FROM THIRSTY SOILS TO SPIRIT HILLS:

A CASE STUDY OF INDIGENOUS NATURAL RESOURCE MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN MALAWI

by

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ABSTRACT

Policy and development tend to be governed by assumptions and priorities such as measuring progress by the application of technology, and failing to view ourselves as dependent on larger natural systems. This behavior has resulted in increasingly unsustainable natural systems and has further disadvantaged people in poorer socioeconomic positions. There is growing recognition in the importance of indigenous knowledge as a foundation for sustainable agriculture and natural resource management. Indigenous knowledge builds on years of local forms of resource use where community-level rules and spiritual beliefs regulate behavior. This type of knowledge is both dynamic and diverse in any community and tends to maintain the ecological integrity of the environment.

This case study used 20 Participatory Rural Appraisal techniques to determine what indigenous knowledge contributes to the sustainable use and conservation of natural resources in Malawi. The results describe farmers' natural resource knowledge, aspects of indigenous farming techniques, and village-level resource management based on traditional laws, customs and spiritual beliefs. The differentiation of this knowledge along selected socioeconomic criteria were also considered.

Overall, I found that indigenous knowledge indicates responsible and sustainable use of natural resources primarily as a result of community adherence to social sanctions, the integration of different sources of knowledge over generations, and farmers ability to adapt to micro-ecological conditions. Knowledge was also diverse in the community which was revealed by differences in age, gender, wealth, and kinship. Indigenous knowledge was found to be just as valid as other types of knowledge in Malawi, but has been devalued, ignored and impeded by farmer's lack of control and access to resources. Several recommendations were made at various levels in order to advance indigenous knowledge for sustainable natural resource management.

CHICHEWA GLOSSARY

boma	government (as some level of government administration is represented in cities and most major towns, the term is also used in reference to city or town centers)
bowa	mushrooms
chitsamba	shrubs and small woody plants
dambo	a fertile grass-covered plain which becomes flooded in the rains and retains moisture in the dry season
dimba	a dry season garden made on a *dambo*-type land
ganyu	casual or seasonal labour sought by many subsistence farmers during times of stress, especially when stored harvests runs low.
kachasu	a strong liquor made in villages, resembling gin
mabobo	leafhoppers
mankhwala	traditional medicine
masamba	green, leafy vegetables eaten as *ndiwo*.
mfumu	a person of respected authority, especially a village-headman
mopane	indigenous woodland of lower altitudes
mphala	dryland upon which *munda* cultivation takes place
mtengo	tree
Mulungu	deity or supreme being (now interchangeable with the Christian term for 'God')
munda	a primary field where staple and cash crops are grown; also a term for rain-fed agriculture on *mphala* land
mzimu	ancestral spirits
ndiwo	green leafy vegetables which accompany the standard *nsima* meal
nsima	a thick porridge of cooked maize flour which is the main part of most meals
telele	edible grasses, and okra
thokozani	to thank
udzu	grass

ACRONYMS

ADC	Area Development Committee
ADD	Agriculture Development Division
ADMARC	Agriculture Development and Marketing Corporation
CBRM	Community-Based Resource Management
CIKARD	Centre for Indigenous Knowledge And Research Development
CURE	Coordination Unit for the Rehabilitation of the Environment
DC	District Commissioner
EPA	Extension Planing Area
FRIM	Forestry Research Institute of Malawi
FSR	Farming Systems Research
GOM	Government of Malawi
HYV	High Yielding Varieties
IDRC	International Development Research Centre
IKS	Indigenous Knowledge Systems
IUCN	International Union for the Conservation of Nature
LSV	Lower Shire Valley
MCP	Malawi Congress Party
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
PRA	Participatory Rural Appraisal
RDP	Rural Development Program
SA	Sustainable Agriculture
SUCOMA	Sugar Corporation of Malawi
TA	Traditional Authority
UDF	United Democratic Front
UNDP	United Nations Development Programme
VAC	Village Action Committee
VH	Village Headman
WSM	Wildlife Society of Malawi
WUSC	World University Services of Canada

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CHAPTER 1

INTRODUCTION

The Chichewa words of wisdom *nkhuni imodzi simanga mtolo* or "one piece of firewood doesn't make a bundle" are words to heed for any researcher as they advise that one should not base conclusions on limited information. I started this research with only a few "sticks of firewood", bits of information, which taken alone did not amount to anything of great significance. By the end of my stay in Matengambiri village I had tied together what I thought amounted to an immense "bundle": an in-depth study of the dynamic nature of indigenous environmental knowledge.

Evolution of This Research

The impetus for this research came about during a two year contract, September 1992-94, with World University Services of Canada (WUSC) in Malawi, Southern Africa. My work with a non-governmental organization (NGO) on community-based environmental projects exposed me to the difficult challenges Malawi is facing to balance development[1] with environmental protection and management. In many areas of Malawi the environment is showing symptoms of stress and deterioration resulting from conditions of deforestation, soil erosion, land shortages, and overpopulation. As in many African

[1] There are numerous ways to approach development and each will differ in its ways of perceiving the underlying problems of development themselves. In this thesis I often refer to mainstream development or Western development in reference to their connotations and assumptions of economic growth, increasing production, and modernization (Esteva, 1992) with seemingly little regard for the social dimensions. There is now greater awareness of the inherent connection between the health of a country's environment, its economy, and the well-being of its people (Cleveland, 1990:187). This approach to development has a greater chance to become sustainable over the long-term and socially equitable among people.

countries, Malawi has had a history of colonialist rule where "modernizing" ideologies were carried on by the ensuing independent government struggling to meet the macroeconomic pace of the North under conditions of rising external debt. This has affected Malawians, the majority of whom are rural farmers living a subsistence lifestyle under increasingly difficult conditions. Previous centralized government approaches have only accelerated environmental deterioration by limiting people's access and control over resources and by denouncing their traditional practices and beliefs. Recent changes in government structure and policy, however, indicate positive changes and greater government responsibility towards finding more sustainable and socially equitable ways to achieve development and manage the natural resources.

Many of the rural practices and farmer insights which I encountered while working with Malawian farmers seemed to have a direct or indirect effect of conserving natural resources. For many generations their lifestyles have been directly dependent on the surrounding environment for survival, and therefore have inevitably developed a deep understanding of the interactions taking place in natural systems. For example, I observed farmers using the surrounding environment as an indicator to help them decide what crops to plant where. Many people in rural communities also seemed to have a great amount of knowledge about the medicinal and food value of wild plants.

