated on agriculture and such food crops as coffee and tea, and local researchers focus only on either domesticated plants and crops, or on fragments of various types of wild plant use, which have recently come under threat of extinction (*cf.* Gilmore 1919; Desmore 1928; Barrows 1931; Sindiga 1998; Maundu *et al.* 1999).

In this context, the results of the present study also show a gradual decrease in the use of wild plants for a wide range of purposes among the respondents in the sample survey villages in Meru. The destruction of indigenous cultures which are known to contribute to the conservation of both biodiversity and cultural diversity in terms of plants and plant-related knowledge is resulting in a critically negative impact on the lives of the Meru. Unfortunately, a large segment of the local population is living in poverty, disease and ignorance, in spite of the wealth of their immediate environment. Vast areas of tropical vegetation have been destroyed, and local people's values ignored in favour of foreign values and commercial products and services.

At this critical point in time, however, a counter-development seems to be emerging, albeit still on a small scale, in which a reorientation towards indigenous peoples and their management and conservation systems is coming to light, paving the way for new directions in science and in society (*cf*. Slikkerveer 1992). The preservation of the Meru people's values, knowledge, beliefs and

practices in relation to their plant resources cannot therefore be undervalued and, where possible, should be reintegrated into a global system of knowledge and technology (*cf.* Conference of Parties [COP] – Convention on Biological Diversity [CBD] 2000). Consequently, in the newly-developing field of study of biocultural diversity conservation, increased attention paid to indigenous people's indigenous management and conservation systems should focus on the description of significant local methods and practices, but it should also not overlook the underlying conservation-based philosophies of nature and the environment which have enabled such people as the Meru in Kenya to live and survive in sustained interaction with their environment and its resources up to the present.

The results of this study also demonstrate that human-plant relations in Kenya and in the Greater Meru region in particular are not a recent phenomenon. Indeed, the Meru people have been accumulating their wild plant knowledge system since the early times of their immigration from an island at the Indian Ocean moving inland to the eastern slopes of Mount Kenya where they are settled today. As with other similar groups in Kenya, their early tools and artefacts, enriched by their oral tradition and their language bear witness to massive population movements and close links with other peoples and cultures which date back to prehistoric times. The vegetation itself has undergone little change since prehistory except in density, and as such confirms the close links and relationships between the present and the past (*cf.* Chesters 1957; Keeley & Toth 1981; Jacobs & Winkler 1992; Judd *et al.* 2002). By implication, this study indicates a need for more diachronic studies as the result of the relative paucity in archaeological and palaeo-anthropological evidence related to early human-plant interactions, specifically in East Africa as the 'Cradle of Humankind'. Renewed interdisciplinary research should be developed and implemented in order to reconstruct human adaptation, use, management and conservation of their environment and its diverse natural resources.

In line with such theoretical implications, the method of the 'Ethnographic Analogy' between past and present cultures is shown to be heavily dependent of extensive archaeological excavation, collection and documentation of past material evidence, calling for new ways which should be explored to functionalize the Leiden 'Ethnobotanical Knowledge Systems' approach in such closely related fields of study as in human-wildlife relations, human-livestock relations and human-ecosystem relations over longer periods of time, in comparable cultural areas in Kenya and East Africa.

An additional theoretical implication of the present study has arisen from efforts to assess the human-plant relations in Meru in a retrospective mode so as to document the pre-contemporary processes of human-plant relations on the basis of oral traditions, legends and folk tales. Here, a substantial contribution is needed composed of studies focusing on the documentation of cultural diversity in terms of local and regional languages. Linguistic studies as part of cultural diversity should be paid more attention in this kind of ethnoscience research, especially with a view to the construction of indigenous classification systems as in Meru of wild plants, diseases, wildlife, soil- and vegetation types and the like.

As regards the methodological implications of the study in Meru, the analytical model on human wild plant use behaviour developed at Leiden University has been adapted and operationalised for the study in Meru, demonstrating its functions adequately in an analysis of this kind of ethnobotanical research. Therefore, the model, already successfully applied in similar studies elsewhere, should be developed and refined to study, document and analyse patterns of human behaviour in relation to the local use and conservation of ecosystems, aquatic systems, agroforestry systems and pastoral systems in the culture area of East Africa.

10.2.2 Practical Implications

In this study, the use and conservation of both medicinal and non-medicinal wild plants is analysed by examining the manner the communities in Meru manage their own wild vegetation resources as part of their daily life. It reflects the choice of the participants as they determine the way they live and use a whole range of medicinal, food, material, social, fuel, environmental, non-vertebrate poisons and bee plants. Such an emic view discloses that many households continue to be faced with the dilemma of managing the growing number of their members who are faced with poverty and premature deaths caused by such diseases as malaria and HIV/AIDS. This situation can be blamed on a continuing shortage of resources, but is also attributable to the erosion of traditional ways of life, including the system of *informal education* which used to be an important part of the traditional age-grade system of the Meru.

As in their efforts to gain enough income the large households of today are forced to give less time on the informal education of the younger members who spend most of their time in formal schooling, the parent-child contact is largely reduced and less time is available to teach the young people at home about nature and its rich resources, including the wild useful plants.

In line with such use and conservation teaching and learning projects, renewed attention could also be paid to so far under-utilized plants and crops for medicinal and related purposes in order to generate additional income and employment at the community level.

A practical implication of the present study, therefore, refers to the formulation and implementation of wild plant use and conservation projects and programmes which will draw special attention to the appropriate use of the wild plant resources which still continue to play a major role in the daily life of the local people. Such programmes would link up with an increasing number of global initiatives on biocultural conservation, and also help revitalize local knowledge and practice of sustainable use and conservation of local plant resources for a variety of purposes.

Likewise, due attention should be given to the issues of wild plant use and conservation and this should be integrated into the formal education system, which is pretty poverty stricken in practical studies encouraging actual interactions of youngsters with their natural environment. In this way, the fund of common knowledge and experiences which the elder generations have accumulated, currently in danger of loss, could be revitalized and preserved for the future as part of new curricula of the formal schooling system.

The present study also reveals that in Meru most households are headed by men who tend to determine what should and not be done. In decisions involving plants and crops, females tend to be relegated to a secondary position, especially with regard to the management and use of the vegetation environment. Women are generally not involved in the use of wild plants, particularly for medicine. Indeed, it is rather uncommon to find women in the wild except on the rare occasions when they are collecting firewood. As women are responsible for providing food and nutrition for the family, nowadays they tend to go to the market or food stores instead of roaming the wild vegetation for food. Since this trend reduces the women's chances of learning about their useful wild plants, special women's groups and associations could be set up to focus on the management, use and conservation of wild plants for medicinal and other purposes - as indicated in this study - in order to revitalize and enrich their culture in a harmonious relationship with their surrounding nature.

The results of the present study show that the marital status of participants in Meru is an important factor in the use of plants within the context of the traditional Meru institution of marriage. Indeed, since the widowed and the divorced women in the household surveys are being marginalized in their knowledge and practice of useful wild plants in the same manner as in the

male-dominated households mentioned above, concerted effort should be made at the community level to empower women to be more involved in the use, management and conservation of Meru useful wild plants.

The results of the bivariate analysis also confirm the fact that higher levels of plant knowledge are generally directly related to higher levels of medicinal and non-medicinal plant use behaviour, while a low attitude relates substantially to lower levels of use of these wild plants. This study has revealed that low levels of experience are interacting with low levels of use, indicating that at present wild plants in Meru culture are taking a back stage position, with the risk that no one will be bothered about them in the near future, which, in turn could contribute to further erosion of the Meru rich biocultural diversity. By implication, renewed attention should be placed at the community level on increasing knowledge, attitude and belief concerning the useful wild plants among the Meru, implemented by community-based education programmes and projects on the sustainable use and conservation of indigenous wild plants in the region. Here, local Meru institutions could play a significant role.

The results of the study relating to the environment confirm the significance of the rural setting which contributes positively to medicinal plant use behaviour, since it provides the natural workshops for training, and simultaneously offer opportunities for building positive beliefs and attitudes towards useful wild plants use. Since the study also reveal that the lack of policies to encourage the sustainable use and conservation of wild plants has created a vacuum at the community level which should be filled with well-adapted policies to encourage such environment-friendly activities in the region.

As the study also indicate that the growing shortage of fuel may increase the burden on the natural vegetation in the near future, policies should be implemented to regulate uncontrolled collection of plants and trees from the forests for fuel wood and charcoal. The situation has become critical, not least because prolonged droughts have meant that the inhabitants of such fragile environments as *KK Lumbi* lose their vegetation and livestock, thereby exacerbating the already deteriorating situation. Efforts could also be put in place to regulate water levels in *Kagera* and *Kinoru* villages, which both have large amounts of river water which is allowed to drain into the Indian Ocean. Dissemination of appropriate conservation measures in terms of rules and regulations on the one hand and involvement of local institutions on the other could contribute greatly to sustainable community development in harmony with the environment and its useful plant resources.

Another important practical implication of the present study refers to the use of wild medicinal plants for traditional herbal medicine in the study area, where poor household heads in particular tend to use these medicinal plants more than the richer members of the community. Although the revitalization of the use of herbal medicine in primary health care links up with both traditional cultures and international policies, adequate measures to be put in place by the Government could be designed and implemented, to promote local forms of sustainable use, to also safeguard the local medicinal plants from the risk of over-harvesting as the result of the unlimited commercial exploitation of wild medicinal plants and herbs.

In this context, the study has shown that unquestionably human behaviour is rather difficult to change by direct means but that it is possible to identify certain background factors which seem to act as determinants of human behaviour in terms of their significant relations and interactions with patterns of their behaviour. As regards the use and knowledge of medicinal and non-medicinal wild plants among the Meru - a major object of the present study - a number of such significant determinants have been identified. These can be modified in order to initiate changes in the overall patterns of wild plant use and conservation behaviour.

Among the determinants of medicinal and non-medicinal plant use behaviour among the respondents in Meru are the environment, their profession and level of formal education, their wild plant knowledge and experiences, the gender and current Government policies concerning conservation and community development.

The practical implication of these results include specific attention designed to improve the position of these determinants by concerted efforts related to the promotion and contribution to conservation and improvement of the habitats favourable for wild plants growth, followed by the creation of a deeper understanding and respect for wild plants through the provision of facilities to study nature and culture at the community level. These current processes should be highlighted, but importantly the historical dimension of current configurations which should also be an part of the programme. It goes without saying that the greater involvement and the empowerment of women must be promoted in this important domain of medicinal plants for health and well-being of the entire community.

Finally, an important contribution to sustained use and conservation of useful wild plants could be provided by Government and Non-Government organizations at the local level. These could provide an adequate process of policy planning and implementation in close co-operation with the household heads in the villages in order to introduce sustainable community development in the area, and as such safeguard the Meru cultural heritage of indigenous knowledge and practice of use and conservation of useful wild plants for the future.

10.3 Recommendations

Since some of the results of the present study on Indigenous Knowledge, Belief and Practice of Wild Plants among the Meru of Kenya touch upon various issues which are currently also the subject of the public debate, among them the position of indigenous peoples, the role of traditional medicine, the need of biocultural diversity conservation, and the strategy of sustainable community development, the recommendations derived from it endeavour to link up with these issues, albeit they are primarily formulated to suggest comprehensive practical contributions to the improvement of the position of the Meru people in relation to their wild plant resources.

Preservation of Meru Ethnobotanical Knowledge Systems

One of the major findings of the research is the general concern expressed by community members about the loss of indigenous Meru plant knowledge and practice, specifically with regard to wild medicinal plants. Most respondents unequivocally see this form of local knowledge as a major part of their cultural heritage dating back to the days of the great migrations of their ancestors, the *Ngaa*, who accumulated this body of practical knowledge to help with their survival during their long journey from the coastal island through the forests and fields to the slopes of Mount Kenya.

In view of the role which the useful wild plants have played for a wide variety of purposes in the socio-cultural development of the community, and given the current world-wide revitalization of indigenous knowledge systems - often under threat of extinction - it is strongly recommended that special efforts be undertaken to identify and document these systems in such sectors as environment, health care, agriculture and natural resources management in conjunction with Meru culture and language at the community level. In such endeavours, local institutions can serve as repositories for future research and development. Besides the provision of material support, local representatives and experts could be involved in the entire decision-making processes pertaining to the setting-up of such local institutions in the near future.

Integration of Local Knowledge into the Formal Education System

Closely related to this first recommendation is the general feeling among the Meru people which emerged from the research that the continuation of their culture and identity have recently come under threat of loss as the result of the increased formalization of education for the young which conforms with Western standards and styles. In their view, cultures have been inexorably changed because of the intrusion of foreigners and the introduction of modern education more suited to a Western life-style, which basically began with the onset of colonial rule. Many respondents expressed their wish to incorporate local learning and training into the modern education system to teach the younger generations the values of their nature and culture. This would turn out pupils who are locally informed and globally educated. Here, such local plant experts, sages and healers as the participants in the present study in Greater Meru region could be approached to provide training which would provide graduates who know and respect their environment and take care of it. This would have the added advantage that the local experts would be professionally encouraged by earning some kind of living. In this context, it is essential that, the Intellectual Property Rights (IPR) and compensation of local experts be incorporated into such programmes at the community level. It is therefore recommended that such local subjects as traditional farming methods, collection of non-timber forest products - including useful wild plants - nature and wildlife conservation practices and environmental protection in conjunction with Meru culture be incorporated into current teaching programmes and curricula in all schools in the Greater Meru region.

Revitalization of Traditional Herbal Medicine in Forest and Home Gardens

The study in the three Meru Districts also revealed that the use of traditional herbal medicine is generally regarded as a typical cultural feature of the Meru people which goes back to the time long before their settlement in their current region. Although ignored, oppressed and even forbidden by the missionaries and colonial settlers at the end of the nineteenth century, the knowledge and use of traditional herbal medicine - inherited from their ancestors - never disappeared, and in fact today is enjoying a revaluation in the wake of the growing lack of some modern drugs. Some respondents drew attention to the increase in religious influence in the communities, because of which members confessing to be Christian condemn practices related to wild plant use as 'satanic'. They believe these ways have to be abolished if a person is to receive the ‘good news’.

Similarly, the initially negative attitude towards indigenous medical practices shown by modern health care staff discourages the use of herbal medicine in health care development. In spite of such pressure, however, the use of herbal medicine is rising today, and the concomitant growing interest in medicinal plant use requires official promotion as well as encouragement and practical training, involving the establishment of herbal gardens in forests and at homesteads, and the organization of related teaching projects and programmes. In short, concerted action must be taken to support such efforts. Such projects envisaged in Meru could very well link up with a new initiative currently underway between the NMK and the LEAD Program at Leiden University to develop a community-based programme on herbal gardens in Meru and other regions of Kenya known as *Shamba la Miti ya Ndawa* (SHAMINDA) or garden/farm for medicinal plants. It is therefore recommended that Government and Non-Government Organizations will launch new initiatives to train and encourage families at the community level to begin their forest and home gardens for medicinal plants and herbs to boost their health and well-being. For these the plants must be provided in a cheaper and more sustainable way to link up with national initiatives and international policies of complementary and alternative health care development.

Policy Planning and Implementation Regarding Nature Conservation

During the survey in the Meru villages, it unequivocally emerged that all respondents claimed that there were virtually no Government or Non-Government policies and programmes operational in Greater Meru region to encourage conservation and the protection of nature. Cogently, it is significant to observe that there are still no official rules or regulations about the use and protection of wild natural resources. Local customary rules which have been transmitted and put into practice at the community level still prevail in lonely splendour. These traditional customary rules for the environment and its resources do tend to be ephemerally emphasized in political campaigns, and sporadically put into practice by law enforcement mercenaries with considerable discrimination towards the local people. Nor were any monitoring or controlling policies mentioned by the majority of the respondents in the sample survey villages. To a certain extent, local people are left to make their own rules and regulations to dictate how to care and protect their environment. Nevertheless, the survey also indicated that with the growing revaluation of Meru culture and nature, there is a mounting need for generally applicable rules which combine local customary and national laws and are aimed to strengthen the position of the indigenous peoples.

It is therefore recommended that concerted efforts be made in co-operation with the local people to draft official regulations to determine how nature might best be conserved for the benefit of the Meru, providing them with the opportunity to continue their sustainable use, management and conservation of their useful wild plant resources. Such efforts should not be made in isolation or limited to the context of the Meru region only; they should also involve the position of other indigenous and traditional peoples in Kenya, as well as other parts of Sub-Saharan Africa. This important recommendation for community-based conservation of nature should link up with similar international initiatives currently firmly on the agenda in the Indigenous People's Platform which was recently accepted at the UN General Assembly to strengthen their worldwide course.

Incorporation of Useful Wild Plants into Biocultural Conservation Programmes

The study in Meru also indicates that the concern raised about the threat of loss of Meru culture is closely related to their fear of the loss and extinction of their environment, which has provided them with their biocultural base for their livelihood and survival over many generations. Especially the older community members expressed their concern about the growing indifference towards sustainable use and conservation of the natural environment and its resources. In their view, the clearing of the forests for the commercialization of agricultural lands and the construction of new buildings incontrovertibly impinge on the typical Meru landscape, and much more seriously are extremely deleterious to the rich biodiversity of the environment and its plant and tree vegetation. Unquestionably such processes are now a threat to wild plant existence, and their delayed consequences could later lead to diminishing rains and subsequent droughts and erosion.

In fact, some parts of the land have already been transformed into commercial buildings, standing forlorn on open dust-fields, a recipe for even great devastation. It is not surprising that in these areas, Meru culture is disappearing apace, bowing down before commercial agriculture, industry and plain settlement. It is therefore recommended that special efforts be made and measures be put in place to prevent any further unrestricted extension of commercial land and properties into forested fields in order to halt further loss of the natural environment in the region. Special attention should be paid to incorporating the specific Meru ways of sustainable use and conservation of useful wild plant into future biocultural conservation programmes and projects

Promotion of Sustainable Plant-Based Community Development

As the present study in Greater Meru region has incontrovertibly shown, the potential benefits emerging from the ethnobotanical surveys in the villages of the three Meru Districts are significant, specifically for sustainable socio-economic development of the communities. Therefore more attention should be given to documenting, analysing and promoting the role which useful wild plants can play in sustainable community development.

This study had ineluctably demonstrated that great potential resources have been identified in the traditional medical system, which can provide traditional and complementary health solutions to local health care problems in the research area. Similarly, the identification of under-utilized wild plants and crops could also be used to generate income to be substituted for detrimental logging and over-exploitation of the tropical forests. Finally, a more extensive study and analysis of locally identified rare and vulnerable useful wild plant species, now under threat of over-exploitation and extinction, may lead to community-based conservation efforts to save these unique wild resources for the future.

In conclusion, it is therefore recommended that in line with current global conservation programmes, initiatives be taken to combine the local conservation efforts of medicinal and non-medicinal wild plants of the Meru people with sustainable economic development programmes in order to realize the potential benefits for future sustainable plant-based community development in Greater Meru region.

Bibliography

Abebe, D. & A. Ayehu (1993) *Medicinal Plants and Enigmatic Health Practices of Northern Ethiopia*, Addis Ababa: Indian Press.

Abbiw, K.D. (1990) *Useful Plants of Ghana. West African Uses of Wild and Cultivated Plants*. Kew: Intermediate Technology Publications and The Royal Botanic Garden, Kew.

Adams, W.M. & L.J. Slikkerveer (eds.) (1996) *Indigenous Knowledge and Change in African Agriculture,* Studies in Technology and Social Change No. 26, TSC Programmes, Ames, Iowa: Iowa State University.

Adimihardja, K. (1999) *Indigenous Agricultural Knowledge in Mount Halimun Area, West Java,* INDAKS Project Report, Bandung: INRIK

Agazzi, E. (1994) *Il Mondo Incerto: Acura di Marcello Pera.1*, Roma: Laterza.

Agnew, A.D.Q. & S. Agnew (1994) *Upland Kenya Wild Flowers (Second Edition*). Nairobi: East African Natural History Society.

Agrawal, A. (1999) On Power and Indigenous Knowledge, in: Posey, D.A. (ed.) *Cultural and Spiritual Values of Biodiversity: A Complementary Contribution to the Global Biodiversity Assessment,* Nairobi/London: UNEP/ITP.

Agung, A.A.G (2005) *Bali Endangered Paradise? Tri Hita Karana and the Conservation of the Islands Biodiversity*. A PhD Thesis, Leiden: The Netherlands.

Alcorn, J.B. (1989) Process as Resource: The Traditional \Agricultural Ideology of Bora and Huastec Resource Management and its Implications for Research, in: Posey, D.A. & . Balee (eds) *Resource Management in Amazonia*, Bronx, New York Botanical Garden.

Alcorn, J.B. (1991) Ethics, Economies and Conservation, in: Oldfield, M. and J.B. Alcorn (eds.) *Biodiversity: Culture, Conservation and Ecodevelopment*, Bolder: Westview Press.

Alcorn, J.B. (1994) Noble Savages or Noble Stage? Northern Myths and Southern Realities in Biodiversity Conservation, in: Toledo, V.M.E *Ethnocologia*, Vol. II, No. 3.

Alcorn, J.B. (1996) Is Biodiversity Conserved by Indigenous Peoples? In: Jain, S.K. (ed.) *Ethnobiology in Human Welfare*, New Delhi: Deep Publications.

Alcorn, J.B. (1999) Indigenous Resource Management Systems, in: Posey, D.A. (ed.) *Cultural and Spiritual Values of Biodiversity*, *A Complementary Contribution to the Global Biodiversity Assessment*, Nairobi/London: UNEP/ITP.

Altieri, M. (1987) *Agroecology: The Scientific Basis of Alternative Agriculture*, Boulder: Westview Press.

Altieri, M.A. (1993) Ethnoscience and Biodiversity: Key Elements in the Design of Sustainable Pest Management Systems for Small Farmers in Developing Countries, *Agriculture Ecosystems and Environment*, 46 (1-4) Special Issue.

Altieri, M.A & L.C. Merrick (1987) *In Situ* Conservation of Crop Genetic Resources through Maintenance of Traditional Farming Systems, *Economic Botany*, 41 (1).

Anderson, O.C. (1980) A Testimony of Prehistoric tasks. Diagnostic Residues on Stone Tool Working Edges. *World Archaeology*, 12: 181-194.

Anderson, E.N (1996) *Ecologies of the Heart: Emotion, Belief and the Environment*, Oxford University Press.

Armitage, P.L. (1975) The Extraction and Identification of Opal Phytoliths from the Teeth of Ungulates. *Journal of Archaeological Science,* 2:187-197.

Atran, S. & D. Medin (1997) Knowledge and Action: Cultural Models of Nature and Resource Management in Mesoamerica, in: Bazerman, M. *et al.* (eds.) *Environment, Ethics and Behavior*, San Francisco: New Lexington Press.

Ayliffe, L.K. *et al.* (2004) Turnover of Carbon Isotopes in Tail Hair and Breath CO2 of Horses feed on an Isotopically varied diet. *Ecologia,* 139: 11-22.

Bahn, P. & J.R. Flenley (1992) *Easter Island, Earth Island*, London: Thames & Hudson.

Balée, W. (1994) Footprints of the Forest: Ka'apor Ethnobotany – *The Historical Ecology of Plant Utilization by an Amazonian People*, New York: Columbia University Press.

Balick, M.J (1990) Ethnobotany and the Identification of Therapeutic agents from the rainforest, in: Chadwick, J. & J. Mash (eds.) *Bioactive Compounds from Plants* (Ciba Foundation Symposium 154). New York: John Wiley & Sons.

Balick, M.J. (1996) *Plants, People, and Culture. The Science of Ethnobotany*, New York: Scientific American Library.

Balick, M.J. & P.A. Cox (1997) Ethnobotanical Research and Traditional Health Care in Developing Countries, in: Medicinal Plants for Forest Conservation and Health Care, Non-Wood Forest Products, Rome: FAO.

Bannerman, R.H., Burton, J and Ch'en Wen-Chieh (1983) *Traditional Medicine and Health Care Coverage: A Reader for Health Administrators and Practitioners*. Geneva: WHO.

Barrows, D. (1931) Prehistoric Pueblo Foods. *Museum of Arizona Notes,* 4: 1-4.

Beentje, H. (1994) *Kenya Trees Shrubs and Lianas*. Nairobi: National Museums of Kenya.