Numerous terms exist to describe the knowledge, practices, and beliefs of indigenous people around the world. Variations range from "Indigenous knowledge" (IK), "local

knowledge", "traditional knowledge", to "rural people's knowledge" (RPK). Each of these terms have created considerable debate as a result of discrepancies with the numerous interpretations. For example, "tradition" is often equated with static, "local" with simplicity, and "indigenous" with originating in a specific area. "Indigenous knowledge", however, has undoubtedly become the most widely accepted. McCorkle refers to IK as "...theories, beliefs, practices, and technologies" (1989:4). Chambers defines IK as:

> ...knowledge located in the people and only rarely written down...[it] refers to the whole system of knowledge, including concepts, beliefs and perceptions, the stock of knowledge, and the process whereby it is acquired, augmented, stored, and transmitted (1983: 83).

This type of indigenous knowledge (IK) which I encountered in Malawi has gained increasing support over the past fifteen years. In the past it was investigated mainly by anthropologists, sociologists and geographers, in contrast today IK is included in soil sciences, veterinary medicine, forestry , human health, fisheries, range management and many others.

Subsets of the general field of indigenous knowledge include: indigenous technical knowledge (ITK), traditional environmental knowledge (TEK), ethnobotanical studies, ethnoveterinary, and others. Throughout this thesis I refer to it as indigenous knowledge or indigenous environmental knowledge.

As Malawi is intensely dependent on agriculture, research focusing on farmer agricultural and natural resource knowledge seems appropriate. Commercialization and

industrialization of agriculture in Malawi, and around the world, has negatively affected the environment with agrochemicals and expensive inputs as well as seriously altering and threatening rural lifestyles. Finding more sustainable ways to farm has led to the evolution of sustainable agriculture (SA). Sustainable agriculture promotes environmental, ecological, economic, and social stability. SA emphasizes minimum dependence on high inputs of energy while maintaining overall environmental productivity and diversity (Edwards, 1993:100). The most important difference to conventional agriculture is that SA meets the social needs of farmers by recognizing and using long-held practices and technologies of farming, while limiting the introduction of foreign technologies.

Indigenous knowledge also extends beyond the farm boundary to land surrounding the community. Use of resources by indigenous societies are often regulated by customary laws, religious beliefs, and fear of community sanctions. This enables communities to restrict the use of important or threatened resources, indirectly resulting in a sustainable form of management. In Malawi, conflicts have historically existed between the various ruling governments and the indigenous people over the use and access to resources. This has resulted in resource mismanagement, further degradation of the environment, and a decline in the practice of traditional laws regulating communal resource use. Ideally, sustainable use of natural resources should be achieved through community-based resource management (CBRM). CBRM allows communities to make their own management decisions by giving people greater access and control to resources (Fellizar,

1993). Decision-making is very much a part of IK as it requires substantial knowledge of which resources are valuable and therefore which resources require careful and controlled use of, when, and by whom.

There are parallel developments between SA and CBRM as both recognize the importance of indigenous knowledge and the social relationships operating within communities. What, however, are the direct links between IK, SA and CBRM? Can IK be considered a starting point at which to launch these recent approaches which have attracted much enthusiasm for a more sustainable development? Even more basic, are Malawian farmers currently practicing sustainable forms of agriculture? Are they able to manage their resources within traditional structures alone? What and how are the outside influences affecting IK? How is IK manifested in the way people currently perceive their environment?

These questions have presented an ambitious opportunity to pursue research with farmers in an attempt to record their knowledge, and identify and understand their interpretations of natural resource use. This thesis attempts to offer answers to these questions. My undergraduate degree in ecology has provided me with an understanding of the principles underlying indigenous environmental knowledge and sustainable resource management. My previous experience with Malawian farmers has introduced me to the culture, language and current state of agricultural development and natural resource management

in the country. This gave me a strong starting point with which to begin focusing my research questions and methodology.

Statement of Research Questions and Methodological Approach

The purpose of my research is to examine indigenous environmental knowledge of farming systems in terms of their ability to promote sustainable agricultural practices and natural resource conservation. This will be accomplished by describing the complexity of indigenous practices, beliefs and techniques. In addition I propose to show why development must be locally centered and integrate IK if a true and thorough understanding of the local perceptions of the problems and solutions are to be recognized. I have chosen a case study approach and participatory rural appraisal (PRA) methodology as both are relevant for eliciting detailed social information in a community setting.

Participatory rural appraisal (PRA) emphasizes the importance of interacting with farmers and facilitating activities to gain an understanding of their perspective. It involves spending considerable time living and working with rural communities, which is consistent with a case study approach. PRA methods are also at the heart of IK research as they have been employed to elicit, evaluate and understand indigenous knowledge (Chambers, 1987). Robert Chambers has done considerable work to promote the concept and ideology of PRA. He defines it as "an approach and methods for learning about rural life and conditions, from, with and by rural people" (Chambers, 1992:3).

My research questions can be stated as thus:

1) What, if any, indigenous knowledge (IK) in Malawian culture contributes to the sustainable use and conservation of natural resources?

2) Who, or which groups, are the bearers of what indigenous environmental knowledge?

3) How may indigenous knowledge intersect with other knowledge in solving practical environmental problems?

My research ideas were strongly supported by an indigenous environmental organization, the Coordination Unit for the Rehabilitation of the Environment (CURE).

The Coordination Unit for the Rehabilitation of the Environment (CURE)

CURE is an indigenous NGO based in Blantyre, Malawi which was established in 1994 in an effort to improve networking amongst NGOs, government and donors concerned with environmental issues. Although CURE does not focus on implementing projects, it does play an important service and support role by coordinating environmental activities, and by providing training and capacity building to NGOs and government departments involved in natural resource management. Some of the activities CURE is involved in include a community-based environmental education programme, a gender programme that promotes gender equity and awareness in resource management activities, coordination and facilitation of PRA training, publication of a nationally distributed newsletter that focuses on new technologies and ideas, establishment of an environmental resource and learning center to promote the exchange of information, and they also play

an advocacy role by taking critical positions on government policies which have direct implications on environmental sustainability.

I was impressed with CURE's approach, their vehement concern over the direction Malawi's environment is taking, and placing communities appropriately at the center of their efforts. Ultimately it became my affiliate organization for this research in order to guide and direct me, and ensure that this thesis becomes more than just an academic document. The personal relationships I formed within CURE during my research, however, made the affiliation far more meaningful to me than purely academic and resource support.