Bein, E. *et al*. (1996) *Useful Trees and Shrubs in Eritrea. Identification Propagation and Management for Agricultural and Pastoral Communities.* Regional Soil Conservation Unit, RSCU/SIDA. Regal Press Limited, Nairobi: Kenya.

Bennun, L.A., R.A. Aman & S.A. Crafter (eds.) (1995) *Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles,* Tresaith: Samara Publishers.

Berkes, F. (1999) *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*, Philadelpia PA: Taylor & Francis.

Berlin, B. (1992) *Ethnobiological Classification: Principles of Categorization in Plants and Animals in Traditional Societies,* Princeton, NJ: Princeton University Press.

Binford, L.R.. (1969) Stone Tools and Human Behaviour, *Scientific American* 220(4): 70-84.

Binford, L.R. (1977) For Theory Building in Archaeology, New York: Academic Press.

Blackburh, R. & K. Anderson (1992) *The Greening of World Trade Issues*, New York: Harvester Wheatsheaf.

Blundell, M. (1987) *Collins Photo Guide to the Wild Flowers of East Africa*. London: Collins.

Boas, F. (1940) Race, Language and Culture, ew York: Macmillan

Bodeker, G.C. (1997) Introduction, in: Prance, G. *Medicinal Plants for Forest Conservation and Health Care,* Rome: FAO.

Bogers, R.J. *et al.* (2006) Medicinal and Aromatic Plants - Proceedings of the Frontis Workshop on Medicinal and Aromatic Plants, Wageningen, The Netherlands'

Bonneville, R. & A. Vincens (1985*)* Apport de la Palynologie à l'Environnement des Hominids d'Afrique Orientale*,* in: Coppens, Y. (ed.) *L'environnement des Hominidés au Plio-Pléistocène*, Paris: Masson, pp. 237-78.

Brothwell, D.R. (1969) *Science in Archaeology*, London: Thames & Hudson.

Bower, J.R.F. *et al*. (1977) Later Stone Age/Pastoral "Neolithic" Comparative Study in Central Kenya: An Overview. *Azania,* 12:119-146.

Breemer, P.J.M van den (1989) Yam Cultivation and Socio-Ecological Ideas in Aouan Society, Ivory Coast. *Sociologia Ruralis,* 29 (3/4): 265-279.

Breemer, P.J.M van den (1991) The Diffusion of Dry Rice Cultivation among the Aouan of Ivory Coast, in: J.P.M van den Breemer, H.Th. van der Pas & H.J. Tieleman (eds.) *The Social Dynamics of Economic Innovation: Studies in Economic Anthropology*. Leiden: D.S.W.O. Press.

Brokensha, D.W., D.M Warren & O. Werner (eds.) (1980) *Indigenous Knowledge Systems and Development,* Latham: University Press of America.

Brown, F.H. & C.S. Feibel (1986) Revision of Lithostratigraphic Nomenclature in Koobi Fora Region, Kenya*. Journal of the Geological Society*, 143: 297-310.

Brundlandt, G.H (1987) Our Common Future, World Commission on Environment and Development, Lantham: University Press of America.

Bryant, V.M & R.G. Holloway (1983) The Role of Palynology in Archaeology, in: Schiffer, M.S. (ed.) *Advances in Archaeological Method and Theory*. New York: Academic Press, Vol. 6, pp. 191-223.

Bryant, V.M. (1974) The Role of Coprolite Analysis in Archaeology. Texas Archaeological Society. *Bulletin,* 45:1-28.

Bryant, V.M. & G. Williams-Dean (1976) The coprolites of Man, in: Fagan, B. (ed.) *Avenues to Antiquity*. San Francisco: Freeman, pp. 257-266.

Bryant, V.M. (1993) Phytolith research: a look towards the future, in: Pearsall, D.M and D.R. Piperno (ed.) *Current Research in Phytolith Analysis: Applications in Archaeology and Palaeoecology* (MASCA Research Papers in Science and Archaeology, 10). University Museum of Archaeology and Anthropology, University of Pennsylvania, Philadelphia, pp. 175-199.

Bryant, V.M. (1994) Callen's Legacy, in: Sobolik, K,D. (ed.) *Palaeonutrition: The Diet and Health of Prehistoric Americans* (Centre for Archaeological Investigation of Occasional Paper, No 22). Board of Trustees, South Illinois University: pp. 151-160.

Buschkens, W.F.L. & L.J. Slikkerveer (1980) *Health Care in East Africa: Illness Behaviour of the Eastern Oromo in Hararghe, Ethiopa*, Assen: Van Gorcum.

Bunn, H. & E Kroll (1986) Systematic Butchering by Plio/Pleistocene Hominids at Olduvai Gorge, Tanzania. *Current Anthropology,* Vol. 27, pp. 431-452.

Campbell, B. (1983) *Human Ecology: The Story of Our Place in Nature from Prehistory to Present:* Butler & Tanner Ltd: Frome and London.

Chambers, R. A. Pacey & L.A. Thrupp (eds) (1989) *Farmer First, Farmer Innovation and Agricultural Research*. London: Intermediate Technology Publications.

Carlson, T.J.S. & L. Maffi (2004) *Ethnobotany and Conservation of Biocultural Diversity. Advances in Economic Botany, Volume 15*, Series Editor: Charles M. Peters: New York: Botanical Gardens Press.

Cavalli-Sforza *et al*. (1988) Reconstruction of Human Evolution: Bringing together Genetic, Archaeological and Linguistic Data. *Proceedings of The National Academy of Sciences*, 85: 2002-6.

CBD (1992) Convention on Biological Diversity, Rio de Janeiro: UNCED

Cerling, T.E. (1979) Paleochemistry of Plio-Pleistocene Lake Turkana, Kenya. *Palaeogeog. Palaeoclim. Palaeoecol*, 27: 247-85.

Cerling, T.E. (1997) Dietary and Environmental Reconstruction with Stable Isotope Analysis of Herbivore Tooth Enamel from the Miocene Locality of Fort Ternan, Kenya. *Journal of Human Evolution*, 33: 635-650.

Cerling, T.E. (1998) Carbon Dioxide Starvation, the Development of C4 Ecosystem. *Society of London Bulletin*, 353:159-171.

Cerling, T.E. *et al*. (1997) Global Vegetation Change through the Miocene-Pliocene boundary. *Nature,* 389: 153-158.

Cerling, T.E. *et al.* (1999) Browsing and Grazing in Elephants: the Isotope Record of Modern and Fossil Proboscideans. *Oecologia,* 120: 364-374.

Cerling, T.E. *et al.* (2003) Diets of East African Bovidae based on Stable Isotope Analysis. Journal of Mammalogy, 84(2): 456-470.

Cerling, T.E. *et al.* (2004) Orphans Tales: Seasonal Dietary Changes in Elephants from Tsavo National Park, Kenya. *Palaeoclimatology, Palaeoecology*, 206: 367-376.

Cerling, T.E. *et al.* (2004) Stable Isotope Ecology in the Ituri Forest. *Oecologia,* 138: 5-12. Doi: 10.1007/s00442-003-1375-4.

Cerling, T.E. *et al.* (2006) Stable Isotope in Elephants Hair Document Migration Patterns and Diet Changes. *PNAS,* Vol.103, No. 2, pp. 371-373.

Cerling, T.E. *et al.* (2007) Diets of Kenyan Elephants from Stable Isotopes and the Origin of Confiscated Ivory in Kenya. *African Journal of Ecology*. Doi: 10.1111/j.1365-2028.2007.00784.X

Cerling, T.E. & J.M. Harris (1999) Carbon Isotope Fractionation between Diet and Bioapatite in Ungulate Mammals and Implications for Ecological and Palaeoecological Studies. *Oecologia,* 120:347-363.

Cerling, T.E. & K. Viehl (2004) Dietary Preferences of East African Bovidae based on Stable Isotope Analysis. *Journal of Mammalogy,* 84, 456-471.

Cerling, T.E. & K. Viehl (2004) Seasonal Diet Changes of the Forest Hog (*Hylochoerus Meinertzhageni* Thomas) based on the Carbon Isotopic Composition of Hair. *African Journal of Ecology*, 42: 88-92.

Cerling, T.E. & Z.D. Sharp (1996) Stable Carbon and Oxygen Analysis of Fossil Tooth Enamel using Laser Ablation. *Palaeogeography, Palaeoclimatology, Palaeoecology,* 126: 173-186.

Chadwick, J. & J. Marsh (eds.) (1994)*Ethnobotany and the Search for New Drugs*, pp. 25-36. New York: John Wiley & Sons.

Chambers, R. (1983) *Rural Development: Putting the Last First*, London: Longman.

Chambers, R., A. Pacey & L.A. Thrupp (eds.) (1989) *Farmer First: Farmer Innovation and Agricultural Research,* London: Intermediate Technology Publications/New York, Bootstrap.

Chesters, K.I.M. (1957) *The Miocene Flora of Rusinga Island, Lake Victoria, Kenya.* Sadgwick Museum, Cambridge.

Cionchon, R. L. *et al.* (1990) Opal Phytoliths found on the Teeth of the Extinct Ape *Gigantopithecus blacki*: Implications for Paleodietary Studies. *Proceedings of the National Academy of Sciences,* 87: 8120-8124.

Clark, J.G.D. (1957) *Archaeology and Society.* London: Methuen.

Clark, J.G.D. & S.A. Brandt (1984) *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa.* Berkeley: University of California Press.

Clayton, W.D. (1975) 'Chorology of the Genera of *Gramineae*', *Kew bulletin,* 30, 111-132.

Cole, S. (1963) *The Prehistory of East Africa. New York:* Mentor books. Nairobi: Kenya

Conklin, H.C. (1957) *Hanunoo Agriculture: A Report on an Integral System of Shifting Cultivation in the Philippines*, Forestry Development Paper 12, Rome: FAO.

Cotton, C.M. (1998) *Ethnobotany: Principles and Application*, Chichechester: John Wiley & sons.

Cross, R.A. (1980) 'Distribution of Sub-families of *Gramineae* in the Old World', *Kew bulletin, 35*: 79-289.

Cunningham, W.P. & B.W. Saigo (1997) *Environmental Science: A Global Concern*, 4th ed., Dubuque, IA: Wm. C. Brown Publishers.

Cunningham, A. & F.T Mbenkum (1993) *Sustainability of Harvesting of* Prunus africana *bark in Cameroon*: *A Medicinal Plant in International Trade*. People and Plants Working Paper 2, Paris: UNESCO.

Dale, I.R. & P.J. Greenway (1961) *Kenya Trees and Shrubs*. London: Hatchard's & Buchanan's Kenya Estates Ltd.

Daniel, P.D. & J.R. Gregory (1978) Evolution and Distribution of Grasses. *Annals of the Missouri Botanical Gardens*, 68: 5-14.

Daniel, P.D. &J.R. Gregory (1993) Middle Miocene Grasses from Fort Ternan, Kenya. *Journal of Palaeontology*, 67 (1): 113-128.

Darwin, C. (1959) *On the Origin of Species by Means of Natural Selection*. London: Murry.

Davidson, I. & W. Noble (1991) The Evolutionary Emergence of Modern Human Behaviour: Language and its Archaeology. *Man*, 26:223-54.

De Niro, M. (1987) Stable Isotopy and Archaeology. *American Scientist,* 75: 182-19.

Deal, M. (1990) Exploratory Analysis of food Residues from Prehistoric Pottery and other Artefacts from Eastern Canada. *SAS Bulletin,* 13 (1): 6-12.

Denevan, W.M. (1992) The Pristine Myth: The Landscape of the Americans in 1492, *Annals of the Association of American Geographers* (AAAG).

Deschamps, R. & F. Maes (1985) Essai de Reconstitution des Climates et des Vegetations de la Basse vallée de l'Omo au Plio-Pléistocène a l'aide des bois Fossils, in: Coppens, Y. (ed.) *L'environnement des Hominidés au Plio-Pléistocène*, Paris: Masson, pp.175-22.

Desmore, F. (1928) *How Indians use Plants for Food, Medicine and Crafts*, New York: Dover Publications Inc.

Diamond, J.M. (1987) The Worst History of the Human Race, *Discover*, May 1987.

Diamond, J.M. (1991) *The Rise and Fall of the Third Chimpanzee*, New York: Harper & Collins.

Diana, B. (1998) Computer Tomography of Some Fossilised Plant Remains from the Collection of the National Museums of Kenya, Nairobi: A Contribution to INDAKS, in: Starkenburg. M., D. Bosch., G. Rossel (eds.) *Indigenous Knowledge and Practice for Sustainable Agriculture: Evaluative Proceedings of the Leiden/Chania INDAKS Symposium* Special Issue: INDAKS Project No. 2, Leiden/Nairobi/Bandung/Chania, pp. 41-51.

Dimbleby, G.W (1963) Pollen Analysis from two Cornish barrows. *Journal of the Royal Institute of Cornwall* (New Series) 4: 364-375).
Douglas, J.D. (ed.) (1988) *New Bible Dictionary*. Intervarsity Press, Leicester.
Dransfield, J. (1981) Prospects for Rattan Cultivation. *Advances in Economic Botany,* 6: 190-200.
Dutfield, G. (1997) Can the TRIPS Agreement Protect Biological and Cultural Diversity? *Biopolicy International Series* No. 19, Nairobi, Kenya: African Centre for Technology Studies.
Eaton, S.B. *et al.* (1988) *The Paleolithic Prescription*. London: Harper & Row.
Edman, G. & Söderberg (1929) Auffndung von Reis in einer Tonscherbe aus einer etwas fünftausendjährigen Chinesischen Siedlung. *Bulletin of the Geological Society of China*, 8:363-365.
Eghenter, C. (1999) Research Strategies, Conservation Objectives and Community Participation: The Third Phase of the Culture and Conservation Program, Kayan Mentarang Project WWf-1, in: King, V.T. (ed.) *Rural Development and Social Science Research: Cases from Borneo*, Williamsburg VA: Borneo Research Council Proceedings Series 6: 35-45.
Ehrenberg, C.G. (1841) Über Verbreitung und Einfluss des mikroskopischen Lebens in Süd- und Nordamerika. *Monatsberichte der Königlich Prèussischen Akademie der Wissenschaften zu Berlin*, pp.139-44.
Ehrenberg, C.G. (1846) Über die Vulkanischen Phytolitharien der Insel Ascension. *Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin*, pp. 191-202.
Ehret, C. (1967) Cattle-keeping and Milking in Eastern and Southern Africa History: The Linguistic Evidence. *Journal of African Histor*y, 8:1-17.
Ehret, C. (1968a) Sheep and Central Sudanese Peoples in Southern Africa. *Journal of African History,* 9: 213-22)
Ehret, C. (1968b) Cushites and the Highland and Plains Nilotes, in: Ogot, B.A. & J.A. Kieran (eds.) *Zamani: A Survey of East African History,* New York: Humanities Press, pp.158-176.
Ehret, C. (1971) *Southern Nilotic History*. Evanston: North-western University Press.
Ehret, C. (1972) Bantu Origins: Critique and Interpretation. *Transafrican Journal of History,* 2: 1-9.
Ehret, C. *et al*. (1972) Outlining Southern African History: A Reconsideration, A.D. 100-1500. *Ufahamu,* 3(1): 9-27.
Ehret, C. (1973) Patterns of Bantu and Central Sudanic Settlement in Central and Southern Africa. *Transafrican Journal of History,* 3: 1-7.
Ehret, C. (1974a) Agricultural History in Central and Southern Africa. *Transafrican Journal of History,* 4: 1-25.
Ehret, C. (1974b) *Ethiopians and East Africans*: *The Problem of Contacts*. Nairobi: East African Publishing House.
Ehret, C. *et al.* (1974) Some Thoughts on the Early History of the Nile-Congo watershed. *Ufahamu*, 5(2): 85-112.
Ehret, C. (1976) Cushitic prehistory, in: Bender, M.L. (ed.) *The Non-Semitic Languages of Ethiopia. East Lansing.* Michigan: Michigan State University Press, pp. 85-96
Ehret, C. (1979) On the Antiquity of Agriculture in Ethiopia. *Journal of African History,* 20: 161-177.
Ehret, C. (1980a) Historical Inference from Transformations in Culture Vocabularies. *Spache und Gedchichte in Africa*, 2: 189-218.
Ehret, C. (1980b) *The Historical Reconstruction of southern Cushitic Phonology and Vocabulary*. Köln: Beiträge, Institut für Afrikanistik, Universität zu Köln.
Ehret, C. (1980c) The Nilotic Languages of Tanzania, in Polome, E. (ed.) *Language in Tanzania.* London: Oxford University Press, pp. 68-78.
Ehret, C. & D.E. Saxon. *The Central Sudanic Peoples*: Linguistic Reconstruction and Ethnohistory. Unpublished.
Eldredge, N. (1995) *Dominion,* New York: H. Holt.
Elisabetsky, E. & Z.C. Castilhos (1990) Plants used as anlgesics by Amazonian Caboclos as a basis for selecting plants for investigation*. International Journal of Crude Drug Research,* 28: 309-20.

Ellen, R.F. (1994) Rhetoric, Practice and Incentive in the Face of Changing Times: A Study in Nuaulu Attitude in Conservation and Deforestation, in: Milton, K (ed.) *Environmentalism: The Views from Anthropology,* London/New York: Routledge.

Evans Schultes, R. & R.F. Raffauf (1990) *The Healing Forest Medicinal and Toxic Plants of the Northwest Amazonia*, Portland, Oregon: Dioscorides Press

Fairhead, J. (1992) *Indigenous Technical Knowledge and Natural Resources Management in Sub-Sahara Africa*, Chatham: Natural Resources Institute.

Fadiman. J.A. (1982) *An Oral History of Tribal Warfare: the Meru of Mt. Kenya*. Ohio: Ohio University Press.

F.A.O (1992) *Forest, Tress and Food*. Food and Agriculture Organisation of the United Nations.

Flannery, T.F. (1996) *The Future Eaters: An Ecological History of the Australian Lands and People,* New York: George Braziller.

Foley, R.A. (1995a) Language and Thought in Evolutionary Perspective, in: Hodder, I., *et al*. (eds.) *Interpreting Archaeology,* London: Routledge, pp. 76-80.

Foley, R.A. (1995b) The Causes and Consequences of Human Evolution. *Journal of the Royal Anthropological Institute*, 30: 1-20.

Foley, R.A. (1997) *Humans Before Humanity. An Evolutionary Perspective*. Blackwell Publishers Ltd. 108 Cowley Road, Oxford: OX4 IJF, UK

Freeman, L.G. (1968) A Theoretical Framework for Interpreting Archaeological Materials, in: Lee, R.B. & I. DeVore (eds) *Man the Hunter*, Chicago: Aldine.

Gifford-Gonzalez, D.P. (1980) Implications of a Faunal Assemblage from a Pastoral Neolithic Site in Kenya: Findings and a Perspective on Research, in Clark, J.G.D. & S.A. Brandt (1984) *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa.* Berkeley: University of California Press.

Gifford-Gonzalez, D.P. (1984) Faunal Evidence for Early Stock-keeping in the Central Rift of Kenya: Preliminary Findings, in: Kryzaniak, L. & M. Kobusiewicz (eds) *Origin and Early Development of Food-Producing Cultures in Northeastern Africa,* Poznan: Polish Academy of Sciences.

Gillet G.B. (1975) The Vascular Plants of Meru National Park. *Journal of E.A.N.H.S,* 154: 11-24.

Gilmore, G.R. (1919) *Uses of Plants by the Indians of the Missouri River Region*. London: University of Nebraska Press.

Gilmore, G.R. (1991) *Uses of Plants by the Indians of the Missouri River Region*, London: University of Nebraska Press.

Githae, J. (2002) Indigenous Knowledge for Biodiversity Development: Our Experience at Karati in South Kinangop, in: Kabuye, C. (ed.) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology.* Nairobi: Kenya. Majestic Printing works Limited.

Gonzalez-Bernaldez, F. (1991) *Socio-linguistic Studies in the Philippines*, Berlin: Mouton De Gruyter.

Goodenough, W. (1956) Componential Analysis and the Study of Meaning, *Language* 32:195-216.

Goodman, A.H. *et al.* (1984) Indications of Stress from Bone and Teeth, in: Cohen, M,N & G.J. Armelagos (eds.) *Palaeopathology at the Origins of Agriculture.* Academic Press, New York: pp. 13-49.

Government of the Republic of Kenya, Ministry of Finance and Planning (2003). *Meru North District Development Plan (2002-2008*). *Effective Management for Sustainable Economic Growth and Poverty Reduction.* The Government Printer, Nairobi: Kenya

Government of the Republic of Kenya, Ministry of Finance and Planning (2003) *Meru Central District Development Plan (2002-2008*). *Effective Management for Sustainable Economic Growth and Poverty Reduction*. The Government Printer, Nairobi: Kenya.

Government of the Republic of Kenya, Ministry of Finance and Planning (2003) *Meru South District Development Plan (2002-2008*). *Effective Management for Sustainable Economic Growth and Poverty Reduction*. The Government Printer, Nairobi: Kenya.

Government of the Republic of Kenya (2007).
http://www.kenya.go.ke/) contacted 27th September 2007.

Greenberg, J.H. (1964) Historical inferences from Linguistic Research in Sub-Saharan Africa, in: Butler, J. (ed.) *Boston University Papers in African History,* 1: 1-5.
Hames, R. (1991) Wildlife Conservation in Tribal Societies, in: Oldfield, M.L. & J.B. Alcons (eds.) *Biodiversity: Culture Conservation and Ecodevelopment*, Boulder/San Francisco/Oxford: Westview Press.
Hamilton, A. (1968) Some Plant Fossils from Bukwa. *Uganda Journal,* 32(2):157-164.
Harlan, J.R.*et al.* (1969) Ethiopia: A Center of Diversity, *Economic Botany* 23: 309-314..
Harlan, J.R. *et al.* (1976) *Origins of African Plant Domestication*, The Hague: Mouton.
Harlan, J.R. (1992) Indigenous African Culture, in: Cowan, C.W & P.J Watson (ed.) *The Origins of Agriculture: An International Perspective*. Smithsonian Institution Press, London: pp. 59-70.
Harmon, D. (1996) Losing Species, Losing Languages: Connections between Biological and Linguistics Diversity, *Southwest Journal of Linguistics*.
Harmon (1998) Sameness and Silence: Language Extinction and the Dawning of a Biocultural Approach to Diversity, Gl*obal Biodiversity* 8 (3): 2-10.
Harris, L.D. (1984) *The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity,* Chicago: University of Chicago Press.
Harris, J.M. & T.E. Cerling (2002) Dietary Adaptations of Extant and Neogene African Suids. London: *Journal of Zoology,* 256: 45-54.
Harris, D.R & G.C. Hillman (eds.) (1989) *Foraging and Farming: The Evolution of Plant Exploitation*, London: Unwin Hyman.
Harstof, C.A. (1985) Reconstruction of Prehistoric Plant Production and Cooking Methods by New Isotopic Method. *Nature,* 315: 489-49.
Harshberger, J.W. (1896) The Purpose of Ethnobotany. *Botanical Gazette*, 21: 146-154.
Haverkort, B. *et al*. (1991) *Joining Farmers' Experiments: Experiences in Participatory Technology Development,* London: Intermediate Technology Publications.
Haverkort, B. *et al.* (2003) *Ancient Roots, New Shoots*. Endogenous Development in Practice. London: Zed Books.
Heine, B. & I. Heine (1988) *Plant Concepts and Plant Use. Part I Plants of the Chamus (Kenya). An Ethnobotanical Survey of the Semi-Arid and Arid Lands of East Africa.* Fort Lauderdale: Verlag Breitenbach Publishers.
Heine, B. & C. König (1988) *Plant Concepts and Plant Use. Part II Plants of the So (Uganda). An Ethnobotanical Survey of the Semi-Arid and Arid Lands of East Africa.* Fort Lauderdale: Verlag Breitenbach Publishers.
Heine, B. & I. Heine (1988) *Plant Concepts and Plant Use. Part III Rendille Plants (Kenya). An Ethnobotanical Survey of the Semi-Arid and Arid Lands of East Africa.* Fort Lauderdale: Verlag Breitenbach Publishers.
Heine, B. & M. Brenzinger (1988) *Plant Concepts and Plant Use. Part IV Plants of the Borana (Ethiopia and Kenya). An Ethnobotanical Survey of the Semi-Arid and Arid Lands of East Africa*. Fort Lauderdale: Verlag Breitenbach Publishers
Helbaek, H. (1960) The paleo-ethnobotany of the Near East and Europe, in: Braidwood, R.J & B. Howe (eds.) *Prehistoric Investigations in Iraqi Kurdistan. Studies in Ancient Oriental Civilisations,* 31. Chicago: Chicago University Press.
Heywood, V.H. (1993) *The Flowering Plants of the World.* London: B T Batsford Ltd.
Heywood, V.H. (ed.) (1995) *Global Biodiversity Assessment*, Cambridge/Nairobi: United Nations Environmental Program/Cambridge University Press.
Heywood, V.H. (ed.) (1995) *Global Biodiversity Assessment*, Cambridge/Nairobi: United Nations Environmental Program / Cambridge University Press.
Hill, A.F. (1937) Economic Botany: A Textbook of Useful Plants and Plant Products: New York: McGraw-Hill.
Homewood, K.M. & W.A. Rogers (1991) *Masailand Ecology: Pastoralist Development and Wildlife Conservation in Ngorongoro, Tanzania*, Cambridge: University Press Cambridge.