CURE also greatly assisted in my final site selection. Matengambiri village is located in the Lower Shire Valley where CURE has been involved with development initiatives for several years. This community represents a fairly typical village in Malawi with a population of 434 people predominantly composed of subsistence farmers and their families, and has a typical traditional authority structure. I lived and carried out this researched with the community themselves over a three month period.

Objectives and Rationale of This Research

I have several objectives which I have attempted to address throughout this research. The primary objective was to characterize indigenous natural resource management systems on the basis of observation, interviews and PRA activities. I offer specific examples of indigenous natural resource management practices adopted by farmers, and also provide

examples of indigenous knowledge differentiation in Matengambiri village. Finally, where information is available, I compare my research findings with other sources of information in Malawi.

The rationale for this research was to provide insights as to how to approach environmental problems with rural communities at the center of concern. This research addresses the Government of Malawi's priorities to strengthen its commitment towards sustainable development, particularly for sustainable agriculture and community-based resource management, which are both currently part of the country's development agenda. This study is timely when consideration is given to Malawi's recent transition whereby a well entrenched dictatorship was replaced with an elected government. Furthermore, the new government agenda (1994) recognizes the need for democratization, prioritizing local participation in the development process, and improving equitable access and local control of the resources. Finally, I anticipate that this research will build on CURE's environmental activities by raising critical issues which are often neglected in development projects (e.g. farmer ingenuity, and knowledge differences within a village) and suggesting possible ways of increasing the sustainability of projects by validating what people know. To the best of my knowledge a thorough case study of IK research on agriculture and natural resource management has never been conducted in Malawi. Nor has PRA been widely used in Malawi to elicit IK.

Beyond the regional context, I feel this research can benefit Canadians in establishing positive relationships with other countries and broaden our cultural understandings. In

terms of the Canadian foreign policy it may help direct development funding and identify projects. Both Canada and Malawi are highly dependent on agriculture and their natural resources. New insights into sustainable ways to farm and manage resources is important not only in the South, but also in North where the exploitation of resources is just as apparent. Although it is sometimes difficult to look beyond issues close to home, we are all ultimately linked globally and fundamental changes in one corner of the world can affect the sustainability of livelihoods in another.

Thesis Style

It is essential in any research to remain impartial in collecting data and present findings in an objective light so as to strengthen its legitimacy and therefore applicability. All research, however, carries a degree of subjectivity which is based on the researcher's interpretations. Throughout the collection and presentation of my data I have tried to maintain the rigors of social science research while at the same time heeding the biases which may occur from a Canadian woman collecting data in an African village.

Although many social scientists base their data on direct accounts (quotes) from interviews to ensure people's representation in research, in many instances local people's representations or conceptualizations are evident as practices rather than in language (Moore & Vaughan, 1994). Where appropriate I draw on translated quotes to strengthen a point, however, most of my data is presented in a way which reflects the PRA

techniques such as participant observation, or mapping and drawings which visualize practices.

Thesis Organization

This thesis is organized into six chapters. **Chapter one** provides a general introduction including a statement of my research questions, research rationaie and definitions of key concepts. **Chapter two** is an extensive review of the literature covering the most relevant issues related to indigenous knowledge research. I introduce IK by considering the idea that knowledge represents power, and is diverse within any community due to social, ethnic, age, gender and wealth differences. The past and current perceptions, importance, limits and constraints, and present influences on indigenous knowledge will be explored in relation to the process of development. I examine indigenous knowledge as a foundation for recent approaches in community-based resource management and sustainable agriculture. Finally, the literature review addresses the popular notion of participation and empowerment by examining their diversity of meanings. **Chapter three** presents the methodological challenges of accessing indigenous knowledge through participatory rural appraisal. Each of the PRA techniques I have employed in this research will be described as well as a general overview of the methodological framework. **Chapter four** offers an overview of Malawi's historical developments, economy, politics, agriculture, and social structure as well as current concerns in environmental degradation. The latter part of the chapter describes my case study site, Matengambiri village. **Chapter five** examines and discusses my IK findings which are

divided into three parts: resource classification; farming techniques; and village-level resource management based on traditional laws, customs and spiritual beliefs. Finally, **chapter six** provides a synthesis of the research findings, as well as recommendations and suggested areas for future research.

CHAPTER TWO

A REVIEW OF THE LITERATURE - INDIGENOUS KNOWLEDGE AND SUSTAINABLE AGRICULTURE

> African farmers and herders have a deep and profound ecological knowledge, which they apply in getting a living from their lands. Virtually nowhere in Africa has their science been sufficiently studied (Timberlake, 1985:121).

Introduction

This chapter provides an extensive literature review of the current issues relevant to the study of indigenous knowledge. The broad scope of the chapter reflects the need to incorporate a range of perspective now required in more multidiciplinary approaches to research. Part One examines the interrelation of knowledge and power. This is important as it reveals the complexity and conflictual nature of knowledge systems. Perceptions, importance, and limitations of indigenous knowledge systems (IKS) will be considered to present a balanced view. Present influences which reflect the dynamism of IK, and the ability of indigenous people to adapt to changing environments are also addressed. In Part Two, I focus on specific fields of indigenous knowledge, specifically farming systems and natural resource management. An account of the evolution of African farming systems and how they have been affected by Western ideologies introduces the section on recent developments in sustainable agriculture (SA). As indigenous farming systems extend beyond the farm boundary, I consider the link between natural resource management issues and sustainable agriculture. Different resource management regimes are introduced and consideration is given to the potential of community-based resource management (CBRM) in enhancing local conservation efforts. Part Three provides a

literature review of IK research and insights from Sub-Saharan Africa and Malawi. Part Four closes with a discussion on the methodological issues in eliciting IK and the challenges involved in participatory approaches to development.

PART ONE: KNOWLEDGE AND DEVELOPMENT

Perceptions of Indigenous Knowledge (IK)

Contemporary definitions of Indigenous knowledge represent a point of convergence among its proponents. It has been defined by Dei as:

> ...the product of indigenous people's direct experience of the workings of nature and its relationships with the social world. It is also a holistic and inclusive form of knowledge (1993:105).

This definition implies IK is general and non-specific. In contrast, Warren, the director of world's leading indigenous research center emphasizes its diversity and fluidity:

> ... knowledge that is unique to a given culture or society...the information base... Codified in the language of the society, it facilitates communication and decision making... [it] is dynamic; it changes through indigenous creativity and innovativenss as well as through contact with other knowledge systems...There is considerable variability in the knowledge any given individual has about different topics depending on the age, gender, and occupational roles of the person...[and it] is passed down from generation to generation, usually by word of mouth (Warren, 1989:3).

I subscribe to Warren's definition which I feel more aptly represents the complexity inherent in knowledge systems. Indigenous knowledge is legitimized through recognition of the expertise and culture of indigenous peoples. Other definitions imply that indigenous knowledge should be considered an essential element for development. As

Titilola (1994) points out, sustainable development[2] is not achieved by respecting physical and biological constraints alone. Social factors are equally important. IK, however, has not always been viewed in such a positive light.

Early representations of indigenous people and their knowledge have been described as "backward", "primitive", "inferior" and "unscientific" (Thrupp, 1989). Indigenous peoples and their traditional ways were considered as having nothing to contribute to the process of development, and even a hindrance to it. This type of discourse fueled power differences, as "traditional" implied living in another time and was not worthy of being taken seriously (Ferguson, 1994). Indigenous peoples, as a result, were not seen as creators of technology, but only adopters or rejecters of it. International development evolved out of deeply entrenched patterns of thinking based on hierarchy, domination and control, and dualism (e.g. modern over tradition, male over female, culture over nature, and subject over object). The modernizing development process, involving a transfer-of-technology (ToT), was seen as necessary in order to educate and develop rural livelihoods around the world (Ferguson, 1994).

Following the ToT approach of the 1970's, it became apparent that skills transfer in itself would not bring about development (Parpart, 1995). Insights such as Paulo Friere's (1972), that dialogue and cooperation are contingent on the acceptance of people's views,

[2] Concern for a more sustainable development reflects the growing public interest that the protection of natural resources and the maintenance of environmental quality are seen as essential for economic development.

have also worked towards dismantling the concept of technology transfer. The relationship between indigenous people and outsiders became less hegemonic and more of an equitable partnership. Throughout the 1980's the importance of Indigenous Knowledge Systems (iKS) in development became of particular concern. Brokensha, Warren and Werner were probably the first to examine this relationship:

> Development from below, is for many reasons, a more productive approach than that from above, and ...an essential ingredient is indigenous knowledge...To incorporate in developmental planning indigenous knowledge: is a courtesy to the people concerned; is an essential step to successful development (1980:7).

The rationale for the growing interest in IK at this time was primarily based on its classification and preservation. A fear developed, however, that indigenous knowledge (IK) was only being perceived as something that could easily be tapped, extracted and compartmentalized into formal scientific knowledge systems in order to sustain development projects (Thrupp, 1989). Attempts to simply blend or integrate local knowledge into existing scientific procedure falsely assumes that indigenous knowledge is an easily extractable and distinct body of knowledge (Scoones and Thompson, 1994). Some described IK as a valuable resource to be harnessed as a cheap option to sustain development projects: "Harnessing the latent possibilities which abound in the indigenous knowledge and technical expertise of the people...is the cheapest, most appropriate and potentially most successful means of bringing about development in rural Africa" (Atteh, 1989:111).

Perhaps in critical response to this self-serving "utility" perception of IK, Indigenous Knowledge began to be defined by its differentiation from "Western knowledge" (DeWalt, 1994; Howes and Chambers, 1980; Lalonde, 1993; Warren, 1991; and Woodley, 1991). This type of comparison, however, sets up a false dichotomy as it implies that there is no indigenous knowledge in Western cultures, and that indigenous cultures have not been effected by the West. The vagueness of our understanding of what is implied by "Western" knowledge makes the debate confusing. For example, Western can not simply be equated with science as there is evidence which also supports the scientific nature of indigenous knowledge (e.g. Richards, 1985). Similarly, "indigenous" may be exposed to misinterpretation. (see Agrawal, 1995). As Semali contends "no knowledge system can exist in a cultural, economic or political vacuum" (1996:15).

I do believe there are differences between IK and Western knowledge systems in terms of how they are produced, and the more localized nature of IK. The general distinctions between the two types of knowledge, however, are not as neat and tidy as much of the literature suggests. There are no clear cut lines which can be drawn. In my opinion, and for the purposes of this thesis, it is not constructive to compartmentalize indigenous and Western knowledge systems. Completely separating the two overlooks the dynamic entity of knowledge generation, its fluidity, and the subtle ways ideas move. What is constructive is to gain an appreciation for the diversity of sources of knowledge and view each as important in *itself*. This provides an opportunity to learn more openly from each other and broaden our choices in order to cope with present-day environmental problems.

The perspective which has recently emerged suggests that IK extends beyond the technical aspects to include non-technical insights, perceptions, intuitions, and philosophies. This is evident in a *The Cultural Dimensions of Development*, a compilation of contemporary IK research by Warren *et al.* (1995). This broader perspective now considers indigenous knowledge as cultural knowledge produced within particular social, political, and economic contexts (Warren *et al.*, 1995). IK is not only a catalogue of technical skills in agriculture, forestry, health, etc., but is also based on decision-making strategies which allow people to maintain their livelihoods in the face of adverse conditions and to cope in times of extreme stress (Fairhead and Leach, 1994).

Strong links are also being made between the feminist and indigenous knowledge literature (Agarwal, 1991; Feldstein and Jiggins, 1994; Ferguson, 1994; Goetz, 1988; Parpart, 1995; Thrupp, 1989; and Townsend, 1993). Agarwal (1991) contends that as women constitute the majority of farmers in the less industrialized countries, women tend to be the most knowledgeable about farming practices. She also maintains that the gathering of food, which is done mainly by women and children, demands great knowledge of the nutritional and medicinal properties of plants. Similarly, Thrupp (1989) suggests that women have valuable knowledge about medicinal properties of plant species, viable seed sources, natural resource constraints and farming techniques. She claims that rural women's rich knowledge is a result of their cultural roles in the community, and that this knowledge is often unknown by men. The depletion of women's repositories of knowledge and practices thereby undermines the stability and

sustainability of the environment The emerging perspective of IK as cultural knowledge could be beneficial to the Women, Environment, Development debate[3] by incorporating a gender perspective into existing Western paradigms. This could overcome the gender biases and women's marginalization in research and extension programs, particularly in agriculture (Ferguson, 1994; and Feldstein and Jiggins, 1994). Furthermore, by addressing the differences in class, ethnicity, race and other identities, the view that women are a homogenous category is challenged (Ferguson, 1994; and Goetz, 1988). Understanding the dynamics and differences inherent in IK shifts the predominant paradigm of the 1970s and 80s away from a discrediting and undervaluing of rural people's knowledge towards an appreciation of other ways of knowing. It is essential to understand how knowledge is constructed in order to realize how other ways of knowing develop and how inevitable conflicts arise.