Howell, N. (1984) Demographic Behaviour of Hunter-Gatherers: Evidence for Density-Dependent Population Contrul, in: Burch, T. *Demographic Behaviour: An AAAS Selected Symposium,* Vol. 45, Boulder: Westview Pres,,

Ibui, A.K. *et al.* (1986) A Giant Tree Squirrel from the Late Miocene of Kenya. *Journal of Mammalogy*, 67(2): 274-283.

Ibui, A.K. (2000) Plant Fossils Start Talking. *Newsletter.* Reinwardt Academy, Amsterdam: Amsterdam School of the Arts.

Ibui, A.K. (2000) *Kenya Fossil Plants Website (KFPW). Kenya Fossil Plants Now on the Internet*. Reinwardt Academy, MA Thesis, Amsterdam: Amsterdam School of the Arts

Ibui, A.K. (2000) Fossil Plants Start Talking. *National Museums of Kenya Horizons*, Vol. 4(2), pp. 12-13.

Ibui, A.K. (2001) Prehistoric, Present Peoples and Plants. The Prehistoric Club of Kenya, *Yakale*, Vol. 2(3), pp. 6.

Ibui, A.K. *et al.* (2003) New Plant Fossil Site in Mbaria near Mutonga River, Meru South District, East of Mt. Kenya. *International Journal of BioChemiPhysics*, Vol. 11 & 12(1&2), pp. 43-47.

Inglis (1993)

Isaac, G. (1978) *The Food Sharing Behaviour of the Protohuman Hominids*. Scientific American.

Isaac, G. (1984) The Archaeology of Human Origins. *Advances in World Archaeology*, Vol. 3, pp. 1-87.

(ICSU) (1999) *International Council for Science* Conference, Budapest.

(IPNI) (2006) The International Plants Names Index (IPNI) *http://www.ipni.org/ipni/plantnamesearchpage.do* contacted in March-June 2006.

(IPNI) (2007) The International Plants Names Index (IPNI) *http://www.ipni.org/ipni/plantnamesearchpage.do* contacted in October – November 2007.

ICOM (1998) *Handbook of Standards, Documenting African Collections:* International Council of Museums (ICOM).

IUCN (1990) *Protected Landscapes: A Guide For Policy-Makers and Planners*, International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.

(IUCN (1997) *Red List: International Covenant on Environment and Development*, Gland, Switzerland.

IUCN/UNEP/WWF (1991) *Caring for the Erath: A Strategy for Sustainable Living*, Gland Switzerland.

IUCN/WWF (1998) *A Guide to Designing Legal Frameworks to Determine Access to Genetic Resources*, Gland Switzerland.

Iverson, J. (1941) Land occupation in Denmark's Stone Age. *Denmark's Geolologiske Undersogelse*, 2(66): 1-67.

Iwu, M.M. (1993) *Handbook of African Medicinal Plants*. CRC PRESS. Boca Raton London, New York: Washington DC.

Jacobs, F.B. & H.S.C. Kabuye (1987A Middle Miocene (12.2 my old) Forest in the East African Rift Valley, Kenya. *Journal of Human Evolution* (1987) 16, 147-155.

Jacobs, F.B. & A. D. Winkler (1992) Taphonomy of Middle Miocene Autochthonous Forest Assemblage, Ngorora Formation, Central Kenya. P*alaeogeography, Palaeoclimatology, Palaeoecology*, 99:31-40.

Johannes, R.E. (1989) *Traditional Ecological Knowledge*, Cambridge: IUCN/The World Conservation Union.

Johns, T. (1990) *With Bitter Herbs They shall Eat It. Chemical Ecology and the Origins of Human Diet and Medicine.* The University of Arizona Press, Tucson, Arizona.

Johnson, D. (ed.) (1991) *Plants for Human Needs in Asia. Palms Utilization and Conservation in India, Indonesia, Malaysia and the Philippines*, Rotterdam: A.A Balkema.

Judd, W.S. *et al.* (2002) *Plant Systematics. A Phylogenetic Approach*. Second Edition, Massachusetts: Sinauer Associates, Inc. Sunderland, U. S. A.

Kabuye, C.H.S. (1995).The Importance of Multidisciplinary Work on the Transition and Development of Agriculture in East |Africa, in: Leakey, R.E. & L.J. Slikkerveer (eds.) *Origins and Development of Agriculture in East Africa: The Ethnosystems Approach to the Study of Early Food Production in Kenya*. Studies in Technology and Social Change. Ames, Iowa State University: No. 19.

Kabuye, C.H.S. (ed.) (2002) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology*. Majestic Printing works Limited, Nairobi: Kenya.

Kalland, A. (1994) Aboriginal Subsistence Whaling: A Concept in the service of Imperialism, in: High North Alliance 11, *Essays on Whales and Man* (Second Edition), High North Alliance, Reine Lofoten.

Katende, A.B. *et al*. (1999) *Wild Food Plants and Mushrooms of Uganda*. Regional Land Management Unit (RELMA), SIDA. Colour Print Ltd., Nairobi: Kenya.

Kay, P. (1966) Ethnolography and Theory of Culture, Bucknell. *Review,* 14: 106-113.

Keeley, N.H. (1980) *Experimental Determination of Stone Tool Uses: A Microwear Analysis,* Chicago: University of Chicago Press.

Keeley, L.H & N. Toth (1981) Microwear Polishes on Early Stone Tools from Koobi Fora, Kenya. N*ature,* 293: 464-465.

Kirch, P. V. & T.L. Hunt (1996) *Historical Ecology in the Pacific Islands: Prehistoric Environmental and Landscape Change,* New Haven, Connecticut: Yale University Press.

Kirigia, M.G. (2007) Whither the Meru Nation? Research into the Indigenous Knowledge of the Ameru of Kenya, in: Gichere, N. & S. Ishida (eds.) *The Indigenous Knowledge of the Ameru of Kenya. Meru*: Meru Museum.

Klein, R.G. (1993) Hunter-Gatherers and Farmers in Africa: The Transformation of a Continent, in: Burenhult, G. *People of the Stone Age: Hunter-Gatherers and Early Farmers,* San Fransisco: Harper.

Kofi-Tsekpo (1995) Traditional Medicine in Kenya, in: Bennun, L.A., R.A. Aman & S.A. Crafter (eds.) (1995) *Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles,* Tresaith: Samara Publishers.

Kokwaro, J.O. (1976) *Medicinal Plants of East Africa*. East African Literature Bureau, Nairobi: Kenya.

Knutson, T.L. (1992) *A History of International Relations Theory: An Introduction,* Manchester: Manchester University Press.

Kohn, R. & L.K. White (1976) *Health Care*: *An International Study*, WHO, Oxford: Oxford University Press.

Krzyzaniak, L. (1978) Note on Kadero. *Nyame Akuma,* 9: 4.

Landon, J. & P. Robertshaw (1985) Physico-Chemical Studies of Early Pottery from Southwestern Kenya. *Azania,* 20: 1-28.

Laluenza, C. & A. Pérez-Pérez (1994) Dietary Information through the Examination of Plant Phytoliths on the Enamel Surface of Human Dentition. *Journal of Archaeological Science,* 21, 29-34.

Layton, R. (1989) Introduction: who needs the Past?, in: Layton R (ed.) *Who needs the Past? Indigenous Values and Archaeology (One World Archaeology 5*), London: Unwin Hyman.

Leakey, M.D. & L.S.B. Leakey (1950) *Excavations at Njoro River Cave*. Oxford: Oxford University Press.

Leakey, M.G. & J.M. Harris (1995) Past Biodiversity in the Turkana Basin, in: Bennun, L.A., R.A. Aman & S.A. Crafter (eds.) *Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles*, Tresaith: Samara Publishers.

Leakey, M.G. *et al*. (1995) New Four Million Year Old Hominid Species from Kanapoi and Allia Bay, Kenya. *Nature*, 376:565-71.

Leakey, R.E. (1976) *New Hominid Fossil from the Koobi Fora Formation in Northern Kenya,* Nature, vol. 261, pp. 574-576.

Leakey, R.E. (1977) *Origins.* Rainbird Publishing.

Leakey, R.E. (1982) *Human Origins*, London: Hamish Hamilton.

Leakey, R.E. (1991) Keynote Address, in: Leakey, R.E. & L.J. Slikkerveer (eds.) *Origins and Development of Agriculture in East Africa: The Ethnosystems Approach to the Study of Early Food Production in Kenya*. Studies in Technology and Social Change. Ames, Iowa State University: No. 19. pp. vii-xiii.

Leakey, R.E. (1994) *The Origin of Humankind*. London: Clays Ltd.

Leakey, R.E. & R. Lewin (1992a) *Origins: What New Discoveries Reveal About the Emergence of Our Species and Its Possible Future*. New York: E.P. Dutton.

Leakey, R.E. & R. Lewin (1992) *Origins Reconsidered*. *In Search of What Makes Us Human,* New York: Doubleday.

Leakey, R.E. & R. Lewin (1995) *The Sixth Extinction*. *Patterns of Life and the Future of Humankind*. New York: Doubleday dell Publishing Group, Inc.
Leakey, R.E. & R. Lewin (1998) *Origins Reconsidered*. New York. Simon & Schuster.
Leakey, R.E. & L.J. Slikkerveer (1991) Origins and Development of Agriculture in East Africa: The Ethnosystems Approach to the Study of Early Food Production in Kenya. *Studies in Technology and Social Change.* Ames, Iowa State University: No. 19.
Leakey, R.E. & L.J. Slikkerveer (1993) *Man-Ape, Ape-Man: The Quest for Human's Place in Nature and Dubois 'Missing Link'.* Leiden: Netherlands Foundation for Kenya Wildlife Service.
Leakey, R.E. & L.J. Slikkerveer (1995) *Pithecanthropus.* Leiden: Richard Leakey Foundation for Anthropological Research. Leiden Ethnosystems and Development Program (LEAD) of Leiden University, The Netherlands, and July/August 2003.
Lee (1979) *The!Kung San: Men, Women, and Work in a Foraging Society*, New York: Cambridge University Press.
Lee, P.C. (1994) Social Structure and Evolution, in: Slater, P. & T. Halliday (eds.) *Behaviour and Evolution*, Cambridge: Cambridge University Press, pp.266-303.
Levin, N.E. et al. (2006) Stable Isotope Aridity Index for Terrestrial Environments. *PNAS*, Vol. 103, No. 30, pp. 11201-11205.
Lewin, R. (1993) *Human Evolution: An Illustrated Introduction (3rd edition),* Oxford: Blackwell Scientific Publishers.
Lewis, W.H. & M.P. Elvin-Lewis (1994) Basic, Quantitative and Experimental Research Phases of Future Ethnobotany with Reference to the Medical Plants of South America, in: Chadwick, J. & J. Marsh (eds.) *Ethnobotany and the Search for New drugs*, New York: John Wiley & Sons.
Lewis, W.H. & M.P. Elvin-Lewis (1994) Basic, Quantitative and Experimental Research Phases of Future Ethnobotany with Reference to the Medicinal Plants of South America. In J. Chadwick & J. Marsh (eds) *Ethnobotany and the Search for New Drugs*, pp. 60-76. New York: John Wiley & Sons.
Lieberman, P. (1991) *Uniquely Human*. Cambridge, MA: Harvard University Press.
Lipscomb. J.F. & L.W. Cone (1972) *The History of Kenya Agriculture*. University press of Africa
Livingstone, D.A. (1969) Communities in the past: Essays in Plant Geography and Ecology, in: Greenidge K.N.H. (ed.) *Papers Presented at the Symposium in Terrestrial Plant Ecology 1966*, Saint Francis Xavier University Antigonish, Nova Scotia: Nova Scotia Museum Halifax N. S. pp.83.
Maffi, L. (1999) Domesticated Land, Warm and Cold: Linguistic and Historical Evidence on Tzeltal Maya Ethnoecology, in: Blount, B.G. & T.S. Gragson (eds.) *Ethnoecology: Knowledge Resources and Rights*, Athens Georgia University Press.
Maffi, L. (2001) *On Biocultural Diversity: Linking Language, Knowledge, and the Environment,* Washington, D.C.: Smithsonian Institution Press.
Maffi, L. (2004) Maintaining and Restoring Biocultural Diversity: The Evolution of a Role for Ethnobotany, in: Carlson T.J.S. & L. Maffi (eds.) Ethnobotany and Conservation of Biocultural Diversity, *Advances in Economic Botany* No. 15, Bronx, New York. New York Botanical Gardens Press.
Maffi, L. & G. Oviedo (2000) *Indigenous and Traditional Peoples of the World and Ecoregion Conservation,* Gland, Switzerland: WWF/Terralingua.
Magickenya (2007) http://www.magickenya.com, contacted September 2007)
Maitima, J.M. (1995) Late Holocene Human Activities and their Impacts on Biological Diversity, in: Bennun, L.A., R.A. Aman & S.A. Crafter (eds.) *Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles*, Tresaith: Samara Publishers.
Maitima, J.M. (1997) Prehistoric Fires and Land-cover Change in Western Kenya: Evidences from Pollen, Charcoal, Grass Cuticles and Grass Phytoliths. *The Holocene,* 7 (4): 409-417.
Malinowski, B. (1932) *The Sexual Life of Savages*, London: Routledge.
Marshall, F.B. (1991) Besides Bones: A Zooarchaeological Perspective on the Need for Archaeological Research on the Origins of Food Production in East Africa, in: Leakey, R.E. & L.J. Slikkerveer (eds.) *Origins and Development of agriculture in East Africa: The Ethnosystems approach to the study of early food production in Kenya,* Studies in technology & social change 19, Ames, IA: Iowa State University.

Martin, G. (1995) *Ethnobotany: A Methods Manual*, London: Chapman & Hall.
Martin, G. & A. Semple (1994) Joint Ventures in Applied Ethnobotany. *Nature and Resources,* 30.
Maundu, P.M. *et al*. (1999) *Traditional Food Plants of Kenya.* The Kenya Resource Centre for Indigenous Knowledge, National Museums of Kenya, Nairobi: English Press Limited.
Maundu, P.M., C.H.S. Kabuye & J. Chweya (eds.) (1993) Proceedings of the Indigenous Food Plants Workshop, Nairobi: National Museums of Kenya, 14-16 April, 1993, pp. 55.
McClatchey, W. *et al.* (1999) An Evaluation of Educational Trends in Economic and Ethnobotany, Gainesville, Fla.: CIEER.
McGrew, W.C. (1992) *Chimpanzee Material Culture: Implications for Human Evolution*, Cambridge: Cambridge University Press.
McKee, J.K., F.E. Poirier & W.S. McGraw (2004) *Understanding Human Evolution*, New Jersey: Pearson Prentice Hall.
McNeely, J.A. (1996) Soul of the Tiger: Searching for Natures Answers in Southeast Asia, *The Journal of Asian Studies*.
McNeely, J.A. *et al*. (1990) *Conserving the World's Biological Diversity*, IUCN/WRI/CI/WWF-US/The World Bank, Gland, Switzerland:IUCN.
Medusa Network (1996) Medusa Network of the Mediterranean Region on Identification, Conservation and Use of Wild Plants of the Mediterranean Region. *Pamphlet.*
Meeussen, A. (1956) Statistique lexicographique en Bantu: Bobangi et Zulu. *Kongo-Overzee,* 22:86-89.
Medin, D.L. & S. Atran (1999) *Folk Biology*, Cambridge, Mass.: MIT Press.
Mellers, P. (1994) The Upper Palaeolithic Revolution, in: Cunliffe, B. (ed.) *The Oxford Illustrated Prehistory of Europe.* BCA, London: pp. 42-78.
Middleton, W.D. (1990) An Improved Method for Extraction of Opal Phytoliths from Tartar Residues on Herbivore Teeth. *Phytolitharien Newsletter,* 6(3): 2-5.
Middleton, W.D. (1994) Extraction of Opal Phytoliths from the Herbivore Dental Calculus. *Journal of Archaeological Science,* 21: 469-473.
Millar, D. (1999) Traditional African World Views from a Cosmovision Perspe*ctive*, in: Haverkort, B. & W. Hiemstra (eds.) *Food for thought: Ancient Visions and New Experiments of Rural People,* London: Zed Books.
Minnis, P.E. (2000) 'Introduction' in *Ethnobotany, A Reader*, Norman: University of Oklahoma Press.
Mogire, J.F. (2002) Ethnobotanical Survey in Migori District: Preliminary Results of Medicinal Uses of Indigenous Trees and Shrubs, in: Kabuye, H.S.C. (ed.) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology.* Nairobi: Majestic Printing Works Limited, pp. 95
Mshana, N.R. *et al.* (2000) Traditional Medicine and Pharmacopoeia. *Contribution to the Revision of Ethnobotanical and Floristic Studies in Ghana.* Scientific, Technical and Research Commission of the Organisation Of African Unity (OAU/STRC).
Muchiru, S. (1985) *Conservation of Species and Genetic Resources*; An NGO Guide. Nairobi: The Environment Liaison Centre.
Mundy, E.M. & C.M. McCorkle (1989) Ethnoveterinary Medicine: An Annotated Bibliography. *Bibliographies in Technology and Social Change*, No. 6. Technology and Social Change Program, Iowa State University, Ames: Iowa 50011 USA.
Musimba, K.R (2002) Indigenous Food Resources in Pastoral/Agropastoral Communities of South Kenya, in: Kabuye, H.S.C. (ed.) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology.* Nairobi: Kenya. Majestic Printing works Limited, pp. 97.
Muya, G. (2002) The Role of indigenous (Medicinal) Knowledge in Herbal Medicine Practice in Kenya, in: Kabuye, H.S.C. (ed.) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology*. Nairobi, Kenya. Majestic Printing works Limited, pp. 98-102.

Nabhan (1989) *Enduring Seeds: Native American Agriculture and Wild Plant Conservation,* San Fransisco: North Point Press.
Ng'unyura, M.G.R.M. (2000) *Miturire ya Ameru*. *Kwambiria Gucwaa Kwandika Iuku Ria Mbere.* A. M. Secretarial Services. Meru: Brown Rock Hotel Building.
Njiro, I.E. (2002) Indigenous Knowledge of Coping with Food Shortages, in: Kabuye, H.S.C. (ed.) Ethnobiology and Conservation of Cultural and Biological Diversity. *Proceedings of the Fifth International Congress of Ethnobiology*. Nairobi: Kenya, Majestic Printing works Limited, pp. 29-42.
Noda, K. *et al.* (1985) Topography of the Seeds and Leaves of Tropical Weeds with a Scanning Electron Microscope. Bangkok: *National Weed Research Institute*, pp.159.
Norgaard, R.B. (1994) Development Betrayed, London: Routledge.
Odera O. (ed.) (1994) *Philosophy, Humanity, and Ecology*, African Centre for Technology Studies, African Academy of Sciences, Nairobi, Kenya: ACTS Press.
Odera Oruka, H. & C. Juma (1994) Ecophilosophy and Parental Earth Ethics. in: Odera Oruka, H. *Philosophy, Humanity and Ecology*, Nairobi: ACTS Press.
Opoku, K.A. (1978) *West African Traditional Religion*, Lagos: FEP International Pvt.
Palmer, E.M. (1871) Food Products of the North American Indians. *A Report of the Commissioner of Agriculture for the year 1870*
Pamplona, R. (2000) *Encyclopaedia of Medicinal Plants.* Graficas Reunidas – Mar Tirreno, 7 bis – Pol. Ind. San Fernando – E-28830 San Fernando de Hernares, Madrid: Vol. 1&2.
Persoon, G.A. (1991) Ecological Balance and Innovations: Cases from the Forest, in: Van den Breemer, J.P.M., H.Th. van der Pass & H.J. Tieleman (eds.) The Dynamics of Economic Innovation, *Studies in Social Anthropology* (SAS), Leiden: DSWO Press.
Persoon, G.A. (2003) Indigenous Peoples and Tropical Rain Forest Management: Global Discourses, Local Dilemma', in: Van Ploeg, J. van, A.B. Masipiquenaan & E.C. Bernado (eds.) *The Sierra Madre Mountain Range*: *Global relevance, Local Realities*, Tuguegaro City, Cagayan Valley Programme for Environment and Development.
Persoon, G.A. & D.M.E. van Est (1999) Co-management of Natural Resources: The Concept and aspects of Implementation, in: Bernado, E.C & D.J. Snelder (eds.) *Co-managing the Environment: The Natural Resources of the Sierra Madre Mountain Range*, Cagayan Valley Programme for Environment and Development.
Passey, B.H. *et al.* (2006) Inverse Methods for Estimating Primary Input Signals from the time-averaged Isotope Profiles. *Geochimica et Cosmochimica Acta,* Vol. 69, No. 16, pp.4101-4116.
Passey, B.H. & T.E. Cerling (2002) Tooth Enamel Mineralization in Ungulates: Implications for recovering a Isotope time-series. *Geochimica et Cosmochimica Acta*, Vol. 66, No. 18, pp. 3225-3234.
Passey, B.H. & T.E. Cerling (2006) In Situ Stable Isotope Analysis (δ^{13}, $\delta^{18}O$) of very small teeth using Laser Allocation GC/IRMS, *Chemical Geology*. 235:238-249.
Perrings, C.A. *et al*. (1995) *Biodiversity Loss: Economic and Ecological Issues*, Cambridge/New York: Cambridge University Press.
Peters, R.C. *et al.* (1992) *Edible Wild Plants of Sub-Saharan Africa*. Kew: Royal Botanical Gardens.
Philips, O. & A.H. Gentry (1993) The Useful Plants of Tambopata, Peru: I. Statistical Hypotheses Tests with a New Quantitative Technique, *Economic Botany,* 47 (1): 15-32.
Piperno, D. (1988) *Phytolith Analysis: An Archaeological and Geological Perspective*. London: Academic Press.
Pose, D.A.(1996) Indigenous Knowledge, Biodiversity and International Rights, in Grayson, A.J. *The Commonwealth Forestry Review* 71(1) Oxford. Commonwealth Forestry Association.
Posey, D.A. (ed.) (1999) *Cultural and Spiritual values of Biodiversity: A Complementary Contribution to the Global Biodiversity Assessment,* Nairobi/London: UNEP/ITP.
Posey, D.A, & W. Balee (eds.) (1989) Resource Management in Amazonian: Indigenous and Folk Strategies, *Advances in Economic Botany* 7.
Potts, R. (1988) *Early Hominid Activities at Olduvai*, Aldine.
Powers, S. (1875) Aboriginal Botany. *Proceedings of the California Academy of Sciences,* 1873-1874.

Prain, G. *et al*. (1999) *Biological and Cultural Diversity: The Role of Indigenous Agriculture Experimentation in Development*, London: ITP.
Prance, G.T (1991) What is Ethnobotany Today? *Journal of Ethnopharmacology*, 32: 209-291.
Purseglove, J.W. (1976) The Origins and Migrations of Crops in Tropical Africa, in: Harlan, J.R. *et al Origins of African Plant Domestication*, The Hague: Mouton.
Raharijaona, V. (1989) Archaeology and Oral Traditions in the Mitongoa-Andraijaona area (Betsileo region) of Madagascar, in: Layton R (ed.) *Who needs the Past? Indigenous Values and Archaeology (One World Archaeology 5)* London: Unwin Hyman, pp. 189-194.
Redford, K.H. (1990) The Ecological Noble Savage, *Cultural Survival Quarterly* 15(1).
Renfrew, C. & P. Bahn (1993) *Archaeology: Theories, Methods and Practice*, London: Thames & Hudson.
Richards, P. (1985) *Indigenous Agricultural Revolution*, London: Unwin Hyman.
Richards, P., L.J. Slikkerveer & A.O. Phillips (eds.) (1989) *Indigenous Knowledge Systems for Agriculture and Rural Development. The* CIKARD *Inaugural Lectures*, Studies in Technology and Social Change 13, Ames, IA: Iowa State University.
Riley, B.W. & D. Brokensha (1988) *The Mbeere in Kenya 1. Changing Rural Ecology*. Lanham: University Press of America.
Riley, B.W. & D. Brokensha (1989) *The Mbeere of Kenya 11. Botanical Identities and Uses*. London.
Rimita, D.M. (1988) *The Njuri Nceke of Meru.* Diocese of Meru – Kolbe Press
Rindos, D. (1983) *The Origins of Agriculture. An Evolutionary Perspective*. San Diego/New York: Academic Press Inc.
Robertshaw, P.T. & Collett (1983) Identification of Pastoral Peoples in the Archaeological Record: An Example from East Africa. *World Archaeology,* 15.
Robins *et al*. (1916) Ethnobotany of the Tewa Indians. *Bureau of American Ethnobiology Bulletin,* No. 5. USA.
Rose, L.C. *et al.* (1984) Histological Indicator of Childhood Stress in Prehistoric Skeletal Samples, *American Journal of Physical Anthropology* 49: 511-516.
Rossouw, L. (1996) The Extraction of Opal Phytoliths from the Fossilised Teeth of Two Bovid Species from Florisbad. Navors: *Nas. Mus., Bloemfontein,* 12(5): 265-275.
Rudgely, R. (1993) *The Alchemy of Culture: Intoxicates in Society*. London. British Museum Press.
Schelenberg, H.C. (1908) Wheat and Barley from the North Kurgan, Anau, in: Pumpelly, R. ed.) *Exploration in Turkestan.* Washington, D. C.: Carnergie Institution, Vol.3, pp. 471-473.
Schoch, W.H. *et al*. (1988) *Botanical Macro-Remains, Bern*. Paul Haupt Publishers.
Schrire, C. (1980) Identity Enquiry of San Hunters-Gatherers, *Human Ecology* 8:9-32.
Sept, J.M. (1984) *Plants and Early Hominids in East Africa: A Study of Vegetation in Situations Comparable to Early Archeaological Site Locations.* PhD thesis: Berkeley: University of California.
Shipman, P. (1986) Scavenging or Hunting in Early Hominids. *American Anthropologist,* Vol. 88. pp. 27-43.
Sindiga, I. (1994) Indigenous Medical Knowledge of the Maasai, *Indigenous Knowledge and Development Monitor* 2: 16-18.
Sindiga, I. *et al.* (1995) *African Traditional Medicine*, Nairobi.
Slikkerveer, L.J. (1978) Health and Nutrition in Rural Ethiopia. *ICA Festival Paper*. Leiden: University, Leiden.
Slikkerveer, L.J. (1982) Rural Health Development in Ethiopia: Problems of Utilization of Traditional Healers. *Social Science and Medicine,* XVI (21): 1859-1872.
Slikkerveer, L.J. (1989) Changing Values of Social and Natural Scientists toward Indigenous Peoples and their Knowledge Systems, in: Warren, D.M., L.J. Slikkerveer & S.O Titilola (eds) *Indigenous Knowledge Systems: Implications for Agriculture and International Development*, Studies in Technology and Social Change 11, Ames, Iowa State University.
Slikkerveer, L.J. (1990) *Plural Medical Systems in the Horn of Africa: The Legacy of "Sheikh" Hippocrates,* London: Keagan Paul Int.
Slikkerveer, L.J. (1991) *Indigenous Agricultural Knowledge Systems in Africa: The Ethnosystems' Approach to Sustainable Development in Kenya*, SSCW/NWO Programme Report, Leiden: Leiden University, 86 pp.

Slikkerveer, L.J (1992) *New Perspectives on Development Research in The Netherlands* (editor), with a Foreword by Jan Tinbergen, The Hague: NUFFIC, 65 pp.

Slikkerveer, L.J. (1994) Indigenous Agricultural Knowledge Systems in Developing Countries: *A Bibliography*. Special Issue: INDAKS Project Report. Lead and the Indaks R & T. Consortium. Leiden-Nairobi-Bandung-Chania.

Slikkerveer, L.J. (1995) Indigenous Agricultural Knowledge Systems in East Africa: Retrieving Past and Present Diversity for Future Strategies, in: Bennun, L.A., R.A. Aman & S.A. Crafter (eds.) *Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles*, Tresaith: Samara Publishers.

Slikkerveer, L.J. (1996) *Indigenous Agricultural Knowledge systems for Sustainable Agriculture in Developing Countries, (INDAKS), Progress Report* No. 6, Leiden: LEAD.

Slikkerveer, L.J. (1998) Traditional Ecological Knowledge: Peoples, Forests and Plants', in: *Proceedings of the International Congress of the Forum Forest in Focus on 'Biodiversity: Treasures in the World's Forests'*. Alfred Toepfer Akademie fur Natuuschutz, Schneverdingen: Germany.

Slikkerveer, L.J. (1999) Ethnoscience, 'TEK' and its Application to Conservation, in: Posey, D.A (ed.) *Cultural and Spiritual Values of Biodiversity: A Complementary Contribution to the Global Biodiversity Assessment,* Nairobi/London: UNEP/ITP.

Slikkerveer, L.J. (2000) Etnobotanische Kennissystemen van Medicinale Planten in Ontwikkelingslingslanden: Een brug met vele pijlers en bogen. Oratie, Leiden: Universiteit Leiden.

Slikkerveer, L.J. (2001) Building Bridges with Traditional Knowledge in: *Indigenous Knowledge and Development Monitor*, Vol. 8, No. 2, pp. 21-22.

Slikkerveer, L.J. (2002) Traditional Medical Systems and the Challenge of Validation: Towards a model of Transcultural Medicinal Plant Use in Indonesia, in: Quah, S. & L.J. Slikkerveer (eds.) *Traditional Healing Systems: Negotiating Science and Technology Challenges.* Singapore/Leiden: Indigenous Knowledge Systems, Research and Development Studies No.4.

Slikkerveer, L.J. (2003) Conservation of Bio-Cultural Diversity. in: Heyndrickx, P. & L.J. Slikkerveer, *The World Think Tank: Bringing Together the World's Finest Minds.* Gent, Belgium: Institute for European Business Administration, pp. 10-14.

Slikkerveer (2004) Etnobotanische Kennis Systemen (EKS): De Bijdrage van Non-Experimental Validation (NEV) aan het Onderzoek van Geneeskruiden in Indonesië (Jamu), In: Tijdschrift van de Nederlandse Vereniging voor Geneeskruiden Onderzoek (NVGO), Jaarcongres No. 90, 33 pp.

Slikkerveer, L.J. (2005) *The Rise of Ethnomedicine in Indonesia: Innovative Wisdom for the Advancement of the Medical Social Sciences*, Bandung: Universitas Padjadjaran.

Slikkerveer, L.J. (2006) Medicinal and Aromatic Plants, in: Bogers, R., L.E Craker & D. Lange (eds.) *Proceedings of the Frontis Workshop on Medicinal and Aromatic Plants,* Wageningen: The Netherlands, 17-20 April 2005, pp. 6.

Slikkerveer, L.J. & Ch. Lionis (1996) *Traditional Medical Beliefs and Practices in Rural Crete: The Persistence of Philosophical and Cosmological Views of the Universe in Hippocratic-Gelenic Humoral System*, Heraklion: Department of Social and Family Medicine, University of Crete.

Slikkerveer, L.J. & G.A. Lange (1991) Palaeoethnobotanical Perspectives on Indigenous Agricultural Knowledge Systems in Kenya, in: Leakey, R.E. & L.J. Slikkerveer (eds.) *Origins and Development of Agriculture in East Africa: The Ethnosystems Approach to the Study of Early Food Production in Kenya,* Studies in Technology and Social Change*,* No. 19, Ames Iowa State University, pp. 183-194.

Slikkerveer, L.J.& M.K.L. Slikkerveer (1995) Taman Obat Keluarga (TOGA): Indonesia Medicine for Self-Reliance, in: Warren D.M., L.J. Slikkerveer & D. Brokensha (eds.) The *Cultural Dimension of Development: Indigenous Knowledge Systems*, London: Intermediate Technology Publications, pp. 13-34

Slikkerveer, L.J. & R.E. Leakey (1991) *Origins and Development of Agriculture in East Africa: The Ethnosystems Approach to the Study of Early Food Production in Kenya,* Studies in Technology and Social Change*,* No. 19, Ames Iowa State University.

Slikkerveer, L.J & S.O Titilola (eds.) (1989) *Indigenous Knowledge Systems: Implications for Agriculture and International Development*, Studies in Technology and Social Change 11, Ames IA: Iowa State University.

Slikkerveer, L.J. & S.R. Quah (2003) *Traditional Healing Systems: Negotiating Science and Technology Challenges,* Leiden: LEAD, Leiden University.
Slikkerveer, L.J. & W.H.J.C. Dechering (1995) LEAD: The Leiden Ethnosystems and Development Program, in: Warren, D.M., L.J. Slikkerveer & D. Brokensha (eds.) *The Cultural Dimension of Development: Indigenous Knowledge Systems*, London: Intermediate Technology Publications, pp. 435-440.
Sponheimer, M. *et al.* (2006) Isotopic Evidence for Dietary Variation in the Early Hominin *Paranthropus robustus*. *Science,* Vol. 314.
Stahl, B. (1984) A History and Critique of Investigation into Early African Agriculture, in: J.D.Clark & S.A Brands (eds.) *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa*. Los Angeles: University of California Press.
Stoneking, M. (1993) DNA and Recent Human Evolution. *Evolutionary Anthropology*, 2(2): 60-73.
Stringer, C. & R. McKie (1996) *African Exodus: The Origins of Modern Humans*, London: Jonathan Cape.
Sutherland, W. (1998) Managing Habitats and Species, in: W. Sutherland (ed.) *Conservation Science and Action,* Oxford: Blackwell Science.
Suzuki, D. (1999) Finding a New Story in: Posey, D.A. (ed.) *Cultural and Spiritual Values* of Biodiversity, A Contemporary Contribution to the Global Biodiversity Assessment, Nairobi/London: UNEP/ITP.
Toledo, V.M. (1992) What is Ethnoecology? Origins, Scope and Implications of a Rising Discipline, *Ethnoecológica* 1(1): 5-21.
Toledo, V.M. (1997) Sustainable Development at the Village Community Level: A Third World Perspective, in: Smith, F. *Environmental Sustainability*, Boca Raton, Fla.: St. Lucie Press.
Toledo, V.M (2000) Ethnoecology: A Conceptual Framework for the Study of Indigenous Knowledge on Nature, Plenary Lecture, Seventh International Congress of Ethnobiology in Athens, Greece.
Toledo, V.M. (2001) Biocultural Diversity and Local Power in Mexico: Challenging Globalisation, in: Maffi, L. (ed.) *On Biocultural Diversity*, Washington DC: Smithsonian Institution.
Toledo, V.M., B. Ortiz & S. Medellin-Morales (1994) Biodiversity Islands in a Sea of Pasturelands: Indigenous Management in the Humid Tropics of Mexico, *Ethnoecologia* 3:37-50.
Tyler, S.A (1969) *Cognitive Anthropology*, New York: Holt, Rinehart & Winston.
Ucko, P.J. & G.W. Dimbleby (1969) *The Domestication and Exploitation of Plants and Animals*, London: Duckworth.
UNCED (1992) *Agenda 21, Preamble and Chapters 26-1*, Rio de Janeiro, New York: UN.
UNEP (1999) Annual Report, United Nations Environment Programme, Nairobi: UNEP.
Van der Burg, E (1983) *Nonlinear Canonical Correlation and Some Related Techniques,* Leiden University, Leiden: DSWO Press.
Van der Burg, E. & J. De Leeuw (1988) Use of the Multinomial Jackknife and Bootstrap in Generalized Nonlinear Canonical Correlation Analysis. *Applied Stochastic Models and Data Analysis*, Vol. 4, 159-172.
Van der Burg, E. *et al.* (2000) Quality of Life of Cancer Patients: A Multi-set Analysis, in: Decker, R. & W. Gaul (eds.) *Classification and Information Processing at the Turn of the Millennium*, Berlin: Springer, pp. 421-429.
Vavilov, N.I. (1951) *The Origin, Variation, Immunity and Breeding of Cultivated Plants*. Roland Press, New York: USA.
Van Seters, A.P. (1997) Forest Based Medicines in Traditional and Cosmopolitan Health Care, in Prance, G. *Medicinal Plants for Forest Conservation and Health Care,* Rome: FAO.
Wamukoya, G.M. & F.D.P. Situma (2000) *Environmental Management in Kenya*. *A guide to the Environmental and Coordination Act, 1999*.The Centre for Research and Education on Environmental Law. Nairobi
Warren, D.M. (1980) 'Ethnoscience in Rural Development', in: Brokensha, D.M. Warren & O. Werner (eds.) *Indigenous Knowledge Systems and Development*, Lanham MD, University Press of America, pp. 363-376.

Warren, D.M. (1982) 'The Tichiman-Bongo Ethnomedical System, in: S.P Yonder (ed.) *African Health and Healing Systems: Proceedings of a Symposium*. University of California, Los Angeles: Crossroads Press, pp. 85-107.

Warren, D.M. (1989) Linking Scientific and Indigenous Agricultural Systems, in: Compton, J.L. (ed.) *The Transformation of International Agricultural Research and Development*, Boulder/London. Lynne Rienner.

Warren, D.M. (1989) Utilising Indigenous Healers in National Health Delivery Systems: The Ghanaian Experiment, in: J. van Willigen, B. Ryiko-Bauer & A. McElroy (eds.) *Making Our Research Useful: Case Studies in Utilisation of Anthropological Knowlegde,* Boulder: Westview Press.

Warren, D.M., D. Brokensha & O. Werner (1980) *Indigenous Knowledge Systems and Development,* Latham: University Press of America.

Warren, D.M., L.J. Slikkerveer, & S.O. Tititola (eds.) (1989) *Indigenous Knowledge Systems: Implications for Agriculture and International Development*, Studies in Technology and Social Change 11, Ames, Iowa: Iowa State University.

Warren, D. M. *et al*. (1995) *The Cultural Dimension of Development: Indigenous Knowledge Systems.* London, Intermediate Technology Press.

Wetterstrom, W. (1991) Fleshing out Early Agriculture with Ancient Seeds, in: Leakey, R.E. & L.J. Slikkerveer (eds.) *Origins and Development of Agriculture in East Africa: The Ethnosystems approach to the study of early food production in Kenya,* Studies in technology and Social Change, No. 19, Ames, Iowa State University, pp. 219-234.

West, A.G. *et al.* (2004) Technical Report: Short-Term Diet Changes revealed using Stable Carbon Isotopes in Horse Tail-Hair. *Functional Ecology,* 18:616-624.

WHO (1978) International Conference on Primary Health Care (PHC), Alma Ata, Geneva: WHO.

WHO (1991)Annual Report World Health Organization, Geneva, Switzerland.

Wickens, G.E. *et al.* (1985) *Plants for Arid Lands*, London: Unwin Hayman.

Willis, D. (1989) *The Hominid Gang. Behind the Scenes in the Search for Human Origins*. Penguin Books. Hudson Street, New York: USA Inc., 375.

Wikipedia (2006) Encyclopidia.
(http://en.wikipedia.org/wiki/Kenya) contacted 11th April 2006.

Wikipedia (2007) Encyclopidia.
(http://en.wikipedia.org/wiki/Kenya) contacted 26th September 2007.

Wilson, E.O. (1988) *Biodiversity*, Washington DC: National Academic Press.

Wood, B.A. (1991) *Koobi Fora Research Project Vol. 4: Hominid Cranial Remains*. Clarendon Press, Oxford

WRI/IUCN/UNEP (1992) *Global Diversity Strategy*, Washington DC: World Resources Institute.

WWF (1998) *People and Protected Areas: A Case of Binsar Wildlife Sanctuary* by
Orus Ilyas, World Wide Fund for Nature, Delhi, India: World Wide fund for Nature.

Wyk, B.E. van & N. Gericke (2000) *People's Plants. A Guide to Useful Plants of Southern Africa.* Briza Publications.

Yen, D.E. (1993) The Origins of Subsistence Agriculture in Oceania and the Potentials for Future Tropical Food Crops. *Economic Botany,* 47: 3-14.

Young, A. (1982) The Amhara Medical System, in: Yoder, S. *African Healing Systems,* Berkeley: California University Press.

Zent, S. (1999) The Quandary of Conserving Ethnoecological Knowledge: A Piaroa Example, in: Blount, B.B. & T.S. Gragson (eds.) *Ethnoecology: Knowledge, Resources and Rights,* Athens: University of Georgia Press.

Appendix

List of useful wild plants' vernacular names, genus and species names and family names

Vernacular name	Genus and species names	Family name &Author
Butonwa, Mutonwa	*Galinsoga parviflora*	Compositae Cav.
Cebeni, Cibini, Thibini	*Psilotrichum elliottii*	Amaranthaceae Baker
Chechu	*Sphaeranthus cyathuloides*	Compositae O. Hoffm.
Cubutei	*Unknown*	Unknown
Gakenakeni	*Ipomoea obscura*	Convolvulaceae (L.) Ker-Gawl.
Gakonge Karia Kanini	*Aloe sp.*	Aloeaceae Engl.
Gakumu	*Oreosyce sp.*	Cucurbitaceae
Gatiiri, Kalema Ntiiri	*Cucumis dipsaceus*	Cucurbitaceae Spach
Gatiki, Gitiki, Mubinga	*Sida tenuicarpa*	Malvaceae Vollesen
Gatunguru karia gaceke, Gitunguru	*Allium annuloprason*	Alliaceae T.V. Egorova
Gicibi, Mucibi, Mucibicibi	*Leonotis nepetifolia*	Labiatae (L.) R. Br.
Gikandu, Gikandakandu, Gikuru, Makuri, Mukandu, Mukandakandu	*Ocimum gratissimum*	Lamiaceae/Labiatae L.
Gikuruthi, Makuruthi	*Ocimum basilicum*	Lamiaceae L.
Gioko, Moko, Mwoko	*Senecio hadiensis*	Compositae Forssk
Gitanka	*Unknown*	Unknown
Gitima, Kilencu	*Pennisetum clandestinum*	Graminae Hochst ex Chiou.
Gitorombolo (ro), Kithirikwa, Mutolombolo (ro)	*Solanecio mannii*	Compositae (Hook.f.) C. Jeffrey
Gitungugu, Itungugu, Kiariki kia rwego (kiria kinene), Murenda, Muutuutu	*Jatropha carcas*	Euphorbiaceae L.
Gituu	*Unknown*	Unknown
Igerema, Kagerema, Kajoo, Kigerema, Mwimba na Muthumbi	*Zehneria scabra*	Cucurbitaceae (L.f) Sond.
Inagu, Managu, Managwi	*Gynandropis gynandra*	Caparaceae (L.) Briq
Irigu ria Mutigi	*Musa sp.*	Unknown
Irimba, Muthanje	*Unknown*	Cyperaceae
Ituma, Ituma ria kina, Ituma ria Muriuntu, Mweu, Mutuuma	*Colocasia antiquorum*	Araceae Schott
Kaari, Kanuku, Kirurite	*Ajuga remota*	Lamiaceae/Labiatae Benth.
Kabeche	*Crotalaria mauensis*	Leguminosae Baker. F.
Kabeche, Mubugu	*Caesalpinia decapetala*	Caesalpinoideae (Roth.) Alston
Kaiaba	*Dovyalis abyssinica*	Flacourtiaceae Warb.
Kaimba na nchichi, Makena	*Asparagus racemosus*	Asparagaceae Wild.
Kaimbiya, Kimbiya, Muiimbi	*Allophylus sp.*	Sapindaceae
Kamama	*Amaranthus graecizans*	Amaranthaceae L.
Kamila	*Unknown*	Unknown
Kamugere, Mukuma	*Hibiscus fuscus*	Malvaceae Garcke
Kamugerwe	*Hibiscus aponeurus*	Malvaceae Sprague & Hutch
Kamuti komũ	*Microglossa pyrifolia*	Compositae (Lam.) Kuntze
Kanyelia, Munyelia	*Diplolophium africanum*	Umbelliferae Turc.
Kariaria, Kilialia, Kiriaria, Mulialia, Mriaria	*Emilia discifolia*	Compositae (Olive. C. Jeffrey)
Karigicha	*Cissampelos mucronata*	Menispermaceae Rich.
Karura	*Asparagus setaceus*	Asparagaceae (Kunth.) Jessop.
Karuta	*Unknown*	Unknown
Kathuri, Kithuuri	*Euphorbia tirucalli*	Euphorbiaceae L.
Kaungu njue	*Unknown*	Unknown
Kegeri, Rukirampio	*Justicia diclipteroides*	Acanthaceae Lindau
Kiaraka, Kijara, Mwaraka, Mwogoya	*Tetradenia riparia*	Labiatae/Lamiaceae (Hochst.) L.
kiariki kia rwego (kiria kinene), Muutuutu	*Jatropa carcas*	Euphorbiaceae L.
Kiariki, Mubariki, Mwariki	*Ricinus communis*	Burseraceae L.
Kibaki	*Nicotiana tabacum*	Solanaceae L.
Kigonko, Nkonko	*Oxygonum sinuatum*	Polygalaceae Dammer
Kigwa	*Saccharum officinarum*	Graminae/Poaceae L.
Kigwa gia gipompo	*Saccharum officinarum*	Graminae L
Kijara, Mujara, Mwogoya	*Plectranthus barbatus*	Labitae/Lamiaceae Andrews
Kijogu, Kithungu, Kithunku	*Solanum nigrum*	Solanaceae L.