Social Construction of Knowledge and Relation to Power

Knowledge is generally understood as a socially constructed, dynamic process (Scoones and Thompson, 1994). As Marsden (1994) points out, all knowledge is culturally bound. Consequently, knowledge is not only expressed through simple dialogue, but may be hidden in songs, poetry, stories, jokes, dances, and proverbs. This can make it difficult to decipher and lead to misinterpretations. This complexity indicates that knowledge should not be considered simply a body to be accumulated, possessed, or imposed without

[3] Women, environment, and development (WED) debate gained international momentum following the United Nations Conference on Environment and Development (UNCED) in 1992. Indigenous women's knowledge, in particular, has been central in the WED approach. For further discussion on its mainstream thoughts see Braidotti *et al.* (1994) and Shiva (1988).

realizing its effects on others (Foucault in Escobar, 1995:5). Nor is knowledge something that can easily be quantified or qualified (Long and Villareal, 1993). Knowledge emerges out of what Long and Villareal (1993) refer to as "an encounter of horizons", and is the product of interactions and dialogue at many levels. Easily identifiable knowledge "producers" and "users" are not created through neat and tidy social divisions. Knowledge is not unitary and systematized, but rather fragmentary and diffuse (Long and Villareal, 1993). In studying knowledge systems it is therefore essential to recognize that there are "multiple realities" or viewpoints, and to remain critical by asking "who's knowledge am I interpreting?" Understanding social interactions in any situation is necessary in order to develop a clear sense of how knowledge is created.

There exists variation in people's willingness to share their knowledge, demonstrating that knowledge also has a dimension of power. It is generated, transmitted and transferred by different people in society. For example, people living in one village will have different access to knowledge, thus certain villagers will have more control (Thrupp, 1989). Knowledge differentiation implies that knowledge may work as a source of power, and differences in disclosure of information can be used for self-interest, contributing to further social stratification (Thrupp, 1989). This places people in more powerful and less powerful positions in a society. The distinction between the "powerful" and "powerless", however, is not always clear cut. Salas (1994) describes it as misleading to believe that the poor are "powerless" passive victims. This idea is also the basis of Paulo Freire's *Pedagogy of the Oppressed* (1972). Freire emphasizes that the

poor and exploited people need only to be informed to raise their "critical consciousness" and take action to transform their own world. Even in oppressive situations, there will be some room for maneuvering and negotiating power (Scoones and Thompson, 1994). Power relations, therefore, should never be underestimated. Understanding the power relations in a society will help to better interpret how knowledge systems are continually created and reshaped. Consequently, awareness of who holds and uses power is then particularly critical in investigating indigenous knowledge systems.

The locality under which knowledge develops is particularly relevant to a discussion on indigenous knowledge. Locality, to a great extent, gives knowledge the dimensions of its character. Indigenous knowledge is "local" in the sense that it is derived from direct experience in a particular place with a unique social and physical environment (Kloppenburg, 1991). As Agrawal (1995:425) points out "...nothing even makes sense without at least an imaginable context." This knowledge, bound within the context of the local ecosystem for example, enables a farmer to make the necessary decisions regarding the varieties of crop to plant, when to plant, and the kind of pest protection to utilize. Thus, indigenous knowledge appears to be holistic and inductive (Kloppenburg, 1991). As Drinkwater (1994) affirms, for knowledge to be understood it can not easily be abstracted, but must be looked at within its historical and spatial situation.

In summary, recognizing who possesses what type of knowledge, and knowing where the knowledge arises helps to highlight the normally unseen factors which influence

people's actions. This is important in order to prevent the wholesale transplanting of ideas of technologies as different people in different places will have different needs. Realistically, knowledge differences and their origins are complicated and therefore difficult, perhaps even impossible, to clearly uncover. The importance of IKS for enhancing lifestyles, nevertheless, is more apparent.

Importance of Indigenous Knowledge Systems

There is a general concern that indigenous knowledge is disappearing all over the world primarily because of modernization pressures and cultural homogenization which threaten traditional lifestyles, practices and cultures (Agrawal, 1995). Woodhouse (1992) underscores this for indigenous farming practices in Africa and the increasing promotion of hybrid maize and chemical fertilizers. Mainstream development, despite its good intentions, has been guilty of ignoring the local realities they are intended to help (Ferguson, 1994). Indigenous knowledge, however, often contains valuable information about how ecosystems work, and are resilient enough to deal with changes in environmental conditions. Although not without it's limitations, indigenous knowledge can make an important contribution to the development process in a number of ways.

To achieve local level development, rural development activities must involve the people by starting with the interests, priorities and needs of the people themselves. Recognizing indigenous knowledge allows greater local participation in the development process (Atteh, 1992; and Warren *et al.*, 1995). A relationship based on understanding and

respect helps to create a favorable environment for co-operative and collective activities. Accessing local knowledge lends itself to equitable participation as IK is possessed by all community members regardless of their gender, age, education, or economic status. Discerning whose knowledge it is, gives a wider socioeconomic perspective which can assist in identifying target groups for development planning (McCorkle, 1989). Furthermore, recognition of IK builds human dignity and empowerment. Legitimizing, encouraging and reinforcing IK empowers individuals and communities to regain and strengthen their dignity and confidence which in many countries have been destroyed by colonial intervention. Empowering people through active participation in decision-making can contribute to community strength and allow them to take steps to alleviate their poverty (Thrupp, 1989; den Biggelaar, 1991; and Woodley, 1991).

Dependence on external assistance is one of the main characteristics in less developed countries. By utilizing and strengthening local skills and resources, greater self-reliance can be realized (Atteh, 1992). This promotes self-reliance on both human and natural resources and leads to more sustainable forms of development. Local knowledge is pre-adapted to physical and human ecological conditions in terms of environmental suitability, cost, accessibility, ease of comprehension, and fits within existing social and political structures. Building on existing knowledge and experience rather than introducing foreign ideas and technologies can help direct projects, avoid unnecessary mistakes, and increase the chances of successful development (den Biggelaar, 1991; McCorkle, 1989; and Warren *et al.*, 1995).

Eagerly adopting exogenous technologies and practices often results in the abandonment of a people's cultural heritage, and hence their ability to solve problems. In eliciting IK, interest and rediscovery of a peoples' history and culture are promoted (Atteh, 1992; and Berkes, 1993). Awareness of other knowledge systems also can enhance our appreciation of the international community and re-orientated our thinking (Berkes, 1993; Chambers, 1983; and Warren *et al.*, 1995). This is particularly important in Western cultures which tend to suffer from cultural imperialism where certain ideas and ways of thinking have been reinforced and deeply entrenched. Remaining open to other world views can promote new insights into problem solving. Different ways of practicing resource management and conservation, for example, can be attained from investigating indigenous knowledge systems which can then be extrapolated to solve problems in other regions and cultures (Berkes, 1993; and Chambers, 1983).

Caveats to the Romantic: Limitations of Indigenous Knowledge

While the importance and usefulness of local knowledge systems cannot be denied, care must be taken not to overromanticize. There are limits and constraints to all knowledge systems. IKS is no exception. By conveying images of the "noble savage" and rural people living in harmony with their environment, indigenous people and indigenous knowledge systems will continue to be misrepresented. The tendency to idealize everything that is local and traditional helps to conceal indigenous structures of exploitation and domination that existed prior to development interventions (Braidotti *et al.*, 1994). Recovering and preserving all aspects of "traditional" cultures could seriously exacerbate, for example, class conflicts and the subordination of women.

Romantic perspectives on indigenous knowledge often assume that all specialized knowledge is shared by all members of the rural community. The extent and distribution of local knowledge, however, varies greatly from community to community and even within communities. Knowledge is not uniformly spread and not all rural people will possess valid and useful information (Thrupp, 1989). Individual abilities for learning, storing, and generating knowledge differ. Expanding on this, McCorkle (1989) explains that not all people within a community will have control over a given body of knowledge. In many African communities, for example, traditional healers and midwives hold specialized knowledge. Knowledge differences often leads to power imbalances within the community. This makes knowledge difficult to access as not all individuals are willing to equally share their knowledge . Those with the knowledge often control it, and may use it as a source of status or privilege and careful protect it. As knowledge relates to power, there will always be inequities in access to information and hence, knowledge generation and transmission.

IK exists in innumerable forms, among innumerable groups of people with many different forms of languages and cultures. There is rarely any systematic form of recording IK systems comparable to the books, films, or computers of Western cultures. Most IK is stored in people's memories and passed from generation to generation orally or through visual teaching (Atteh, 1992). The unwritten nature of IK makes it difficult to describe its boundaries, applications and means of change through time. The numerous languages of indigenous peoples also creates difficulties in exchanging and promoting

cross-cultural knowledge. A further constraint to promoting IK is that people who lack formal knowledge often view their knowledge as simple. As a result, they feel embarrassed, ashamed, and unwilling to view their knowledge as legitimate and appropriate (Thrupp, 1989).

The environment, both physical and social, in which any society thrives in is in a constant state of change. It is within this setting that IK must evolve. As a result, aspects of local traditions will eventually become irrelevant and no longer useful, while others will adapt to changing circumstances. It is important, therefore, when eliciting IK to sift through the information and determine what was found appropriate by people in the past, and what is being used for the current environmental conditions.

IK develops in the context of unique cultural and ecological conditions. The localized context of IK is designed to solve location-specific problems or suit cultural-specific traditions. This uniqueness, although a positive characteristic, makes most IK difficult to directly transfer to other settings (Atteh, 1992). Development must be tailored to reflect the local context IK has evolved within. In trying to incorporate IK into larger development plans, however, indigenous government elites can be a great obstacle (Thrupp, 1989). Rural development is often viewed as bringing people in line with Western societies. Unfortunately IK is still viewed by most indigenous governments as inferior and backward.

The warnings against romanticizing IK's role in development are numerous. Anthropologist Darrell Posey states that we must avoid the patronizing myth that indigenous people " live in perfect harmony with nature and therefore should stay there and never change" (Woodliffe, 1996:269). Change, as we have seen, is an inherent part of indigenous knowledge systems allowing people to adapt to outside influences. How, and to what extent, do outside influences affect indigenous knowledge?

Present Influences on IKS

It would be naïve to assume that all indigenous knowledge systems are environmentally benign. Evidence exists from IKS around the world to refute this claim; for example, slash-and-burn (swidden) cultivation in the Amazon (Dore and Nogueira, 1995) and Sri Lanka (Gelbert, 1988), overgrazing by nomadic pastorilists in Kenya (Reckers, 1994) and overharvesting of marine resources in Papua New Guinea (Osborne, 1995).

Even in remote areas, communities are influenced by the market economy which may challenge the sustainability of traditional land-use practices. Soemarwoto (1993) describes rural farmers in East Kalimantan growing surplus food beyond their subsistence needs in order to sell them in the local markets. Increasing output requires further clearance of forest for shifting cultivation which shortens the slash-and-burn cycle, making forest regeneration more difficult. Due to demands from international markets, traders are also luring local people to overexploit forest products (e.g. hard woods, latex, bamboo, exotic fruit, etc.). This has the potential to destroy the local environments, and create further demands as the supply becomes limited.

Population pressure also threatens indigenous management systems. Many societies which traditionally practiced swidden cultivation are now required to open up new land (where possible), or divide and further subdivide agricultural land to accommodate the next generation of farmers. Intensive cultivation on smaller plots of land further lends itself to increased soil erosion and a decrease in soil fertility.

Immigration is another factor in population pressure. In densely populated regions people are often forced to relocate, even to different ethnic regions, in an attempt to find suitable land to sustain themselves and their families. In many African countries this has created communities of mixed ethnicity. These situations can lead to a breakdown in indigenous management systems when the immigrant population does not adopt the local practices which have proven sustainable over generations (Dyasi, 1985:99; and Nhira, 1995).

Rapidly changing environments, such as refugee hosting countries (Babu and Hassan, 1995) and desertification (Reckers, 1994), have led to conditions where traditional resource management practices are no longer appropriate. Under these circumstances people may be forced to abandon the livelihood they have practiced for generations. Agriculture, for example, can no longer be considered a sustainable form of land use in areas of Kenya (Reckers, 1994).