(Cont'nd) List of useful wild plants' vernacular names, genus and species names and family names

Vernacular name	Genus and species names	Family name & Author
Kilala	*Hyphaene compressa*	PulmaeH. Wendl
Kilantana, Lantana	*Lantana camara*	Verbenaceae L.
Kilialia, Mulialia	*Periploca linearifolia*	Asclepiadaceae Dillon & A. Rich
Kilui, Mului, Muthare	*Lobelia gibberoa*	Campanulaceae Hemsel
Kinyakwe	*Ageratum conyzoides*	Compositae L.
Kioru, Mooru, Muboru	*Plectranthus sp.*	Labiatae/Lamiaceae
Kiramata karia kanene	*Cyathula polycephala*	Amaranthaceae Baker
Kiramata karia kanini	*Cyathula polycephala*	Amaranthaceae Baker
Kiagwi	*Unknown*	Unknown
Kirao, Kiroo, Muroo, Mwino	*Senna didymobotrya*	Leguminosae (Fresen) H.S. Irwin
Kirenge, Rurenga, Murenge	*Cucurbita ficifolia*	Cucurbitaceae Bouche
Kirugundu	*Conyza sumatrensis*	Compositae (Retz.) E. Walker
Kiruta	*Sesamum calycinum*	Pedaliaceae Welw.
Kithambiataru, Muthambiataru	*Melanthera scandens*	Compositae (Schu, nach. & Thonn.)
Kithiamura, Muthiamura	*Vernonia brachycalyx*	Compositae/Asteraceae C. Hoffm.
Kithorokwe, Mpumpu, Muumpu, Nthoroko	*Vigna unguiculata*	Leguminosae (L.) Walp.
Kithunji, Kithunju, Muthunju	*Aloe secundiflora*	Aloeaceae Engl.
Kithunji, Kithunju, Muthunju	*Aloe literatia*	Aloeaceae Rendle
Kiugu, Mung'wani, Muu	*Markhamia lutea*	Bignoniaceae K. Schum.
Koomere, Mukamwiru	*Tridax procumbens*	Compositae L.
Likithente, Mumangu, Ntilukungi	*Pappea capensis*	Sapindaceae Eckl. & Zeyh
Lukwayi, Lukweyi	*Balanites aegyptiaca*	Balanitaceae Wall
Mang'ua	*Sclerocarya birrea*	Anacardiaceae Hochst.
Maragwi	*Artemisia afra*	Compositae Jacq
Mbotwa, Nkabakabu	*Physalis peruviana*	Solanaceae L.
Menywa	*Aframomum augustifolium*	Zingiberaceae Engl.
Meruu	*Passiflora ligularis*	Passifloraceae A. Juss
Miraa, Muraa, Murau	*Catha edulis*	Celastraceae (Vahl) S. end.
Mitunda, Mutunda jwa muugu, Muugu	*Passiflora edulis*	Passifloraceae Sims
Mu'ere, Mukenia	*Pentas lanceolata*	Rubiaceae (Forssk.) Deflers
Mu'uti	*Aspilia mossambicensis*	Compositae (Olive.) Wid.
Muakwa, Muthakwa	*Vernonia auriculifera*	Compositae Hiern.
Mubaki, Mubabaki	*Symphytum officinale*	Boraginaceae L.
Mubangi	*Tegetes minuta*	Compositae L.
Mubaumauta	*Eucalyptus saligna*	Myrtaceae Sm.
Mubea, Muuya	*Sorghum bicolor*	Graminae (L.) Moench.
Mubiru, Mwilu	*Vangueria infausta*	Rubiaceae Burch
Mubobua	*Balanites sp.*	Balanitaceae Wall
Mubungu	*Unknown*	Unknown
Mubunju	*Ziziphus mucronata*	Rhamnaceae Wild
Muburu, Muuru	*Vitex doniana*	Verbenaceae Sweet
Mubuti, Muti, Muuti	*Erythrina abyssinica*	Leguminosae Lam
Mubuu	*Grewia villosa*	Tiliaceae Wild
Muchaani, Mutanda Mbogo, Mutanda Mboo	*Toddalia asiatica*	Rutaceae Lam.
Muchabi	*Cassia occidentalis*	Leguminosae L.
Muchabi	*Strychnos henningsii*	Loganiaceae Gilg.
Muchagucha	*Drypetes gerrardii*	Euphorbiaceae Hutch.
Muchaii	*Rosemarinus officinalis*	Labiateae L.
Muchamaru, Mululu, Munyaliko, Munyalikwa	*Grewia similis*	Tiliaceae K. Schum.
Muchambi	*Unknown*	Unknown
Mucharage, Muriuntui	*Olea capensis*	Oleaceae L.
Muchegene	*Achyranthes aspera*	Amaranthaceae Jacq. F.
Muchogomo, Mukuria Mbungu	*Ekebergia capensis*	Meliaceae Sparrm.
Muchoka	*Plumbago zeylanica*	Plumbaginaceae L.
Muchurai	*Rhus natalensis*	Anacardiaceae Bernh. Ex Krauss
Muchuthi, Mujuthi	*Caesalpinia volkensii*	Leguminosae Harms.

(Cont'nd) List of useful wild plants' vernacular names, genus and species names and family names

Vernacular name	Genus and species names	Family name & Author
Muciri, Mukinduri	*Croton dichogamus*	Euphorbiaceae Pax
Muciri, Mukinduri	*Croton macrostachyus*	Euphorbiaceae Del.
Mucoco	*Vigna sp.*	Papilionoideae
Mucugu, Nchugu	*Cajanua cajan*	Leguminosae (L.) Millsp.
Mucugucugu jwa kithaka	*Crotalaria sp.*	Papilionoideae
Muemba, Nkiloloti	*Acacia nilotica*	Luguminosae Karst
Mugaa	*Acacia gerrardii*	Mimosoideae Benth.
Mugaa	*Acasia tortilis*	
Mugaiguna, Muraiguna	*Rumex abyssinicus*	Polygonaceae Jacq
Mugenkagenka	*Senna singueana*	Leguminosae (Del.) Lock
Mugeta	*Rapanea melanophloeos .*	Myrsinaceae (L.) Mez
Mugokora, Murathaiga jumweru	*Trimeria grandifolia*	Flacourtiaceae (Hochst) Warb.
Mugoroma	*Rhamnus prinoides*	Rhamnaceae L'Herit
Muguchwa,Muluili, Munenenka, Muruiri, Muuchwa	*Zanthoxylum chalybeum*	Rutaceae Engl.
Mugugutu, Murua, Muturutua	*Rhoicissus tridentata*	Vitaceae (Eckl. & Zeyh.) N.R.
Muguita	*Kalanchoe sp.*	Crassulaceae
Mugumbao, Mugumbee, Mukumbao	*Withania somnifera*	Solanaceae (L.) Dunal
Mugumo	*Ficus thonningii*	Moraceae (Blume
Muguruka	*Securidaca longipedunculata*	Polygalaceae Fres
Mugwaci Jwa Muti, Mukwaci, Mukwaci jwa muti, Mwanga	*Manihot palmata*	Euphorbiaceae Pax
Mugwatia Nderi	*Scutia myrtina*	Rhamnaceae Kurz
Muithurai	*Dodonaea viscosa*	Sapindaceae Jacq
Mujuri	*Unknown*	Unknown
Mukalamatu, Murubaine, Mwarobaini	*Melia azadirachta*	Meliaceae L.
Mukambura, Muro	*Dovyalis abyssinica*	Flacourtiaceae (A. Rich.) Warb.
Mukaraku	*Salvia coccinea*	Lamiaceae/Labiatae L. F.
Mukau	*Melia volkensii*	Meliaceae Guerke
Mukaua	*Rytigynia sp.*	Rubiaceae
Mukawa, Munamulia	*Carissa edulis*	Apocynaceae (Forssk.) Vahl
Mukiithia, Munyithia	*Clausena anisata*	Rutaceae (Wild.) Benth.
Mukinda Nthaka, Muninkithia	*Clematis brachiata*	Ranunculaceae Ker Gawl.
Muko uri iuu	*Asystasia gangetica*	Acanthaceae T. Anders
Mukoko	*Unknown*	Unknown
Mukomere	*Rothmannia urcelliformis*	Rosaceae Bullock. Ex Robyns
Mukongolo juria mweru	*Trichilia sp.*	Meliaceae
Mukongolo juria Mwiru		
Mukongolo, Mutuati, Mutugati	*Trichila emetica*	Meliaceae Vahl
Mukuananthi	*Ipomea sp.*	Convolvulaceae
Mukui	*Unknown*	Unknown
Mukula	*Piliostigma thonningii*	Leguminosae (Schum.) Milne -
Mukululu, Mukuuru	*Flueggea virosa*	Euphorbiaceae Baill
Mukutha	*Albizia sp.*	Leguminosae
Mukuthuku	*Unknown*	Unknown
Mukuu	*Calotropis procera*	Asclepiadaceae (Aiton) W. T. Aiton
Mukwego	*Bridelia micrantha*	Euphorbiaceae (Hochst.) Baill.
Mulele	*Fiscus sp.*	Moraceae
Mulikinyai	*Euclea divinorum*	Ebenaceae Hiern
Mulinkoloi, Mutharange	*Indigofera swaziensis*	Leguminosae Bolus
Mulita, Muuta	*Pentas lanceolata*	Rubiaceae Schum
Mumanko	*Euclea divinorum*	Ebenaceae A.Rich.
Mumilinchui	*Acacia mellifera*	Leguminosae Benth
Munachiano, Murumu	*Fagaropsis angolensis*	Rutaceae (Engl.) Engl.
Munanku	*Glycine wightii*	Leguminosae (Wight & Arn.)
Mung'ang'a	*Zanthoxylum gillettii*	Rutaceae (De Wild) Waterm
Mung'entia Nthaka, Muruciu	*Conyza bonariensis*	Compositae (L.) Cronquist

(Cont'nd) List of useful wild plants' vernacular names, genus and species names and family names

Vernacular name	Genus and species names	Family name &Author
Mungithia	*Unknown*	Unknown
Muninkiu	*Unknown*	Unknown
Munyugunyugu, Murathangii	*Bidens pilosa*	Compositae L.
Murama	*Unknown*	Unknown
Murangi	*Arundinaria alpina*	Graminae K. Schum.
Murantina, Murigi	*Kigelia africana*	Bignoniaceae Benth
Murathaiga	*Osyris lanceolata*	Santalaceae Hochst. & Steud
Murema	*Unknown*	Unknown
Murembu	*Ehretia cymosa*	Boraginaceae Thonn
Murenda	*Pavonia patens*	Malvaceae Chiov.
Murera Njau	*Solanecio angulatus*	Compositae (Vahl) C. Jeff.
Murigarigu	*Rauwolfia caffra*	Apocynaceae Sond
Murigi wa kuthamba	Unknown	Unknown
Muriiru	*Syzgium cordatum*	Myrtaceae Hochst. Ex Chiou.
Muringa	*Cordia africana*	Boraginaceae Lam.
Murogorogo	*Scheffleri abyssinica*	Araliaceae (A.Rich.) Harms
Murubaini (Original), Mwarobaini	*Azadirachta Indica*	Meliaceae L.
Murugairia	*Clerodendrum myricoides*	Verbenaceae (Hochst.) Vatke
Murugumbari	*Podocarpus latifolius*	Podocarpaceae (Thunb.) Mirb.
Murugwa	*Piper capensis.*	Piperaceae L.
Murukwati	*Eriobotrya japonica*	Rosaceae Lindl.
Murunwa	*Unknown*	Unknown
Mururu	*Unknown*	Unknown
Mururuku	*Terminalia brownii*	Combretaceae Fresen
Mutabi	*Ocimum kilimandscharicum*	Labiatae/Lamiaceae Guerke
Mutagata, Mutata	*Harissonia abyssinica*	Simaroubaceae Oliver
Mutaliani, Mutariani	*Steganotaenia araliacea*	Umbeliferae Hochst
Mutana Biiji, Muthira Nthoni	*Maytenus senegalensis*	Celastraceae (Lam.) Exell
Mutare, Ntaratare (cia rwego)	*Rubus pinnatus*	Rosaceae Wild.
Muteetu, Muteletu	*Teclea simplicifolia*	Rutaceae (Engl.) Verdoorn
Mutendera upesi, Mutenderuka na mpwi	*Cardamine obliqua*	Cruciferae A. Rich.
Mutero, Muthata	*Olea europaea L. ssp africana*	Oleaceae (Mill.) P. S. Green
Muthaara jumweru	*Indigofera arrecta*	Leguminosae Benth
Muthaara, Muthaara jwa Mpuko	*Indigofera arrecta*	Leguminosae Hochst.ex. A. Rich
Muthagira	*Olinia usambarensis*	Olinaceae Schweinf.
Muthaiti	*Ocotea usambarensis*	Lauraceae Engl.
Muthanduku juria mwiru	*Acacia mearnsii*	Leguminosae De Wild
Muthigio	*Rhus longipes*	Anacardiaceae Engl.
Muthii	*Cordia monoica*	Boraginaceae Roxb
Muthiriti	*Lippia ukambaensis*	Verbenaceae Vatke
Muthithi	*Tamarindus indica*	Leguminosae L.
Muthongiru	*Lantana trifolia*	Verbenaceae Cham
Muthuguya	*Unknown*	Unknown
Muthunka	*Launaea cornuta*	Compositae (Olive. & Hiern) Jeffr.
Muthunthi	*Ximenia americana*	Olacaceae L.
Muthuti, Runduti	*Dyschoriste sp.*	Acanthaceae
Mutogota Iginyo, Mutogota Ing'inyo, Mutogota Inyo	*Heliotropium steudneri*	Boraginaceae Vatke
Mutongu	*Solanum incanum*	Solanaceae L.
Mutoo	*Azanza garckeana*	Malvaceae (F. Hoffm.) Excell &
Mutuja	*Myrianthus holstii*	Cecropiaceae Engl.
Mutula, Mutura	*Solanum aculeastrum*	Solanaceae Dun.
Mutunguu	*Commiphora eminii*	Burseraceae Engl.
Mutuntu, Mutungururi	*Croton macrostachyus*	Euphorbiaceae Hochst. Ex Delile
Mututu	*Clerodendron myricoides*	Verbenaceae R. Br.
Mutuu	*Tabernaemontana pachysiphon*	Apocynaceae Stapf.
Mutuuma	*Rhychosia minima*	Papilionoideae (L.) DC.

(Cont'nd) List of useful wild plants' vernacular names, genus and species names and family names

Vernacular name	Genus and species names	Family name & Author
Muukula, Muukura	*Mondia whitei*	Asclepiadaceae (Hook.F.) Skeels
Muula	*Lannea schweinfurthii*	Anacardiaceae Engl.
Muumbukura	*Unknown*	Unknown
Muunkoma	*Monanthotaxis parvifolia*	Annonaceae (Oliv.) Verdc.
Mu'uti	*Unknown*	Unknown
Muutu	*Unknown*	Unknown
Mwananthenge	*Jasminum sp.*	Oleaceae
Mwang'ua	*Senna siamea Lam.*	Leguminosae (Lamack) H.S.Irwin &
Mwarankware	*Clerodendrum johnstonii*	Verbenaceae Verdc.
Mwatha	*Vernonia lasiopus*	Compositae C. Hoffm.
Mweereere	*Rauwolfia caffra*	Apocynaceae Sond(L.) Stapf
Mwenjela(ra)	*Cussonia holstii*	Araliaceae Harms.
Mwimba na Muthumbi	*Zehneria scabra*	Cucurbitaceae (L.f) Sond.
Mwinyu	*Unknown*	Unknown
Mwiria	*Prunus africana*	Rosaceae (Hook. F.) Kalkman
Mwiteeria	*Unknown*	Unknown
Mwithiruai	*Unknown*	Unknown
Ncabi	*Lablab purpureus*	Leguminosae (L.) Sweet
Ncani Mura	*Unknown*	Unknown
Ndago	*Cyperus articulatus*	Cyperaceae L.
Nduru, Rukwa(karukwaci)	*Dioscorea minutiflora*	Dioscoreaceae Engl.
Ngaii	*Unknown*	Unknown
Ngakura	*Rhamnus staddo*	Rhamnaceae A. Rich
Ngangarisi	*Unknown*	Unknown
Nguruka Ya Kieni	*Vernonia grabra*	Compositae (Steetz.) Vatke
Njira	*Coriandrum sativa*	Umbelliferae L.
Njogu ya iria	*Blumea mollis*	Compositae (D.Don) Merr.
Njuria	*Sterculia stenocarpa*	Sterculiaceae H. Winkler
Nkenkeyia	*Commelina sp.*	Commelinaceae
Ntamba na ruci, Ntamba na ruji	*Commelina benghalensis*	Commelinaceae (L.)
Ntaratare inceke	*Rubus apetalus*	Rosaceae Poir.
Ntaratare, Mutare	*Rubus volkensii*	Rosaceae Engl.
Ntarimukia	*Erucastrum arabicum*	Cruciferae Fische & Mey.
Nthangari	*Digetaria abyssinica*	Graminae Stapf
Ntigiji,Tigiji	*Myrsine africana*	Myrsinaceae L.
Ntilikungi	*Unknown*	Unknown
Nturiri	*Turraea robusta*	Meliaceae Gürke
Nyaari	*Sporobolus pyramidalis*	Graminae P. Beauv.
Nyaki	*Hyparrhenia hirta*	Graminae (L.) Stapf
Nyangarisi	*Unknown*	Unknown
Quinini	*Unknown*	Unknown
Rukuno	*Unknown*	Unknown
Rugwaci, Rukwaci, Rukwaci rwa mukuo	*Ipomoea batatas*	Convolvulaceae (L.) Poir
Rungoo	*Tephrosia sp.*	Leguminosae
Rungu	*Unknown*	Unknown
Tangauci	*Unknown*	Unknown
Terere, Terere iria nini (ntune)	*Amaranthus hybridus*	Amaranthaceae L.
Thaa ya Njogu	*Urtica massaica*	Urticaceae Mildbr
Thunui	*Warburgia ugandensis*	Canellaceae Sprague

Source: Fieldwork (2002)

Glossary

Amiiru – the name of the people living in Meru who are also be referred to as '*the Meru*' or ***Ameru***
Anganga – wondering
Athi (pl.) **–** hunters also referred to as ***Mwathi*** (sing.)
Aturi (pl.) - ironsmiths referred to as ***Muturi*** (sing.)
Baraza – kiswahili name for meetings
Dawa - medicine
Dawa cia Miti – herbal traditional or alternative medicine
Dawa ya Miti - medicine from plants
Gaaru – warrior, father's or man's hut
Gakiri ka Mbaki - snuff box
Gichanuri (sing.) – comb, ***Iichanuri*** (pl.) combs: combs hair straight.
Giciaro - blood brothers
Gikombe (sing.) – cup: ***Iikombe*** (pl.) - cups
Gikuri (sing.) – comb, ***Iikuri*** (pl.) – combs: combs hair flat
Gitije - the respected one
Gitunguru – refers to onion but also to plants with bulbs resembling the onion
Gukuura nkuuro - tattooing
Gutana - circumcising
Gutura matu - ear piercing
Iiga - grinding stone
Ijuga (pl.) - traditional plates
Ikabu (pl.) - baskets
Ikiri (pl.) - gourds
Iikombe (pl.) - cups
Ikongolo (pl.), ***Gikongolo*** (sing.) –wood laid across a river to assist in crossing
Iikuri (pl.) – combs
Irio – Meru traditional food
Julai - coldest season in the year: June - August
Ka – miniature
Ka-Aga - belonging to curse removers (referring to Kaaga Forest)
Kajuga (sing.), **Tujuga** (pl.) – plate made from *Rungu* (*Cucumis sp*.)
Kaminchuria Metho – formal education system that offered reading lessons to individuals during the colonial era of the 1920s or 1930s
Kangangi – wondering form place to place
Kaau (sing.), ***Twaau*** (pl.) - drinking vessel made form *Rungu* (*Cucumis sp*.)
Ki – of the---- (belonging to the ---)
Kiama – council
Kiama kia Ngome (Nkome) – council of elders known as Ngome from Meru South District
Kioro - mock burning of the penis after circumcision
Kibiri – wooden stirrer
Kiiji (sing.) - *un-circumcised* boy child also referred to as ***Mwiji*** (0-7yrs)
Kiini Kiiru - the respected one also referred to as ***Gitije*** or ***Murungu wa Kirinyaga*** - God of Mount Kenya or as ***Ngai*** - rain bringer
Kimiiru – this is the language of the Meru and mostly referred to as the '*Meru language'*

Kiuru - wife's hut
Kirimara – the dazzling mountain now known as Mount Kenya
Kithanda kia mutu – food made from maize flower cooked with grains, also called ***Mukinde Kiuru*** – mother's hut
Kiuthi – game played on a wooden board with *Njuthi* (seeds) from *Mujuthi* (*Caesalpina volkensii)*
Kukukukoooo, Mugeni nejeeeeee, nturume ithinjueee - cry of a cook in a bid to divert attention from its being slaughtered to the sheep or goat
Lima - to cultivate
Maguta ja Mbariki - castor oil
Makamba – bush or rubbish
Marachi – perfume
Matatu – swahili name for the local transport van
Maturutia – women bangles
Mau Mau – Kenya's freedom fighters before independence in 1963
Mbwaa – the home of the *Ngaa* in an Indian Ocean Island (maybe Manda)
Migiro (pl.) – curses, ***Mugiro*** *(sing.)*
Migwi (pl.) arrows
Mikanda (pl.) - ropes
Mirwa (pl.), ***Murwa*** (sing.) - digging sticks
Miti shamba – swahili name for herbal or traditional medicine
Miswaki (pl.) – *tooth brushes*
Miunda (pl.) - farms
Miuuru **(**pl.) - grain storage container also referred to as ***Muuru*** (sing.)
Muchunku - white man
Muga - curse remover
Mugiro *(sing.)* – curse, Migiro (pl.) – curses
Mugwe - prophet or seer also referred to as ***Mukiama***
Migwi (pl.) arrows
Mukanda *(sing.)* – rope, ***Mikanda*** (pl.) - ropes
Mukiama - prophet or seer also referred to as ***Mugwe***
Mukinde – food made from maize flower mixed with grains, also called ***kithanda kia mutu***
Muraguri - witch-doctor
Murogi - witch
Murungu wa Kirinyaga - God of Mount Kenya also referred to as ***Kiini Kiiru***, or ***Gitije*** - the respected one or ***Ngai*** - rain bringer
Murwa (sing.), ***Mirwa*** (pl.) - digging stick
Muswaki (sing.) ***Miswaki*** (pl.) - tooth brush (es)
Mutaani - circumciser
Muthimbeere - a girl's hut
Mutindwa – name of Meru town (place where people spend most time)
Mutiri – wooden pestle
Muturi (sing.) – ironsmith also referred to as ***Aturi*** (pl.)
Mutuuma – tuberous plants with broad heart shape leaves
Muugu - creeping vegetation
Muuru (sing.) – grain storage container also known as ***Miuuru*** (pl.)
Mwana - child
Mwathi (sing.) **–** hunter also referred to as ***Athi*** (pl.)

Mwiji** (pl.) - un-circumcised* boy, a child also referred to as ***Kiiji (0-7yrs)
Mwiriga - clan
Mwiko – wooden flat spoon for mashing food
Mzee (sing.) - the very elderly and the wisest, also referred to as ***Wazee*** (pl.); 62 + years
Nainchu **-** honey
Nchuguma - a defence stick with a rounded head
Ncuku - store for food stuffs
Ndinguri – adult boy nearing circumcision age, also known as ***Ntaane*** (8-17 yrs)
Ngai - rain or rain bringer
Ngutu - girls in seclusion after circumcision
Nguu Ntune – people of red clothes referring probably the Arabs who enslaved the *Ngaa* at *Mbwaa*
Nja – households, or home or homestead. Also referred to as ***Muchii*** by the people of Tigania
Njeru - white
Njiru - black
Njuki **-** bees
Njuri Nceke – council of elders from Meru North District
Njuri ya Kiama – councillors who have taken an oath
Nkuro(lo) - tattoo
Nondo - red ochre that would be used by women to powder their bodies
Ntaane – adult boy nearing circumcision age, also known as ***Ndinguri*** (8-17 yrs)
Ntariba - sub-clan
Ntiiri - mortar
Ntune – red
Nthaka – warrior hood circumcised young man (18-29 yrs)
Thano mucheke **-** Januray – February dry season
Thano mukungugu - August - September dry season
Nthie – stone used on the ***Iiga*** to grind grain
Nthuki - age-set
Ntiiri – wooden mortar
Rutan*o* - circumcision
Sabuni - soap
Thithinda **-** *Juniperus sp. i. e* Cedar
Urogi **–** poison or witchcraft
Urugura - October to December rainy season
Uta - bow
Uthima - April to June rainy season
Wazee (pl.) - the very elderly and the wisest also referred to as ***Mzee*** (sing.); 62 + years

Abbreviations

ASAL	Arid and Semi Arid Lands
CBD	Convention on Biological Diversity
CBS	Global Biodiversity Strategy
COP	Conference of Parties
DC	District Commissioner
DDP	District Development Plan
DO	District Officer
DP	Democratic Party of Kenya
ED	Endogenous Development
ENT	Ear, Nose and Throat
FF	Farmer First
FGM	Female Genital Mutilation
GDP	Gross Domestic Product
GK	Governments of Kenya
GPS	Global Positioning System
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICSU	International Council for Science
INDAKS	Indigenous Agricultural Knowledge Systems
IE	Intercultural Efficacy
IKS	Indigenous Knowledge Systems
IMF	International Monetary Fund
IPR	Intellectual Property Right
ICSU	International Council for Science
IUCN	World Conservation Union
KANU	Kenya African National Union
KWS	Kenya wildlife Services
NACC	National Aids Control Council
NARC	National Rainbow Coalition
NDP	National Democratic Party
NEMA	National Environmental Management Authority
NGO	Non Governmental Organisation
NMK	National Museums of Kenya
PTD	Participatory Technology Development
PC	Provincial Commissioner
SCA	Site Exploitation Territory
SDP	Social Democratic Party
SES	Socio-Economic Status
SET	Site Catchments Analysis
SPSS	Statistical Programs for Social Sciences
TEK	Traditional Environmental Knowledge
TOT	Transfer-of-Technology
U.S.A	United States of America
UNCHR	United Nations Commission on Human Rights
UNEP	United Nations Environmental Program
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WRI	World Resources Institute

Summary

This ethnobotanical study has been conducted in the Greater Meru Region, situated in the central part of Kenya, East Africa, well-known as the 'Cradle of Humankind', a geographical designation given to this important area of human evolutionary history by Charles Darwin (18 - 18). Although early human fossils have also been found in other parts of the world, including the Middle East and Asia, the discoveries of numerous species of the Hominins - humans and their fossil ancestors - in this part of the world, including the *Australopithecines*, *Homo Habilis*, *Homo ergaster/Homo erectus*, and *Homo sapiens* have further substantiated Darwin's evolutionary theory in the African Continent. During the past decades, spectacular findings of fossils from different hominin species on the eastern and the western shores of Lake Turkana have helped to further reconstruct early human evolutionary history, well preserved, interpreted and stored at the National Museums of Kenya (NMK) in Nairobi (*cf.* Leakey 1992; 1994; Leakey & Lewin 1992b).

While understandably, most scholarly attention has been focussed on the anatomical and morphological analysis of early human fossil remains, supported by archaeological evidence, relatively less attention has been paid to the ways of life and survival of early humans in relation to their natural environment and its plant resources. Although some studies of large molars and massive jaws show that early human ancestors living to 1-2 million years BP used several plant species for their food needs, such as to crush hard fruits and nuts, while other research of the mineral compounds in early human bones indicate the use of plants long before the domestication of plants around 10,000-3,000 years BP, less information has yet been brought together on human-plant relations in (pre)history in this part of the world. In this context, the so far missing evidence is not only remarkable in the light of the identification of East Africa as one of the world's important 'Centres of Genetic Diversity' by the famous botanist Nicolas Vavilov (1951), but also in view of its significance as the presumed area of domestication of several indigenous African crops which evolved into some of today's' most important staples of the continent (*cf.* Klein 1993).

Given, on the one hand, the crucial importance of the further understanding of human-plant relations in this part of Africa in a diachronic mode not only for insight into past processes, but also for potential future use of wild under-utilised plants, and on the other hand, the incomplete evidence from the past, the study in Meru seeks to further explore an alternative research strategy in the area which embarks on comparable human-plant relations and interactions of the present, complemented with a retrospective assessment of the past, known as the 'Ethnosystems' approach (*cf.* Leakey & Slikkerveer 1991).

Over the past century, the Kenya has increasingly been involved in the struggle to halt the growing loss of its natural vegetation, as well as the disappearance of the related indigenous peoples' knowledge and wisdom concerning sustainable local management and conservation, so far, however, with little success. The traditional institutions, beliefs and norms which had guided the local people for so many generations in protecting their plant resources and preserving their knowledge systems in order to live and survive in harmony with nature were threatened if not virtually wiped out by colonial intrusion which showed little respect for the age-old knowledge, beliefs and practices, largely for the commercial benefit of the outsiders.

Forests were cleared for large-scale agricultural production of cash crop at farms of the white colonialists; roads were constructed through fragile ecosystems, transforming nature into settlements, villages and towns. Not long thereafter, members of the proud local communities ended up working as landless labourers for a meagre wage. Later, when Kenya gained its independence in 1963, local entrepreneurs took over to become the owners of the former white-owned farms,

continuing the same Western-style commercial system on their fellow country people, with its devastating implications for the country's bio- and cultural diverse resources. Increased cultivation, extended settlement, and subsequent population explosions up to 4% annually, the country's natural vegetation dwindled reducing the current forest cover today to merely 2.0% nationally, far below the standard of 10.0% required by all countries of the process of global warming is to be averted. The further influx of Western lifestyle as the result of the ongoing processes of development and globalisation, and the disappearance of indigenous peoples and communities as important repositories of knowledge and experience of useful wild plants as a major part of their habitat, renders the future of Kenyan indigenous plant-related knowledge, beliefs and practices rather grim.

In such complex configuration of interacting local and global knowledge systems, the current education system does offer only very few instruments to counter the downward trend of loss of local knowledge and experience, let alone to instigate an appropriate reorientation towards the knowledge-based cultural heritage of Kenya. In contrast to the traditional views and attitudes, most 'modern' curricula's are focused on modernisation and economic development without much consideration for the rich traditions of sustainable indigenous use and management of biocultural diversity in Kenya which have contributed to traditional community life.

By consequence, in order to assess the position of the process of human-plant relations in such a changing environment from the participants, *i.e.* local peoples' point of view, the *ethnosystems* approach allows for an emic-oriented assessment of indigenous people's knowledge, belief and practice concerning their useful wild plants. This specific approach includes a focus on the Participants View (PV), the Field of Ethnological Study (FES) and the Historical Dimension (HD) of the plant-related local processes.

Among the Meru, the utilitarian aspects of indigenous use, management and conservation of their wild plants basically determines their concept of *useful wild plants*. In other words, the Meru people conceptualise their relations with wild plants within the context of their indigenous plant knowledge system *a priori* as useful, in which 'usefulness' forms the guiding principle in their local classification of wild plants as *useful wild plants*. The utilitarian orientation of the Meru is reflected in the various types of wild plant use, indicated below.

As indicated in Chapter I on the *Introduction*, a general overview of the study in Meru is presented, complemented with the formulation of the *general aim* and *specific objectives* of the research. Then in Chapter II, the theoretical orientation on ethnobotanical theories, principles and concepts, is described, focussing on appropriate strategies used to study human-plant relations through time including pre-historical, pre-contemporary and contemporary approaches, which constitute the basic theoretical framework of the study. Following the assessment of ethnobotany as a multidisciplinary field of study, promising avenues from recent approaches of the emic perspective on indigenous plant knowledge and the wider conceptualisation of wild plant use with conservation and community development are explored. It is clear, that in the absence of yet sufficient material evidence from the archaeological and archaeobotanical record the ethnographic analogy remains rather complicated to implement in the study among the Meru in order to reconstruct the (pre)historical associations.

In Chapter III the selection of the appropriate ethnobotanical research methods and techniques and related analytical model of wild plant use behaviour are further described. The alternative approaches to human-plant relations are explored such as the study of 'Traditional Ecological Knowledge' (TEK) and the Leiden ‘Ethnobotanical Knowledge Systems’ Approach (EKS) which provides a diachronic perspective on human-plant relations by starting from present-day structures going back in time into history in a retrospective mode in order to enhance the understanding in

relation not only to the present people's use of their wild plants, but also to that of the past. In the EKS approach, the advance of quantitative ethnobotany is demonstrated in the construction of an analytical model which allows for further understanding and explanation of patterns of human-plant use behaviour reported by the respondents of the sample surveys. Here, the limited prehistoric and pre-contemporary evidence can be complemented with not only explanation, but also prediction of human plant use behaviour with interesting implications for future use of wild plants in the area, such as indicating the potential of under-utilised wild plants. In this way, the present becomes not only the key to the past, but may also be an eye opener to the future.

The specific methods used for collecting data reveal how qualitative data were gathered through semi-structured and open-ended interviews, guided field walks and participant observations. A total of 25 local plant experts from the Greater Meru Region shared their knowledge and expertise on the use of wild plant. The utilitarian principles of the local classification of useful wild plants of the Meru people were later used to group the useful plants into two main categories: medicinal plants and non-medicinal plants. Tools were gathered, informers trained, and documents prepared during the qualitative study where useful wild plants were identified, documented, collected, dried and later preserved for storage at the East African Herbarium of the National Museums of Kenya in Nairobi. In this way, local names of useful wild plants were documented, as well as the habitats in which they were found, the season, the identification details of each plant - especially as regards the colour of the leaves, the look and feel of the barks and leaves, and the smells and tastes of various useful wild plants - complemented with the standard sizes of plants and trees, their heights and shapes. Eventually, the local utilitarian classification of useful wild plants pertained to 8 types of uses, each of which has been documented and described during the qualitative part of the surveys. In due course, the quantitative surveys have been conducted in 3 sample survey villages, representing the three districts of Meru North, Meru Central and Meru South districts: respectively the semi-urban community of *KK Lumbi*, the urban community of *Kinoru* and the rural community of *Kagera*.

Following the above mentioned theoretical and methodological orientations of the research, the study embarked on the *general aim* to document, study and analyse the so far largely neglected, fast disappearing indigenous systems of useful wild plant knowledge and practice among the people of Meru in Kenya within the context of the human-plant relations as these have evolved in the Meru cultural area from the past to the present. The general aim has been operationalised in a number of the *specific objectives* which include the following.

Firstly a general description is given of the research setting on the basis of the sociography of the Republic of Kenya and the Greater Meru region, sub-divided in Meru North, Meru Central and Meru South districts, encompassing the geography, population, and culture;

Secondly, the botanical collection of useful wild plant specimens of the Meru included drying and preservation for the East African Herbarium of the National Museums of Kenya for further documentation and storage for future research and reference. This part of the study provides the collection of over 300 plant specimens which include different species of plants. The documentation also shows that most plants were collected from the Meru South district as the result of the still rather undisturbed and safe circumstances which prevailed in its environment during the fieldwork. Not only were different useful wild plants documented, but also their classification according to the Meru 8 categories of uses; *i.e.* medicinal, food, material, social, environmental, fuel, non-vertebrate poisons and bee plants. In addition, the more detailed taxonomy of the plants was carried out according to the local principles which include the description of the parts of the plants used, and the preparation and administration of plants for traditional herbal medicines. Here, it became clear that wild plants are a major source for the preparation of the people's traditional medicine. This challenging part of the survey resulted in substantial, well-documented list of the wild medicinal

plants, although factors such as religious beliefs, lack of confidence, uncertain dosage and doubt of efficacy seemed to deter some respondents from effectively using these plant-based medicines.

Thirdly, the analysis and documentation of the life of the Meru people as guided by the various factors and data collected during the qualitative study enabled a deeper understanding of this community. Meru households showed to encompass families ranging from one to ten or more members whereby also grandchildren and other family members are part of the extended families. It was also confirmed that gender plays a major role in human-plant relations, as males seemed to dominate the wild plants use, while females seemed to shy away from most uses especially of medicinal plants, but formed the majority in the use of wild fuel and food plants. The heads of the households are predominantly men, and according to the data collected, most were in the age category ranging from 21 - 70 or more years. The data on the respondents revealed a community with members who have had at least a basic formal primary education, amounting to more than four-fifths of the total respondents in the three sample survey villages.

Furthermore, the background characteristics show that most of the community members are farmers, while others are engage in various ways of entrepreneurship and rearing of livestock. A number of 'invisible' factors which tend to influence human wild plant use behaviour include the people's knowledge, belief, attitude, perceived need of plant resources, knowledge transfer to children and their experiences with wild plant use. The overall methods used to assess and analyse the Socio-Economic Status (SES) of the household are analysed in accordance to the local Meru tradition, such as wealth in animals, especially cattle and poultry, while type of house, land ownership, possession of assets and monthly income completed the independent background characteristics. It became clear that some of the Meru respondents in the sample surveys live in poverty, while others enjoy richness.

The surveys also showed that the community was primarily based on Meru villagers who live in three basic types of environment, showing a difference in economic profile, while their vegetation also varied to a considerable extent, which had a marked influence on their conservation practices. The analysis of Government policies and regulations which the people view as either an encouragement or discouragement in their daily use of wild plants revealed relative significant influence on the household heads in their actual use of wild plants.

Although more than half of the wild plants were reportedly used for medicine, it was found that the some medicinal plants are also used as non-medicinal plants, such as food plants, material plants, fuel plants etc. While this multiple use of wild plants sometimes made it difficult to classify them, the actual difference emerged often in the way each was prepared. In the documentation process, it also became clear that several respondents expressed their opinion that medicine from such plants can heal, show no side effects, are readily available, preferable to modern medicine, and often cheaper. Moreover, these traditional herbal medicines are today increasingly used by the people, a phenomenon which is in line with the global reorientation towards traditional medicine. It became also clear that roots are the most used plant parts in traditional medicine, followed in rank order by the leaves, bark, stem, branches and fruits. Among the Meru, the wild plants which provide the highest amount of useful parts are classified in rank order as shrubs, trees, herbs, climbers/creepers, succulents, grass and rhizomes. The documentation also includes the preparation and administration of medicine, including boiling or crashing into a sap or powder. In addition, a local classification is constructed of diseases which are subject to successful herbal treatment, indicated in Chapter VII.

The particular use of non-medicinal wild plants is also described in detail. In the use of food plants, for instance, it was found that as certain respondents did not use these plants for medicine, they did use them for the preparation of food, rendering the use of food plants as the second largest

non-medicinal use of wild plants, reported among the Meru. In this category, mostly used are the herbs, fruits and seeds from shrubs. It was possible to document the various reasons which respondents had as to why they used these wild plants such as their nutritional value, low costs, appetizing properties and, of course, their readily availability. Indeed more than two thirds of the respondents reported that they used wild food plants in the preceding year. It was also possible to compile a list of the wild food plants, where a list of 69 plant species is described. Similarly, the local preparation methods for food are also recorded, also further described in Chapter VIII.

In addition, it has been possible to document the material plants and although tree logging is prohibited, some people are in need of any available wood of plants and trees. These needs include material for most household utensils and drinking vessels, roofing rafters, weaving material for harvesting baskets and brooms which are made out of tree branches without felling the whole tree. A list of the material plants collected in the survey is also compiled, extended with a description of the particular use. Social plants are documented as a major part of Meru culture, such as use for inflicting curses on offenders and neighbour abusers. The use of these social plants tend to cause great fear to the victims who would be threatened with death, hence preventing the community members from causing harm to each other. Plants have also been used in wedding ceremonies and in child birth, and also in instilling discipline to the children, as some respondents expressed their belief in the biblical saying: *'spare the rod and spoil the child'*. Cosmetic and aromatic plants have also been documented, while in addition plants used for leisure complete the list of social plants. It is clear that social use is particularly declining as the result of the availability of some modern products, sold nowadays in the expanding number of shops and drug stores.

Fuel plants have reportedly been used by virtually all respondents, mostly as firewood for domestic cooking and heating. While the Meru do generally not fell trees for firewood, but use mostly dead branches and leaves fallen from the trees, there are some cases reported of making charcoal. During the qualitative survey, an overwhelming abundance of the exotic *Mukima* (*Grewia robusta*) tree was found throughout the Greater Meru Region, providing the bulk of firewood to the local people. While a list of fuel plants is also compiled, environmental, non-vertebrate poisons and bee plants are other useful plants documented in the study area, and as such added to the list of non-medicinal plants of the Meru.

Fourthly, the assessment of the evolution of human-plant relations in Kenya is presented on the basis of relevant, so far available information of subsequent periods of time from the past to the present, encompassing the heritage of the *hominins*, the *modern humans of the Neolithic* and the *pre-contemporary modern humans.*

Fifthly, the presentation of the results of the qualitative study of indigenous Meru knowledge and use of useful wild plants. In addition, the indigenous, rather utilitarian classification of useful wild plants of the Meru is presented. The inventorization and classification of the useful plants of the Meru is also implemented for the structure of the emic study of the various categories of useful plants in the research area.

Sixthly, the documentation of the classification, use and conservation of *medicinal wild plants* of the Meru is provided as the first main category of plants used in traditional medicine, based on their knowledge, use and conservation practices. In addition to the indigenous classification of medicinal plants among the Meru, the related indigenous diseases classification is also presented.

Seventhly, the presentation of the classification, use and conservation of *non-medicinal wild plants* of the Meru as the second main category of plants used in the research area, also based on Meru knowledge, use and conservation practices. This part of the study elaborates on the local sub-categories of wild plants, including food plants, material plants, fuel plants, environmental plants, social plants, non-vertebrate poisons plants and bee plants.

Eighthly, the bivariate analysis as the *first phase* in the overall analytical process is presented, revealing certain significant associations of variables with both medicinal and non-medicinal plants, not only showing considerable significance in the overall outcome, but also further demonstrating their significance for the respondents reported wild plant use behaviour. Such significance is clearly emerging in variables such as *environment*, expressed prominently by the *Pearson Chi-Square* and *Cramer's V* of .000, which underscores the highest possible significant association in the relationship. By consequence, it is possible to conclude that the environment, in which the respondents are living, is strongly influencing the patterns of plant use behaviour as a whole. Other variables which show significance in medicinal plant use include: the predisposing, socio-demographic variables of sex, formal education and profession of the household head, while psycho-social variables include awareness of plant vegetation environments, knowledge of both medicinal and non-medicinal plants, attitude towards and experience with both medicinal and non-medicinal plants. Variables which show significant associations with non-medicinal plant use behaviour include the predisposing socio-demographic variables such as household size, while psycho-social variables include the perceived need of wild plant resources and experience in non-medicinal plant use. Significant intervening variables of Government policies and regulations refer particularly to encouraging policies.

Ninthly, the multivariate analysis as the *second phase* in the overall analytical process provides further understanding of the cohesions among the independent and intervening variables, and of the relations and interactions between them and the dependent variables of plant use behaviour This so-called OVERALS analysis of medicinal and non-medicinal plant use behaviour proves vital in further confirming the selection of the different categories of variables for the study in Meru. Indeed, the multivariate distribution of the component loadings further substantiates the significance of the variable *environment* for both medicinal and non-medicinal plant use behaviour, as the results emerge very strongly in the first dimension. Similarly, the strong interaction of the sex of the household head re-affirms its significance in the second dimension, as noted already during the qualitative surveys. In addition, psycho-social variables such as knowledge and attitude towards medicinal and non-medicinal plants as well as socio-economic status (SES) reveal their interactive significance in the first dimension. Intervening variables including discouraging policies reveal significance in both medicinal and non-medicinal plant use behaviour among the household heads in Meru. Predisposing psycho-social variables such as the preparedness to pay, perceived need and experience in both medicinal and non-medicinal plants, conservation and intervening variables in the second dimension, all confirming their significant interaction with both medicinal and non-medicinal plant use behaviour of the respondents in the three sample survey villages of Meru.

Further interesting results emerge from one dimension of the OVERALS analysis of plant use behaviour in for food, material, social, fuel, environmental, non-vertebrate poisons and bee plants, further providing insight in the intricate nature and the internal influence of each individual pattern of plant use behaviour on the overall non-medicinal plant use already explained above. The psycho-social variables, for instance, display their significant interaction with food plant use behaviour in the variable of experience in medicinal plant use, which proved to be the strongest variable among all other variable of the analysis, thus revealing its determinant role in whether a respondent used a wild plant for food or for other purposes. Other variables which emerged strongly in this pattern of plant use behaviour include belief in medicinal plants, experience in food plants and attitude towards food plants.

The component loadings of the multivariate analysis of material plant use reveal that predisposing psycho-social variables, including experience of material plants, knowledge of medicinal plants and knowledge of material plants, together with the variable of the environment -

representing the three sample villages where respondents live - in addition to intervening variables of discouraging policies have significant interactions with medicinal and non-medicinal plant use behaviour of the household heads. Similar analysis on social plant use reveals that socio-demographic variables, such as the age and profession of the household head together with psycho-social variables of experience in social plant use showed the strongest interactions. Also, variables of knowledge, attitude and belief in social plant use in addition to discouraging policies showed rather significant interaction with both medicinal and non-medicinal plant use behaviour. As regards fuel plant use behaviour, the socio-demographic variable of formal education shows significant interaction, while the psycho-social variable of attitude shows significant interaction. Furthermore, the variable of the Socio-Economic Status (SES) of the household proved to have the strongest significant interaction with medicinal plant use behaviour among all variables of the analysis.

The predisposing socio-demographic variables of marital status and profession, as well as the psycho-social variables of knowledge of medicinal plants and knowledge and experience of environmental plants together with encouraging policies show strong interaction with environmental plant use behaviour. The socio-demographic variable marital status, and the psycho-social variables of knowledge, belief, attitude and experience in non-vertebrate poisons plants showed the strongest interaction with non-vertebrate poisons plant use behaviour.

The multivariate analysis underscores that the variables of experience with bee plants and with medicinal plants, as well as knowledge of bee plants and knowledge of medicinal plants interact significantly with bee plant use behaviour. The environmental variable of the location of the villages where respondents are living confirms its significant interaction with bee plant use behaviour. In all seven categories of wild plants - food, material, social, fuel, non-vertebrate poisons and bee plants - the variables of age, marital status, knowledge, belief, attitude and experience as well as environment, Socio-Economic Status (SES), together with both encouraging and discouraging policies, emerge in showing extremely significant interaction with non-medicinal plant use behaviour among the respondents of the sample surveys in the three Meru villages.

Finally, the calculation of the multiple correlation coefficients with optimal scaling from the OVERALS analysis as the third and final phase of the analytical process reveals that there are varying cohesions among the different categories or blocks of variables, resulting in the construction of the *final analytical model* of the study of medicinal and non-medicinal wild plant use behaviour in Meru. The observation of the cohesions among the blocks of dependent variables of the model in terms of the results of the calculations reveals that there exists a very strong cohesion between the blocks of *socio-demographic* and *psycho-social* variables, further showing that there exists a very strong interaction between these blocks in determining the overall pattern of wild plant use behaviour. Similarly, the cohesions between the blocks of *socio-demographic* and *enabling* variables in both dimensions one and two confirm the interaction among them, while the strong interaction with the two blocks of medicinal and non-medicinal plant use behaviour further underscores their determinant position in the analytical model. Also, relatively strong interaction was measured among the blocks of *socio-demographic* and *environmental* variables in the first dimension, revealing their dominance in medicinal and non-medicinal plant use behaviour. Still, a relatively strong cohesion is observed among the blocks of *psycho-social*, *enabling*, *environmental* and *conservation* variables, equally substantiating the significant interactions among each other and in relation to the dependent blocks of medicinal and non-medicinal plant use behaviour. In contrast, relatively weak cohesions are found among the blocks of *environmental* and *intervening* variables, revealing little interaction with both dependent blocks of plant use behaviour patterns. Similar weak interactions are found among the blocks of the model of *enabling* and *intervening* variables.

The assessment of calculated values of interactions between the different independent and intervening blocks in relation to the two dependent blocks reveals several strong cohesions, such as between the blocks of *socio-demographic*, *psycho-social* and *conservation* variables in interaction with the dependent block of *medicinal plant use behaviour.* Similarly strong interactions are found between the blocks of *socio-demographic*, *psycho-social* and *conservation* variables and the block of *non-medicinal plant use behaviour*, further confirming the significant interactions which exist between these independent and dependent blocks of the model. Comparatively weak coherences are found between the block of *enabling* variables and the dependent block of *non-medicinal plant use behaviour*, indicating that *Socio-Economic Status* (SES) plays a very limited role in determining the non-medicinal plant use behaviour. Other weak coherence has been observed among blocks of *environmental* and *intervening* variables in interaction with the block of *medicinal plant use behaviour*, and, in turn, in interaction with blocks of *intervening* and *environmental* variables and the block of *non-medicinal plant use behaviour*.

The overall analysis of relevant factors which emerge from the research in Meru as strong determinants of medicinal and non-medicinal wild plant use in the present renders it possible to understand in what way early ancestors of modern human lived and survived on the wild plant r4esoirces of the environment. Indeed, the study among the present-day people in Meru indicates that variables related to household size, age, socio-economic status or marital status among others would not have had any effect on the early human plant use behaviour under pre-historic conditions, while other variables such as sex, awareness of a suitable vegetation environment, knowledge and experience in the use of wild plants must have played a vital role in their survival In addition, the study also indicates that particular environments must also have contributed to the choice of where these early human ancestors chose to forage, and subsequently to migrate to other environments where new plant resources and could be explored and used for their continuing evolution and ultimate survival.

The theoretical implications of the study refers to the advantage of the execution of emic-oriented research which pays due attention to the role of the crucial 'invisible' factors as determinants of indigenous plant use and conservation systems, including local knowledge, belief and attitudes within the dynamic context of development and change. Such orientation is encapsulated in the recent ethnoscience approaches of Indigenous Knowledge Systems (IKS), Traditional Ecological Knowledge (TEK) and Ethnobotanical Knowledge Systems (EKS) which pave the way for such ethnobotanical research in Kenya and elsewhere in Africa.

A closely theoretical implication points to the fact that most of the unique indigenous wild plant knowledge system of the Meru, as similar systems elsewhere around the globe, is currently threatened with loss and extinction as the result of development and globalisation. By implication of this study, indicating a need for more diachronic studies as the result of the relative paucity in archaeological and palaeo-anthropological evidence related to early human-plant interactions, specifically in East Africa as the 'Cradle of Humankind', renewed interdisciplinary research should be conducted in order to reconstruct human adaptation, use, management and conservation of their environment and its diverse plant resources. Also, as the method of the 'Ethnographic Analogy' between past and present cultures is shown to be heavily dependent of extensive archaeological excavation, collection and documentation of past material evidence, the promising newly-developed Leiden 'Ethnobotanical Knowledge Systems' approach should be adapted to the diachronic study of human-plant relations over longer periods of time and in comparative culture areas in Kenya and East Africa.