Colonialism and post-colonial "top-down" government systems have also influenced indigenous knowledge systems. Colonialism, the imposition of European conservation paradigms and power structures on indigenous villagers, is often incompatible with the principles of indigenous resource management regimes (Cox and Elmqvist, 1993). Cox and Elmqvist describe a Samoan controlled rainforest reserve based on a communal land tenure system which protects resources on the basis of sacred responsibility to kin, ancestors, and deities. The system was eventually eroded by foreign environmental NGOs who unwittingly caused significant cultural interference. This symbolizes the plight of indigenous peoples in many countries where colonial rule and Western ideologies have been imposed. The paternalism of colonial rule has now effectively been replaced by centralized government systems in less developed countries (Matowanyika, 1994), but the result has been a continuation of top-down approaches to planning development. National planning in countries which have endured several identity changes from colonial to independent governments, often fail to see and inherent value in their own indigenous social, cultural and economic systems. Centralized autocratic governments have encouraged the belief in their own superiority and have led to the erosion and decline of indigenous knowledge systems (Atteh, 1992; and Warren, 1991).

What then, is the significance of indigenous knowledge? Though the environmental problems facing the poor are not insoluble, it is unlikely that indigenous management alone can solve them. Many authors conclude that sustainably development is possible through a combination of indigenous and exogenous technologies and methods

(Aregbeyen, 1996; Atteh, 1992; Berkes, 1993; den Biggelaar, 1991; McCall, 1996; Pretty, 1995; Rajasekaran *et al.*, 1993; Zwahlen, 1996). Development today, as emphasized by Braidotti *et al.* (1994), should be based on negotiating and finding ways to allow people to live according to the culture and values they choose, given what natural resources are available for sustainable use.

PART TWO: INDIGENOUS NATURAL RESOURCE MANAGEMENT: A SEARCH FOR SUSTAINABILITY

The Westernization of African Agriculture

Commercial profit and increased production are seen as the integral values of Western conventional agriculture (Cleveland, 1990). Conventional, or modern industrialized agriculture is also deeply rooted in a monoculture structure (UNDP, 1995:2). It is described as being "highly specialized and capital intensive, heavily dependent upon synthetic chemicals and other off-farm inputs" (Schaller, 1993:89). Intensification of land use and productivity, at the expense of decreasing energy and capital productivity, reflects the ideology fostered by an era of cheap energy and plentiful capital in the West (Cleveland, 1990).

Changes in African farming over the past century can primarily be understood in terms of commercialization and technology diffusion (Woodhouse, 1992). By the mid- nineteenth century, increasing industrialization in Europe shifted colonial interests away from slave trading to economies concentrated on the export of raw materials, (e.g. timber, wild

rubber) agriculture and minerals (Woodhouse, 1992). Colonial administrations often saw no point in building on local or existing agricultural techniques because they were regarded as part of the problem to be addressed (Moore and Vaughan, 1994). African labor was drawn away from village farms and was harnessed for work on foreign owned plantations of export crops (cotton, cocoa, tea, coffee and tobacco) and for mineral extraction (Bernstein, 1992). The building of colonial economies involved a degree of coercion as introduced taxation of African farms required farmers either to sell their labour on mines or plantations, or grow the cash crops demanded by export. Technological change was therefore largely determined by colonial, and later, post-colonial governments. There is evidence, however, that African farmers were often opposed what the colonial states tried to regulate (Bernstein, 1990; and Moore and Vaughan, 1994). Thus, farmers could not be considered passive recipients of the infiltrating agricultural methods.

Post-colonial governments have continued to pursue the large-scale commercial farming successfully established in the colonial era (Woodhouse, 1992). With the assistance of Western Aid agencies, African governments sought to generate economic growth by industrializing agricultural production based on foreign models. As Nyerere admits, this was the case in Tanzania:

> ...it appeared to us [Tanzanians] that if you wanted a productive agriculture, you had a mechanized agriculture, and you used chemical fertilizers, chemical insecticides, and - to be completely up to date - even herbicides. That, at least, was our vision of American and Canadian agriculture - and we were often told that America is the most productive agricultural country (Nyerere, 1983:15).

This seems ironic as the U.S. economic, environmental and social record at home, with regards to agriculture, is currently facing its own set of problems (see Cleveland, 1990:187-190). Similar to the U.S, many of the initiatives to modernize agriculture in Africa have resulted in failure. Two false assumption have led to this. Firstly, that increasing productivity infers increasing chemical inputs and mechanization (DeWalt, 1994). Secondly, that problems of hunger and rural poverty have been perceived primarily as problems of production arising from *within* Africa (Cleveland, 1990). The solution to what was considered relatively unproductive and subsistence-oriented African agriculture was perceived as the transfer of industrial agricultural technology and the introduction of commercial cash crop agriculture (Altieri, 1989).

Mann (1990) cites three examples of the inappropriateness of technology transfer. Between 1963-65 tractors were introduced in Tanzania to facilitate land preparation, however, by the mid 1980's tractors were abandoned due to the financial burden and resulting soil erosion from the deep cultivation of soils, inappropriate for fragile African soils. Similar results were found in Senegal and Ethiopia in the 1960's with the introduction of a western-model plough (Mann, 1990). In all three countries the introduction of foreign agricultural technologies failed to achieve desired goals and only resulted in further top-soil losses from wind and water erosion.

Successes in agricultural development during the past century have largely been measured by improvements in areas such as mechanization, chemical pesticides and

fertilizers, maximizing yields, and hybrid seed development (UNDP, 1995). Questions of equity, regional suitability, and sensitivity to farmer preferences, however, have raised doubts regarding these achievements. The Green Revolution is a well documented example of the shortcoming of modern high-input agricultural technology.

The initial successes of the Green Revolution during the 1960's, which sought to develop high-yielding varieties (HYV) of cereal crops in Mexico and the Philippines, prompted its expansion within the tropic and subtropics throughout the 1970's (Richards, 1985). The tendency of international agricultural research centers was to put together 'packages' (HYV seeds and chemical fertilizers) for implementation that apparently required only fine tuning to be adapted for local conditions. Political and social issues were considered separate from the biological and technical issues, and were perceived to be the responsibility of the governments of the particular countries (Richards, 1985). The narrow genetic base of the HYV and uncertainty of their resistance to local weeds, pests and diseases, however, caused justified concern among some scientists (Smillie, 1991). Neglecting to consider the differing conditions was one of the main reasons for the Green Revolution's lack of success in Africa (Cleveland, 1990). Including loss of diversity, Shiva (1992) cites soil contamination, soil erosion, reduced soil fertility, and high demands on limited water resources as further proof of the failure of the Green Revolution.

The social consequences of the Green Revolution often resulted in further division among social classes (Smillie, 1991; Richards, 1985, Shiva, 1992; and Bernstein, 1992). Benefits from the HYV were disproportionate because these crops required additional input costs beyond the means of most small farmers. Wealthier farmers having better access to the new inputs were more successful with the new varieties, and the tendency was that the local market would become overrun with the HYV, and thus, depressing local food prices (Smillie, 1991). Consequently, this accelerated the differentiation between the rich and poor farmers.