The methodological implications of the study in Meru include the confirmation that the analytical model on human wild plant use behaviour, developed at Leiden University, has

successfully been adapted and operationalised for the study in Meru, demonstrating its adequate analytical function for this kind of advanced, quantitative ethnobotanical research.

The practical implications encompass the need which emerged from the emic-oriented research revealing that many households continue to be faced with the dilemma of managing the growing number of its members pertains not only to a continuing shortage of resources, but also erosion of traditional ways of life including the system of *informal education* which used to be an important part of the traditional age-grade system of the Meru. In line with such use and conservation teaching and learning projects, also renewed attention is due on so far under-utilised plants for medicinal and related purposes in order to generate additional income and employment at the community level.
Another important practical implication of the present study refers to the use of wild medicinal plants for traditional herbal medicine, where in particular, poor people tend to use these medicinal plants more than the richer members of the community. The revitalisation of the use of herbal medicine in primary health care links up with both traditional cultures and international policies, urging adequate measures from the government not only to promote local forms of sustainable use, but also safeguard the local medicinal plants from the risk of over-harvesting as the result of unlimited commercial exploitation of wild medicinal plants and herbs.

Lastly, according to the results of the study in Meru, an important contribution to sustained use and conservation of useful wild plants could be initiated by government and non-government organisations at the local level which could provide an adequate process of policy planning and implementation in close cooperation with the participants in the villages in order to introduce sustainable community development in the area, and as such safeguard the Meru cultural heritage of indigenous knowledge and practice of use and conservation of useful wild plants for the future.

The recommendations which are formulated in Chapter X as the result of the study in Meru, can be summarised as special activities needed to promote the local Meru ways of sustainable use and conservation of useful wild plant into future biocultural conservation programmes and projects as follows:

preservation of the rich Meru ethnobotanical knowledge systems;
integration of local knowledge into the formal education system;
revitalisation of traditional herbal medicine in forest and home gardens;
policy planning and implementation regarding nature conservation;
incorporation of useful wild plants into biocultural conservation programmes;
promotion of sustainable plant-based community development.

In conclusion, the study in Meru recommends that in line with current global conservation programmes, initiatives are taken to combine local conservation efforts of medicinal and non-medicinal wild plants of the Meru people with sustainable economic development programmes in order to realise the potential benefits for future sustainable plant-based community development in Greater Meru region.

Samenvatting

Dit etnobotanisch onderzoek is uitgevoerd in de Greater Meru Region, gelegen in het centrale deel van Kenia, Oost Afrika, welbekend als de 'Wieg der Mensheid', een geografische verwijzing van Charles Darwin (1809-1882) naar dit belangrijke gebied van de geschiedenis van de evolutie van de mens. Hoewel vroege menselijke fossielen ook in andere delen van de wereld zijn gevonden, waaronder het Midden Oosten en Azië, hebben de vele ontdekkingen in dit deel der aarde van fossiel materiaal van vele soorten van de Hominins - mensen en hun fossiele voorouders - waaronder de *Australopithecines*, *Homo habilis*, *Homo ergaster/Homo erectus*, en *Homo sapiens* de evolutie theorie van Darwin in het Afrikaanse Continent verder onderbouwd. Gedurende de afgelopen decennia hebben de spectaculaire vondsten van fossielen van verschillende hominine soorten in de oostelijke en westelijke oevers van het Turkana Meer zeer veel bijgedragen aan de verdere reconstructie van de evolutie van de mens, zoals die goed bewaard, geinterpreteerd en opgeslagen is in de National Museums of Kenya (NMK) in Nairobi (*cf.* Leakey 1992; 1994; Leakey & Lewin 1992b).

Hoewel begrijpelijkerwijs de meeste wetenschappelijke aandacht vooral gevestigd is geweest op de anatomische en morfologische analyse van vroege menselijke fossiele resten, ondersteund door archaeologisch materiaal, is relatief weinig aandacht geschonken aan de levenswijze en overleving van de vroege mens in relatie tot zijn natuurlijke omgeving en de planten daarin. Hoewel enkele studies van grote fossiele kiezen en enorme kaken aantonen, dat de vroege voorouders van de mens, die tussen 1 - 2 miljoen jaar geleden leefden, verschillende plantensoorten gebruikten om in hun voedselbehoeften te voorzien, zoals het kraken van harde vruchten en noten, terwijl ander onderzoek van minerale elementen in vroege menselijke beenderen het gebruik van planten aangeven lang voor de domesticatie van planten tussen 10.000 - 3.000 jaar geleden, is minder informatie bijeengebracht over de relaties tussen mensen en planten in de (pre)historie in dit deel van de wereld. In dit verband is het vrijwel ontbreken van archaeologisch/palaeobotanisch materiaal niet alleen merkwaardig in het licht van de verwijzing van Oost Afrika als één van de belangrijke 'Centra van Genetische Diversiteit' door de bekende botanist Nicolas Vavilov (1951), maar ook gezien de betekenis daarvan als het vermoedelijke gebied van domesticatie van verschillende Afrikaanse gewassen, waarvan sommige zich ontwikkeld hebben tot de belangrijkste huidige hoofdgewassen op het continent (*cf.* Klein 1993).

Gelet, aan de ene kant op het cruciale belang van een beter begrip van de relaties tussen mensen en planten in dit deel van Afrika in diachronisch perspectief, niet alleen voor meer inzicht in processen uit het verleden, maar ook voor potentieel toekomstig gebruik van wilde onderbenutte planten, en aan de andere kant, op het incomplete wetenschappelijk bewijs uit het verleden, tracht de studie in Meru een alternatieve onderzoekstrategie toe te passen in het gebied, die uitgaat van vergelijkbare relaties en interacties tussen mensen en planten in het heden, aangevuld met een retrospectief benadering van het verleden, bekend als de 'Ethnosystems' benadering (*cf.* Leakey & Slikkerveer 1991).

Gedurende de afgelopen eeuw is Kenia steeds meer betrokken geraakt in de strijd tegen het toenemende verlies van zijn natuurlijke vegetatie, maar ook tegen het verdwijnen van de daaraan gerelateerde kennis en wijsheid van de inheemse bevolking omtrent duurzaam lokaal beheer en behoud van de natuur, tot op heden echter met weinig succes. De traditionele instituties, geloof en normen, die de lokale bevolking gedurende vele generaties hebben begeleid in het beschermen van hun planten bronnen en het behouden van hun kennissystemen om te leven en te overleven in harmonie met de natuur, zijn bedreigd, zo niet feitelijk weggevaagd geworden door de koloniale

overheersing die weinig respect toonde voor de eeuwenoude kennis, geloof en praktijken, voornamelijk vanwege de commerciele belangen van buitenstaanders.

Bossen werden gekapt voor grootschalige landbouwproduktie van handelsgewassen op de boerderijen van de blanke kolonisten, wegen werden dwars door kwetsbare ecosystemen aangelegd, waardoor de natuur veranderde in nederzettingen, dorpen en steden. Niet lang daarna eindigden de leden van de trotse lokale gemeenschappen als landloze arbeiders voor een schamel loon. Later, toen Kenia onafhankeijlk werd in 1963, namen lokale ondernemers het systeem over om eigenaar te worden van de voormalige boerderijen van de blanken, waardoor hetzelfde Westerse commerciele systeem op hun medeburgers opgelegd is gebleven, met alle verwoestende implicaties voor de bio- en culturele diverse bronnen van het land.

De toegenomen cultivering van het land, uitgebreide nederzettingen en de daaropvolgende bevolkingsexplosie tot 4% groei per jaar leidde verder to het verdwijnen van veel natuurlijke vegetatie, waardoor het huidige tropenbos tot zo'n 2.0% gereduceerd is, hetgeen ver onder de standaard van 10.0% ligt, dat noodzakelijk is voor alle landen, indien het process van de opwarming van de aarde afgewend kan worden. De verdere instroom van de Westerse levensstijl als gevolg van voortgaande processen van ontwikkeling en globalisering, en het verdwijnen van de inheemse bevolking en hun gemeenschappen als belangrijke bewaarplaats van kennis en ervaring omtrent nuttige wilde planten als belangrijk onderdeel van hun habitat verschaft een tamelijk somber beeld van de toekomst van Kenia's inheemse, op planten gebaseerde kennis, geloof en praktijken.

In een dergelijke complexe configuratie van interacterende lokale en globale kennissystemen biedt het huidige onderwijssysteem slechts weinig instrumenten om de neerwaartse trend van verlies van lokale kennis en ervaring tegen te gaan, laat staan om een geschikte herorientatie te bewerkstelligen ten aanzien van de op kennis gebaseerde culturele erfenis van Kenia. In tegenstelling tot de traditionele visie en houding zijn de meeste 'moderne' curriculae gericht op modernisering en economische ontwikkeling, zonder veel consideratie te hebben met de rijke traditie van duurzame lokaal gebruik en beheer van bioculturele diversiteit in Kenia, dat zoveel heeft bijgedragen aan het traditionele gemeenschapsleven. Teneinde de positie te bepalen van het proces van de relaties tussen mensen en planten in een dergelijke veranderende omgeving vanuit de visie van de participanten, *i.e.* vanuit het standpunt van de lokale bevolking zelf, maakt de *ethnosystems* benadering een van binnenuit gerichte onderzoek mogelijk van de kennis, geloof en praktijken van de inheemse bevolking omtrent hun nuttige wilde planten. Deze specifieke benadering omvat vooral aandacht voor de 'Participants View' (PV), het 'Field van Ethnological Study' (FES) en de 'Historical Dimension' (HD) van op planten gebaseerde processen.

Bij de Meru bepaalt het utiliteitsaspect van lokaal gebruik, beheer en behoud van hun wilde planten in feite hun concept van *nuttige wilde planten*. Met andere woorden, de Meru bevolking percipiert haar relaties met wilde planten binnen de context van haar inheemse kennissysteem van planten *a priori* als nuttig, waarin het 'nut' het principe vormt van haar lokale classificatie van wilde planten zodanig als *nuttige wilde planten*. De orientatie op het nut door de Meru komt ook tot uitdrukking in de verschillende typen van gebruik van wilde planten, zoals hieronder nader wordt omschreven.

In de *Introductie* van Hoofdstuk I wordt een overzicht gegeven van de studie in Meru, aangevuld met de formulering van de algemene doelstelling en de specifieke vraaagstelling van het onderzoek.

Vervolgens wordt in Hoofdstuk II de theoretische orientatie omtrent etnobotanische theorieen, principes en concepten beschreven, gericht op de geschikte strategieen die gebruikt worden om de relaties tussen mensen en planten door de tijd heen te bestuderen, waartoe de pre-historische, pre-contemporaine en contemporaine benaderingen behoren, die het fundamentele theoretisch kader van het onderzoek vormen. Na een beschrijving van de etnobotanie als een multidisciplinair studieveld,

worden de veelbelovende richtingen behandeld van recente benaderingen vanuit het *emic* perspectief - d.w.z. van binnen uit - van inheemse systemen van plantenkennis evenals de bredere conceptualisering van gebruik en behoud van wilde planten en van 'community development'. Het is duidelijk, dat bij het ontbreken van voldoende wetenschappelijk bewijs van archaeobotanical materiaal de zgn. 'Ethnographic Analogy' een tamelijk gecompliceerde methode blijft om toe te passen in het onderzoek onder de Meru om de (pre)historische relaties tussen mensen en planten in het gebied te verklaren.

In Hoofdtstuk III worden de selectie van de geschikte etnobotanische onderzoeksmethoden en technieken, alsmede het daarbij betrokken analytisch model van gebruik van nuttige wilde planten verder omschreven. De alternatieve benaderingen van de relaties tussen mensen en planten worden verkend, zoals het onderzoek naar 'Traditional Ecological Knowledge' (TEK) en de benadering van de Leidse 'Ethnobotanical Knowledge Systems' (EKS), die een diachronisch perspectief tracht te geven aan de relaties tussen mensen en planten door vanuit hedendaagse structuren op retrospectieve wijze terug te gaan in de geschiedenis, teneinde het inzicht te vergroten niet alleen in relatie tot het hedendaagse gebruik van nuttige wilde planten, maar ook in het verleden. In de EKS-benadering wordt het voordeel duidelijk gemaakt van de kwantitative etnobotanie in de constructie van een analytisch model dat verder begrip en verklaring mogelijk maakt van menselijke gedragspatronen van gebruik van planten, zoals dat door respondenten uit de steekproef wordt gerapporteerd. Hier kan het beperkte prehistorische en pre-contemporaine bewijs gecomplementeerd worden met niet alleen verklaring, maar ook voorspelling van menselijke gedragspatronen van gebruik van planten met interessante implicaties voor toekomstig gebruik van wilde planten in het onderzoeksgebied, zoals het aangeven van het potentieel van onder-benutte wilde planten. Op deze wijze wordt het heden niet alleen een belangrijke sleutel voor het verleden, maar zou het ook een openbaring voor de toekomst kunnen worden.

De specifieke methoden die gebruikt zijn om de gegevens te verzamelen laten zien op welke wijze kwalitatieve gegevens bijeen zijn gebracht met behulp van semi-gestructureerde en 'open-ended' interviews, begeleide veldbezoeken en observatie van participanten. In totaal hebben 25 lokale plantendeskundigen uit de Greater Meru Region hun kennis en expertise over het gebruik van wilde planten ter beschikking gesteld. De utiliteitsprincipes van de lokale classificatie van nuttige wilde planten van de Meru zijn later gebruikt om de nuttige planten te groeperen in twee hoofddcategorieën: medicinale planten en niet-medicinale planten. Instrumenten werden verzameld, informanten werden getraind en de documenten werden voorbereid om in het kwalitatieve onderzoek de nuttige wilde planten te identificeren, te verzameken, te drogen en te preserveren voor opslag in het depot van het East African Herbarium van de National Museums of Kenya in Nairobi. Op deze wijze zijn de lokale namen van de nuttige wilde planten gedocumenteerd, alsmede de habitat waarin zij gevonden zijn, het seizoen, de details van identificatie van elke plant - in het bijzonder met betrekking tot de kleur van de bladeren, de verschijningsvorm en het aanvoelen van schors en bladeren, en de reuk en smaak van de verschillende nuttige wilde planten - aangevuld met de standaardhoogte van planten en bomen, en hun omvang en vorm. Tenslotte leidde de op gebruik gebasserde lokale classificatie van nuttige wilde planten tot 8 categorieën van gebruik, waarvan elk tijdens het kwalitatieve onderdeel van het onderzoek is gedocumenteerd en beschreven. Kort daarop zijn de kwantitative surveys uitgevoerd in 3 door een steekproef geselecteerde dorpsgemeen-schappen, representatief voor de drie districten van Meru North, Meru Central en Meru South districts, respectievelijk de semi-urbane gemeenschap *KK Lumbi*, de urbane germeenschap *Kinoru* en de rurale gemeenschap *Kagera*. Na de bovengenoemde theoretische en methodologische orientatie van de studie is het onderzoek toegespitst op de algemene doelstelling om de tot op heden grotendeels verwaarloosde, snel verdwijnende inheemse systemen van kennis en gebruik van nuttige

wilde planten van de Meru bevolking in Kenia te documenteren, bestuderen in de context van de relaties tussen mensen en planten, zoals die zich ontwikkeld hebben vanuit het verleden naar het heden in het cultuurgebied van de Meru. De *algemene doelstelling* is geoperationaliseerd in een aantal *specifieke vraagstellingen*, die als volgt beschreven zijn:

Ten eerste, een algemene beschrijving is gepresenteerd van het onderzoeksgebied op basis van de sociografie van de Republiek van Kenya en de Greater Meru Region, onderverdeeld in de Meru North, Meru Central en Meru South districts, aan de hand van geografie, bevolking en cultuur;

Ten tweede, de botanische collectie van specimens van de nuttige wilde planten van de Meru, bestaande uit het drogen en preserveren daarvan ten behoeve van verdere documentatie en opslag in het depôt van het East African Herbarium van de National Museums of Kenya in Nairobi voor toekomstig onderzoek en referentie. Dit onderdeel van het onderzoek heeft een collectie van meer dan 300 specimens van planten opgeleverd, bestaande uit verschillende plantensoorten. De documentatie toont ook aan, dat de meeste specimens zijn verzameld in het Meru South district als gevolg van de nog grotendeels onverstoorde en veilige omstandigheden van het natuurlijk milieu gedurende het veldwerk. Niet alleen zijn de verschillende nuttige wilde planten gedocumenteerd, maar zijn deze ook geclassificeerd volgens de 8 Meru categorieen van gebruik; *i.e.* medicinale, voedsel, materiale, sociale, milieu, brandstof, non-vertebrate gif en bijenplanten. Bovendien is de meer gedetailleerde taxonomy van de planten uitgevoerd volgens de lokale principes die bestaan uit de beschrijving van de delen van de gebruikte planten, en de bereiding en toepassing van planten voor traditionele kruidengeneesmiddelen. Hier is duidelijk geworden, dat wilde planten een belangrijke bron vormen voor de bereiding van de traditionele geneeskunde van de bevolking. Dit uitdagende onderdeel van het survey resulteerde in een aanzienlijke, goed gedocumenteerde lijst van de wilde medicinale planten, hoewel factoren zoals geloof, gebrek aan vertrouwen, onduidelijke dosering en twijfel aan de werkzaamheid sommige respondenten leek te weerhouden van het gebruik van deze op kruiden gebaseerd medicijnen.

Ten derde, de beschrijving en documentatie van het dagelijks leven van de Meru bevolking zoals dat door een aantal factoren wordt geleid, en de gegevens die gedurende het kwalitatieve onderdeel van het onderzoek zijn verzameld, dat een beter inzicht mogelijk maakt van deze samenleving. De Meru huishoudens vertoonde het beeld van families met één tot tien of meer leden, waarbij kleinkinderen en andere leden deel uitmaken van het uitgebreide familieverband. Ook werd bevestigd, dat gender een belangrijke rol speelt in de relaties tussen mensen en planten, waar mannen het gebruik van nuttige wilde planten lijken te domineren, terwijl de vrouwen zich niet bezighouden met de meeste vormen van gebruik van planten, en in het bijzonder van medicinale planten, hoewel zij wel de meerderheid vormen bij het gebruik van wilde brandstof- en voedselpanten. De huishoudhoofden zijn overwegend mannen, en volgens de verzamelde gegevens varieert hun leeftijd tussen 21 - 70 jaar of ouder. De gegevens van de respondenten geven een beeld van een gemeenschap met leden die tenminste basisonderwijs hebben genoten, hetgeen meer dan vier-vijfde van het totaal aantal respondenten in de drie dorpen van de steekproef omvat. Bovendien laten de achtergrondskarakteristieken zien, dat het merendeel van de gemeenschapsleden boeren zijn, terwijl de overigen zich met verchillende manieren van ondernemerschap en met veeteelt bezighouden. Een aantal 'onzichtbare' factoren die menselijke gedragspatronen van gebruik van planten beinvloeden omvatten kennis, geloof, houding, gepercipieerde behoefte aan planten, overdracht van kennis aan kinderen en ervaring met gebruik van wilde planten. De algemene methoden die gebruikt zijn om de Socio-Economic Status (SES) van het huishouden te bepalen, zijn uitgevoerd volgens de lokale Meru traditie, zoals rijkdom van het aantal dieren, in het bijzonder vee en vogels, terwij het type huis, landbezit, financiële middelen en inkomen per maand de onafhankelijke achtergronds-karakteristieken hebben gecompleteerd. Het is duidelijk geworden, dat

sommige van de Meru respondenten uit het steekproef onderzoek in armoede leven, terwijl anderen in rijkdom vertoeven.

De surveys tonen ook aan, dat de gemeenschap primair gebaseerd is op de Meru dorpelingen die in drie basistypen van het milieu leven, hetgeen een verschil vertoont in het economisch profiel, terwijl hun vegetatie ook aanzienlijk varieert, dat weer een sterke invloed uitoefent op hun praktijken van natuurbehoud. De analyse van de maatregelen en het beleid van de regering die de bevolking ofwel als aanmoediging ofwel als ontmoediging beschouwd worden ten aanzien van het dagelijks gebruik van wilde planten vertoonde geen sterke invloed op het feitelijk gebruik van wilde planten door de huishoudhoofden.

Hoewel meer dan de helft van de wilde planten werd gerapporteerd als gebruik voor geneesmiddelen, is ontdekt dat sommige medicinale planten ook gebruikt worden als niet- medicinale planten, zoals voedselplanten, materiaalplanten, brandstofplanten etc. Terwijl dit multipele gebruik van wilde planten het soms moeilijk maakte om deze te classificeren, kwam het feitelijke verschil naar voren in de wijze waarop elke plant bereid werd. Tijdens het proces van documentatie werd het ook duidelijk, dat verscheidene respondenten hun opinie kenbaar maakten dat geneesmiddelen van dergelijke planten kunnen genezen, geen bijwerkingen vertonen, gemakkelijk beschikbaar zijn, de voorkeur genieten boven moderne geneesmiddelen en dikwijls goedkoper zijn. Bovendien worden deze traditionele kruidenmedicijnen momenteel steeds meer gebruikt door de bevolking, een verschijnsel dat aansluit bij de wereldwijde herorientatie op traditionele geneeskunde. Het werd ook duidelijk, dat wortels het meest gebruikte deel van de planten in traditionele geneeskunde vormen, in rangorde gevolgd door bladeren, schors, stam, takken en vruchten. Onder de Meru worden de wilde planten die het hoogste aantal van gebruikte delen opleveren in rangorde geclassificeerd als struiken, bomen, kruiden, klimplanten, sappige planten, grassen en wortels. De documentatie daarvan omvat ook de bereiding en toepassing van deze medicijnen, zoals het koken of fijnwrijven tot sap of poeder. In aansluiting daarop is een lokale classificatie samengesteld van ziekten die met succes door kruidengeneeskunde behandeld worden, zoals nader is angegeven in Hoofdstuk VII.

Het speciale gebruik van niet-medicinale wilde planten is ook in detail beschreven. In het gebruik van voedselplanten, bij voorbeeld, werd gevonden dat indien een aantal respondenten deze planten niet voor geneeskunde gebruikten, zij die gebruikten voor de bereiding van voedsel, waarmee het gebruik van voedselplanten de tweede grootste categorie vormt van niet-medicinaal gebruik van wilde planten, zoals door de Meru bevolking is gerapporteerd. In deze categorie zijn de kruiden, vruchten en zaden van struiken het meest gebruikt. Het was mogelijk om de verschillende redenen vast te leggen, waarom de respondenten deze wilde planten gebruiken, zoals de voedingswaarde, lage kostprijs, smakelijke eigenschappen en natuurlijk hun gemakkelijke verkrijgbaarheid. Inderdaad rapporteerde meer dan twee-derde van de respondenten, dat zij in het voorafgaande jaar gebruik van wilde voedselplanten hadden gemaakt. Het werd ook mogelijk om een lijst van wilde voedselplanten samen te stellen, waarbij een lijst van 69 plantensoorten zijn beschreven. Eveneens zijn de lokale bereidingswijzen voor voedsel vastgelegd, zoals verder beschreven wordt in Hoofdstuk VII.

In aansluiting daarop is het mogelijk geworden om de materiaalplanten te documenteren, en hoewel het kappen van bomen verboden is, hebben sommige mensen behoefte aan elk beschikbaar hout van planten en bomen. Deze behoefte omvat materiaal voor de meest gebruikte huishoudgereedschappen en drinkbekers, daksparren, vlechtmateriaal voor oogstmanden en bezems die van boomtakken worden gemaakt zonder dat de gehele boom wordt geveld. Er is ook een lijst samengesteld van materiaalplanten die tijdens de surveys zijn verzameld en die aangevuld is met een beschijving van het specifieke gebruik.

Sociale planten zijn gedocumenteerd als een belangrijk deel van de Meru cultuur, die gebruikt worden om vloeken uit te spreken over wetsovertreders en buren die zich misdragen. Het gebruik van deze sociale planten roept grote angst op bij de slachtoffers die daarmee zelfs met de dood bedreigd worden tegen onderling conflicten, waardoor de leden van de gemeenschap beschermd worden tegen het berokkenen van kwaad. Planten zijn ook gebruikt bij huwelijksceremonieën en geboorte van kinderen, terwijl ze ook worden aangewend om kinderen discipline bij te brengen, in welk verband sommige respondenten naar hun geloof in de bijbeltekst verwezen van: *'wie zijn kind liefheeft spaart de roede niet'*.

Cosmetische en aromatische planten zijn ook gedocumenteerd, terwijl in aaansluiting daarop planten die gebruikt worden in vrije tijd de lijst van sociale planten verder aanvullen. Het is duidelijk dat het gebruik van vooral sociale planten aan het afnemen is vanwege de beschikbaarheid van moderne produkten die thans verkrijgbaar zijn in het groeiend aantal winkels en drogisterijen.

Brandstofplanten blijken vrijwel door alle respondenten te worden gebruikt, voornamelijk in het huishouden als brandhout voor het thuis koken en voor verwarming. Terwijl de Meru in het algemeen geen bomen kappen voor brandhout, maar het meeste dode takken en bladeren daarvoor gebruiken, zijn enkele gevallen gerapporteerd van het maken van houtskool. Gedurende het kwalitatieve survey werd een overweldigende hoeveelheid van de exotische *Mukimeen* (*Grewieen robusta*) boom in het gehele gebied van de Greater Meru Region aangetroffen, die het overgrote deel van het brandhout voor de lokale Meru bevolking levert. Naast een lijst die van brandstof-planten is samengesteld, zijn ook milieuplanten, non-vertebrate gif en bijenplanten, en andere nuttige planten gedocumenteerd in het onderzoeksgebied en alszodanig aan de lijst toegevoegd van niet-medicinale planten van de Meru.

Ten vierde, de beschrijving van de evolutie van de relaties tussen mensen en planten in Kenya op basis van relevante, tot op heden beschikbare gegevens over opeenvolgende tijdsperioden van het verleden tot in het heden, bestaande uit de erfenis van de *hominines*, de *moderne mensen van het Neolithicum* en de *pre-contemporaine modern mensen.*

Ten vijfde, de presentatie van de resultaten van het kwalitatieve deel van het onderzoek van lokale Meru kennis en gebruik van nuttige wilde planten. In aansluiting daarop wordt de inheemse utilitaire classificatie van nuttige wilde planten van de Meru gepresenteerd. De inventarisatie en classificatie van de nuttige planten van de Meru is ook gebruikt voor de structuur van de bestudering van binnenuit van de verschillende categorieen van nuttige planten in het onderzoeksgebied.

Ten zesde, de documentatie van classificatie, gebruik en behoud van *medicinale wilde planten* van de Meru is gegeven als eerste hoofdcategorie van planten die gebruikt worden in traditionele geneeskunde, geaseerd op hun kennis, gebruik en praktijkens van natuurbehoud. In aansluiting op de lokale classificatie van medicinale planten van de Meru wordt ook een lokale classificatie van de daarbij betrokken ziekten gepresenteerd.

Ten zevende, de presentatie van classificatie, gebruik en behoud van *niet-medicinale wilde planten* van de Meru als de tweede hoofdcategorie van planten die gebruikt worden in het onderzoeksgebied, eveneens gebaseerd op hun kennis, gebruik en praktijken van natuurbehoud. Dit deel van de studie werkt de lokale sub-categorieën van wilde planten verder uit, waaronder voedselplanten, materiaalplanten, brandstofplanten, milieuplanten, sociale planten, non-vertebrate gifplanten en bijenplanten vallen.

Ten achtste, de presentatie van de bivariate analyse als de *eerste fase* in het algehele analytische proces, die laat zien, dat bepaalde significante associaties van variabelen met zowel medicinale als niet-medicinale planten worden gemeten, waardoor niet alleen een aanzienlijke significantie in het uiteindelijk resultaat naar voren komt, maar die verder hun significantie aantoont voor het door de respondenten gerapporteerde gebruik van wilde planten. Een dergelijke significantie komt ook

duidelijk naar voren in variabelen zoals *milieu*, sterk onderbouwd door de waarde van de *Pearson Chi-Square* en*Cramer's V* van .000, die de hoogst mogelijke significante associatie in de relatie aangeeft. Als gevolg daarvan is het mogelijk om te concluderen dat het milieu waarin de respondenten leven een sterke invloed uitoefent op hun algehele gedragspatroon van gebruik van planten.

Andere variabelen die een significantie vertonen in het gebruik van medicinale planten omvatten de predisponerende socio-demografische variabelen van sexe, formele opleiding, en beroep van het hoofd van het huishouden, evenals de psycho-sociale variabelen van bewustwording van plantenvegetaties in het milieu, kennis van zowel medicinale en niet-medicinale planten, houding ten opzichte van, en ervaring met gebruik van zowel medicinale als niet-medicinale planten. Variabelen die een significante associatie vertonen met gedragspatronen van gebruik van niet-medicinale planten omvatten de predisponerende socio-demografische variabelen, zoals huishoudomvang, terwijl psycho-sociale variabelen van de gepercipieerde behoefte aan wilde planten en ervaring met gebruik van niet-medicinale planten omvatten. Significante intervenierende variabelen van maatregelen en beleid van de regering verwijzen in het bijzonder naar aanmoedigend beleid.

Ten negende, de multivariate analyse als de *tweede fase* in het algehele analytisch process verschaft verder begrip van de cohesie tussen de onafhankelijke en intervenierende variabelen, en van de relaties en interacties onderling als in interactie met de afhankelijke variabelen van gedragspatronen van gebruik van planten. De zogenaamde OVERALS analyse van gedragspatronen van gebruik van medicinale en niet-medicinale planten blijkt van groot belang voor de verdere bevestiging van de selectie van de verschillende categorieen van variabelen voor de studie in Meru. Inderdaad, de multivariate verdeling van de *component loadings* onderstreept de significantie van de variabele *milieu* voor zowel gebruik van medicinale als niet-medicinale planten, aangezien de resultaten zeer sterk naar voren komen in de eerste dimensie. Eveneens bevestigt de sterke interactie van de variabele sexe van het hoofd van het huishouden de significantie in de tweede dimensie, zoals reeds is opgemerkt tijdens de kwalitatieve surveys. In aansluiting daarop vertonen de psycho-sociale variabelen, zoals kennis en houding ten aanzien van medicinale en niet-medicinale planten, evenals de socio-economicsche status (SES) een interactieve significantie in de eerste dimensie. Interveniërende variabelen zoals ontmoedigend beleid vertonen significantie in zowel gebruik van medicinale als van niet-medicinale planten onder de hoofden van de huishoudens in Meru. Predisponerende psycho-sociale variabelen zoals de bereidheid tot betaling, gepercipieerde behoefte en ervaring met zowel medicinale als met niet-medicinale planten, natuurbehoud en de intervenierende variabelen in de tweede dimensie bevestigen allemaal hun significante interactie met gebruik van zowel medicinale als niet-medicinale planten van de respondenten in de drie dorpen uit de steekproef in Meru.

Verdere interessante resultaten komen naar voren uit in één dimensie van de OVERALS analyse van gedragspatronen van gebruik van voedsel, materiaal, sociale, brandstof, milieu, non-vertebrate gif en bijenplanten, waardoor meer inzicht wordt verkregen in de ingewikkelde natuur en de interne invloed van elk individueel gedragspatroon van gebruik van planten op het algehele gebruik van niet-medicinale planten, dat reeds hierboven is omschreven. De psycho-sociale variabelen, bij voorbeeld, vertonen een significante interactie met gebruik van voedselplanten in de variabele van ervaring met gebruik van medicinale planten, die de sterktste interactieve variabele is van alle variabelen uit de analyse, en dus zijn rol vertoont als de determinant van gebruik van een wilde plant voor voedsel of voor een ander doel door respondenten. Andere variabelen die sterk naar voren komen in het gedragspatroon van gebruik van wilde planten zijn geloof in medicinale planten, ervaring met voedselplanten en houding ten aanzien van voedselplanten.

De *component loadings* van de multivariate analyse van gebruik van materiaalplanten toont aan, dat de predisponerende psycho-sociale variabelen, zoals ervaring met materiaalplanten, kennis van medicinale planten en kennis van materiaalplanten, samen met de variabele van het milieu - die verwijst naar de drie dorpen uit de steekproef waain de respondenten leven - in aansluiting op de interveniërende variabelen van ontmoedigend beleid een significant interactie vertonen met gebruik van medicinale en niet-medicinale planten door de hoofden van de huishoudens.

Eenzelfde analyse van gebruik van sociale planten toont aan, dat socio-demografische variabelen, zoals de leeftijd en beroep van het hoofd van het huishouden in samenhang met psycho-sociale variabelen van ervaring met gebruik van sociale planten de sterkste interacties vertonen. Ook variabelen van kennis, houding en geloof ten aanzien van gebruik van sociale planten in aansluiting op ontmoedigend beleid vertoont aanzienlijke significante interactie met gebruikspatronen van zowel medicinale als niet-medicinale planten. Wat betreft het gebruik van brandstofplanten vertoont zowel de socio-demographische variabele van formele opleiding als de psycho-sociale variabele van houding ten aanzien van gebruik van planten significante interactie. Vervolgens blijkt de variabele van Socio-Economische Status (SES) van het hoofd van het huishouden de sterkste significante interactie van alle variabelen uit de analyse te vertonen met het gebruik van medicinale planten. De predisponerende socio-demografische variabelen van huwelijkse staat en beroep, alsook de psycho-sociale variabelen van kennis van medicinale planten en kennis en ervaring met milieuplanten in samenhang met de variabele van aanmoedigend beleid vertonen sterke interactie met gebruik van milieuplanten. De socio-demografische variabele huwelijkse staat, en de psycho-sociale variabelen van kennis, geloof, houding en ervaring met non-vertebrate gifplanten vertoont de sterkste interactie met gebruik van non-vertebrate gifplanten.

De multivariate analyse onderstreept het feit dat de variabelen van ervaring met bijenplanten en met medicinale planten, evenals kennis van bijenplanten en kennis van medicinale planten significante interactie vertonen met gedragspatronen van gebruik van bijenplanten. De milieu variabele van de lokatie van de dorpen waarin de respondenten wonen bevestigt de significante interactie met gebruik van bijenplanten. In alle zeven categorieen van wilde planten - voedsel, materiaal, sociale, brandstof, niet-vertebrate gif en bijenplanten - komen de variabelen van leeftijd, huwelijkse staat, kennis, geloof, houding en ervaring evenals milieu, Socio-Economische Status (SES), in samenhang met zowel aanmoedigend als ontmoedigend beleid, naar voren met buitengewoon significante interactie met gedragspatronen van gebruik van niet-medicinale planten door de respondenten uit de steekproef surveys in de drie Meru dorpen.

Tenslotte, de calculatie van de multipele correlatie coefficienten met optimale scaling van de OVERALS analyse als de *derde en finale fase* van het analytisch process toont aan, dat er een varierende cohesie bestaat tussen de verschillende categorieen of blokken van variabelen, hetgeen resulteert in de constructie van het *finale analytisch model* van de studie van gedragspatronen van gebruik van medicinale en niet-medicinale wilde planten in Meru.

De observatie van de cohesie tussen de blokken van afhankelijke variabelen van het model in termen van de resultaten van de calculaties toont aan, dat er een zeer sterke cohesie bestaat tussen de blokken van *socio-demografische* en *psycho-sociale* variabelen, verder aangevend dat er een zeer sterke interactie bestaat tussen deze blokken in het bepalen van de algehele gedragspatronen van gebruik van nuttige wilde planten. Eveneens bevestigt de cohesie tussen de blokken van *socio-demografische* en *in staat stellende* variabelen in de beide dimensies 1 en 2 de interacties tussen deze blokken onderling, terwijl de sterke interactie met de twee blokken van gedragspatronen van gebruik van medicinale en niet-medicinale planten de determinante positie daarvan in het analytisch model verder onderstreept.

Ook een relatief sterke interactie is gemeten tussen de blokken van *socio-demografische* en *milieu* variabelen in de eerste dimensie, hetgeen de dominantie in gedragspatronen van gebruik van medicinale en niet-medicinale planten verder onderbouwt. Een relatief sterke cohesie is eveneens waargenomen tussen de blokken van *psycho-sociale*, *in staat stellende*, *milieu* en *natuurbehoud* variabelen, die eveneens de significante interacties bevestigt tussen de onafhanjkelijke en intervenierende blokken onderling en in relatie tot de afhankelijke blokken van gedragspatronen van gebruik van medicinale en niet-medicinale planten. In tegenstelling daarmee is een relatief zwakke cohesie gevonden tussen de blokken van *milieu* en van *intervenierende* variabelen, die aantoont dat de interactie met beide afhankelijke blokken van gedragspatronen van gebruik van planten zwak is. Overeenkomstige zwakke interacties zijn gevonden tussen de blokken van het model van de *in staat stellende* en *intervenierende* variabelen.

De beoordeling van de gecalculateerde waarden van interacties tussen de verschillende onafhankelijke en intervenierende blokken in relatie tot de twee afhankelijke blokken vertoont verscheidene sterke cohesies, zoals tussen de blokken van *socio-demografische, psycho-sociale* en *natuurbehoud* variabelen in interactie met het afhankelijke blok van *gedragspatronen van gebruik van medicinale planten.* Eveneens zijn sterke interacties gevonden tussen de blokken van *socio-demografische*, *psycho-sociale* en *natuurbehoud* variabelen en het block van *gedragspatronen van gebruik van niet-medicinale planten*, hetgeen de significante interacties onderstrepen die tussen deze onafhankelijke en afhankelijke blokken van het model aangeven. In vergelijking zijn zwakke coherenties gevonden tussen het blok van *in staat stellende* variabelen en het afhankelijke blok van *gedragspatronen van gebruik van niet-medicinale planten,* dat aangeeft dat *Socio-Economische Status* (SES) een zeer beperkte rol speelt bij het bepalen van *gedragspatronen van gebruik van niet-medicinale planten*. Een andere zwakke coherentie is waargenomen tussen de blokken van *milieu* en van *intervenierende* variabelen in interactie met het blok van *gedragspatronen van gebruik van medicinale planten,* en, op zijn beurt, in de interacties tussen de blokken van *intervenierende* en *milieu* variabelen in relate tot het blok van *gedragspatronen van gebruik van niet-medicinale planten.*

De algehele analyse van relevante factoren die als sterke determinanten van gebruik van medicinale en niet-medicinale wilde planten uit het onderzoek in Meru naar voren komen in het heden maakt het mogelijk om inzicht te krijgen in de wijze waarop de vroege voorouders van de moderne mens leefden en overleefden op basis van wilde planten in hun leefmilieu. Inderdaad, de studie onder de huidige bevolking van Meru toont aan, dat factoren zoals onder andere van *huishoudomvang*, *leeftijd*, *socio-economische status* of *huwelijkse staat* geen effect zouden hebben gehad op het gedrag van gebruik van wilde planten door de vroege mensen in pre-historische omstandigheden, terwijl andere factoren, zoals *sexe*, *bewustzijn van een milieu met geschikte plantenvegetatie, kennis* en *ervaring met het gebruik van wilde planten* een vitale rol gespeeld moeten hebben in hun levenswijze. In aansluiting daarop geeft deze studie ook aan, dat bepaalde natuurlijke milieus ook moeten hebben bijgedragen aan de keuze van deze vroege voorouders van de mens, waar te forageren en vervolgens naar welke andere milieus te trekken waar nieuwe planten verkend en gebruikt konden worden voor hun voortgaande evolutie en uiteindelijke overleving.

De *theoretiche implicaties* van deze studie verwijzen naar het voordeel van de uitvoering van de *emic* benadering - dat wil zeggen vanuit de visie van de lokale bevolking zelf - die ten volle aandacht besteedt aan de rol van de cruciele 'onzichtbare' factoren als determinanten van lokale systemen van gebruik en behoud van planten, waaronder ook lokale kennis, geloof en houding binnen de dynamische context van ontwikkeling en verandering vallen. Een dergelijke aanpak maakt deel uit van de recente 'ethnoscience' benaderingen van 'Indigenous Knowledge Systems' (IKS),

'Tradttional Ecological Knowledge' (TEK) en 'Ethnobotanical Knowledge Systems' (EKS) die de weg bereiden voor dergelijk geavanceerd etnobotanisch onderzoek in Kenia en in overige delen van Africa.

Een nauw daarmee verbonden theoretische implicatie verwijst naar het feit dat het merendeel van het unieke inheemse systeem van kennis van nuttige wilde planten van de Meru, net als soortgelijke kennissystemen elders in de wereld momenteel bedreigd worden met verlies en uitsterven als gevolg van processen van ontwikkeling en globalisering. Als gevolg van deze studie, die de behoefte aangeeft aan meer diachronisch onderzoek dat voortkomt uit de relatief mager archaeologisch en palaeoanthropologisch wetenschappelijk bewijs van vroege interacties tussen mensen en planten - in het bijzonder in Oost Africa als de 'Wieg der Mensheid' - zou hernieuwd interdisciplinair onderzoek uitgevoerd dienen te worden teneinde de menselijke adaptatie, gebruik, beheer en natuurbehoud te reconstrueren ten aanzien van het milieu en de daarbij betrokken bronnen van wilde planten. Nu ook hier blijkt, dat de methode van de 'Ethnographic Analogy' tussen culturen in heden en verleden sterk afhankelijk is van uitgebreide archaeologische opgravingen, collecties en documentatie van vroege materiele vondsten, zou de nieuw in Leiden ontwikkelde benadering van 'Ethnobotanical Knowledge Systems' aangepast dienen te worden aan diachronisch onderzoek van de relaties tussen mensen en planten over langere tijdsperioden in vergelijkbare cultuurgebieden in Kenia en Oost Africa.

De *methodologische implicaties* van dit onderzoek omvatten de bevestiging dat het analytisch model van menselijke gedragspatronen van gebruik van nuttige wilde planten, zoals dat ontwikkeld is door het LEAD Programma van de Universiteit Leiden, met succes is aangepast en geoperationaliseerd voor de studie in Meru, en alszodanig laat zien, dat het een adekwate analytische functie vervult voor dit type van geavanceerd kwantitatief etnobotanisch onderzoek.

De *practische implicaties* omvatten vooral de naar voren komende behoefte aan dergelijk 'emic-oriented' onderzoek, dat aantoont dat vele hoofden van huishoudens continu geconfronteerd worden met het dilemma van het beheer van groeiende aantallen familieleden die niet alleen leiden tot een toenemend tekort aan hulpbronnen, maar ook erosie van de traditionele levenswijze veroorzaken. Hiertoe behoort ook de *informele opleiding* die een belangrijk onderdeel van het traditionele leeftijdsklasse systeem van de Meru vormde. In aansluiting op de lokale trainingsprojecten om dit tegen te gaan dient ook hernieuwde aandacht te worden geschonken aan tot op heden onder-gebruikte wilde planten voor toekomstig gebruik voor medicijnen en voedsel, waardoor op gemeenschapsniveau aanvullend inkomen en werk gegenereerd kan worden.

Een andere belangrijke praktische implicatie van de huidige studie verwijst naar gebruik van wilde medicinale planten voor traditionele kruidengeneeskunde, waarvan vooral de arme bevolkingsgroepen meer gebruik maken dan de rijkere leden van de gemeenschap. De opleving van het gebruik van kruidengeneeskunde in primary health care sluit aan bij zowel de traditionele culturen als bij internationaal beleid dat aandringt op adekwate maatregelen van de regering om niet alleen lokale vormen van duurzaam gebruik te bevorderen, maar ook om medicinale planten te behoeden voor het risico van over-gebruik als gevolg van onbeperkte commerciele exploitatie van wilde medicinale planten en kruiden.

Tenslotte zou naar aanleiding van de resultaten van het onderzoek in Meru een belangrijke bijdrage geleverd kunnen worden aan het duurzaam gebruik en behoud van nuttige wilde planten door initiatieven van gouvernementele en niet-gouvernementele organisaties op lokaal niveau die een adekwaat proces van opzet en uitvoering van beleid zouden kunnen bevorderen in nauwe samenwerking met de participanten in de dorpen om zo *'sustainable community development'* in het gebied tot stand te brengen en alszodanig het culturele erfgoed van inheemse kennis en praktijken van gebruik en behoud van nuttige wilde planten van de Meru voor de toekomst te behouden.

De aanbevelingen die in Hoofdstuk X worden geformuleerd als resultaat van deze studie in Meru kunnen worden samengevat als speciale activiteiten die noodzakelijk zijn voor het bevorderen van de lokale methoden van de Meru van duurzaam gebruik en behoud van nuttige wilde planten in toekomstige programma's en projecten van behoud van bioculturele diversiteit, en wel als volgt:

preservering van Meru etnobotanische kennis systemen;
integratie van lokalel kennis in het formele opleidingssystem;
herleving van tradtionele kruidengeneeskunde in 'home gardens';
planning en uitvoering van beleid dat gericht is op natuurbehoud;
incorporatie van nuttige wilde planten in programma's van bioculturele diversiteit;
promotie van duurzame, op planten gebaseerde 'community development'.

In conclusie beveelt het onderzoek in Meru aan, dat in aansluiting op huidige globale programma's van natuurbehoud, initiatieven moeten worden genomen om lokale pogingen tot behoud van medicinale en niet-medicinale wilde planten van de Meru bevolking te combineren met duurzame socio-economische ontwikkelingsprogramma's teneinde de potentiele voordelen te verwezenlijken voor toekomstige *sustainable plant-based community development* in de Greater Meru Region.

Curriculum Vitae

Alfreda Kajira Ibui was born on 14th April 1955 in Meru, Kenya. After completion of her high school education, she taught for one year at a High School in Meru and later joined the National Museums of Kenya (NMK) in Nairobi in December 1977. She has worked with the NMK since the age of 22 years. During her tenure at work, Mrs. Ibui enrolled at the Kenya Polytechnic, where she was awarded a Diploma in Computer Science in 1995. Following her diploma and her extensive work experience, she qualified for a fellowship from the Netherlands UNESCO Fellowship Program (NUFP) to follow a Master program in the Amsterdam School of Arts in The Netherlands, where she was awarded a Master's Degree in Museology in June 2000. *(http://www.ahk.nl /ahk_upload/ ahk_documenten/rwa_mm_content_modules_theses1.doc*).

Mrs. Ibui has continued to work at the National Museums of Kenya where she is employed as a Research Scientist. During her working career, she has travelled to many parts of the world visiting several museums. She has been a Member of the International Council of Museums (ICOM) for many years. During her association with the African Council of Museums, now the International Council of African Museums (AFRICOM), she contributed in lectures, conferences and workshops, and together with her colleagues wrote the book on the Documentation of African Collections, which was published in both English and French by the International Council of Museums (ICOM) (*cf*. ICOM (1998). *(http://www.museum.or.jp/icom/afridoc/light/html/auteurs/auteurs.html)*. Mrs Ibui is currently a Board Member of AFRICOM from 2006 to 2008. In addition, she has a few other publications relating to her profession and research.

She has also participated in many fieldwork projects in Eastern Africa and has trained numerous local and foreign students on collection, documentation and preservation of both cultural and natural objects. In this endeavour, she has worked with world renowned Anthropologists including Prof. Dr. Richard Leakey. She also participated in the production of his BBC Documentary, 'The Making of Mankind' in 1980. Lately, she has lectured in summer field schools including the Koobi Fora Field School (*KFFS - http://www.rci.rutgers.edu)* conducted in Kenya, for both national and international students.

During her PhD research in The Netherlands, she worked with Prof. Dr. L. Jan Slikkerveer, Director of the Leiden Ethnosystems and Development Programme (LEAD) of Leiden University, and participated in numerous lectures for graduate as well as post-graduate students on 'Anthropology and Sociology of Sub-Saharan Africa,' and in 'Medical Anthropology and Sociology of Developing Countries', and lately, in the MA Course on 'Ethnobotanical Knowledge Systems' (EKS) at the Leiden University Branch of the National Herbarium of The Netherlands. In the context of the LEAD Programme, Mrs. Ibui has contributed to several international Workshops and Symposia in The Netherlands, Indonesia and Singapore, where she presented various papers on her research work in Meru, Kenya.