The negative effects of the Green Revolution, and inappropriate technology transfer in many countries, has led to radical changes in the approach to food production. Assumptions and priorities that have governed agricultural research and policy decisions leading to unsustainable systems have become more visible. These include: separating ourselves from nature; measuring progress by the increase in the application of technology and its efficiency; emphasizing technology over natural systems and society; failing to view humans as part and dependent on larger natural systems; and overlooking the needs of other people separated by socioeconomic status or by time (future generations) (Allen *et al.*, 1991). Several approaches have recently evolved in response to these assumptions and biases. Farming systems research and development (FSR) is one approach which focuses on resource-poor farming systems and more appropriate technology to complement resource-poor farmers' complex, diverse and risk-prone agriculture (Chambers *et al.*,1989). FSR also stresses the importance of farmers'

knowledge and farmers' participation in agricultural development. Critics of FSR, however, assert that it fails to confront power relations that shape resource allocation (Cleveland, 1990:199; Scoones and Thompson, 1994:2) Low-external-input and sustainable agriculture (LEISA) seeks to optimize the use of locally available resources by combining the different components of the farm systems so that they complement each other in a synergistic effect. It also seeks ways to use external inputs to provide elements which are deficient in the ecosystem (Alders *et al.*, 1993) LEISA, however, has been criticized because it focuses on technologies, albiet low-input, as the main component of sustainable agriculture. Altieri (1989) comments that by viewing sustainability as primarily a technological problem, agricultural approaches are still limited in their ability to address the fundamental reasons why agricultural systems become non-sustainable. Despite their differences and criticisms, these approaches reflect the current dissatisfaction with conventional agricultural priorities which emphasizes short-term economic gains over environmental and social goals. It is not within the focus of my thesis to enter into an in-depth analysis of the strengthens and weaknesses of all the current alternatives to conventional agriculture. What will be explored further, however, is the central idea behind them. That is, achieving sustainable livelihoods through a more sustainable and appropriate form of agriculture.

Defining Agricultural Sustainability

Schaller (1993) suggests that two misunderstood issues continue to promote conventional agriculture, namely the profitability of sustainable farming, and adequacy of food

production. He maintains that in the profitability calculations, many of the benefits of sustainable farming to farmers and the rest of society are excluded. Furthermore, no consideration is given to the loss of income due to the degradation of natural resources. Proponents of conventional agriculture hold a belief that Sustainable Agriculture will not be able to produce the yields necessary to feed the growing population (Schaller, 1993). With time, however, sustainable agricultural methods have shown to be at least equal to that of conventional agriculture (Altieri, 1989; Shaller, 1993; and UNDP, 1995). As non-sustainable farming methods continue to take their toll on the environment, future productivity will decline as population pressures are at their peak. This system has been found to be inappropriate for the majority of small scale, resource poor farmers of the world. The negative environmental, social and economic impacts of conventional agriculture has led to the search for a more "sustainable" agriculture.

A sustainable agriculture means different things to different people. The evolution of the concept and its precise definition are still debated. Petty (1995) describes it as an ecosystems approach to farming that attempts to provide long-term sustained yields using low-impact technologies. In recent years, however, more emphasis has been placed on the social dimension of sustainanability. Edwards *et al.* (1993) emphasize environmental health and minimum dependence on high inputs in their definition, but stress the importance of meeting the social needs of rural communities. Allen *et al.* offer an expanded definition which includes social equity: "A sustainable agriculture is one that equitably balances concerns of environmental soundness, economic viability, and social

justice among all sectors of society" (1991:37). Lockeretz (1988:180) believes the varying definitions reflect the fact that sustainable agriculture is not a new idea, but rather a synthesis of ideas originating from different sources. The emphasis in sustainable agriculture will probably continue to be modified and redefined to meet current pressures farmers face and agricultural-related environmental concerns.

Proponents of sustainable agriculture suggest that it requires more than just careful and efficient farming practices, but also fundamental changes in the way we think about food production (Richards, 1985; Shiva, 1992; and Smillie, 1991). As Richards (1985) argues, rather than creating or transferring technologies, emphasis should be on encouraging a process which allows farmers to discriminate, select and adopt new technologies which conform to those processes that originate within their own social group. Agricultural sustainability must be viewed as more than just sustainable on-farm practices, but rather as Schaller (1993) suggests as an organism with processes occurring beyond the field boundary. Just as in CBRM, the link between resource conservation, economics and development must be realized. The future productivity of agriculture rests on how well the environment is presently conserved and managed. A sustainable agricultural system must also be an equitable one which fosters a democratic decision-making process and recognizes competing interests (Allen *et al.*, 1991). The overall emphasis in sustainable agriculture is on whole-systems, or agroecological systems, in order to address immediate problems with local impacts and future problems resulting in global impacts.

With thousands of different forms of agriculture practiced around the world an obvious question arises: How are the attributes of sustainable agriculture to be measured and evaluated given different agricultural systems around the world?, e.g. how does a farmer in Africa know when he or she has achieved a "sustainable agriculture" as compared with a farmer in Canada?

According to Yunlong and Smit (1994) a sustainable agriculture would:

1) Maintain the productive capacity of the environment without seriously disrupting ecological processes. Genetic resources will be protected and high biological diversity will be maintained.

2) Be compatible with the social (e.g. cultural attitudes, customs, and traditions) and political (e.g. land tenure) environment in which it operates.

3) Be technologically (what farmers reasonably have access to) and economically feasible. That is, benefits to a farmer should at least balance his or her investment in terms of labor, time and costs of production. This is also dependent on the other two as for example, the long term consequences of environmental degradation will also be economic.

Sustainable agriculture, under Yunlong and Smit's criteria, is viewed from ecological, social and economic perspectives. Each of these dimensions, although subjective and difficult to measure, should be assessed in terms of each other to determine the sustainability of agriculture. In efforts to control and sustain their lives in fragile environments, Africa's rural people have developed long sustaining forms of agriculture and resource use (Titilola, 1994). Many elements of indigenous agricultural systems fulfill Yunlong and Smit's criteria of sustainable agriculture. Furthermore, there is a growing recognition in the importance of indigenous knowledge as, not only good

examples to draw on, but as a foundation for sustainable agriculture and natural resource management (Olson, 1992).

Indigenous African Agriculture

Farming systems are complex interactions between social, biological, and environmental processes (Altieri, 1989). Indigenous farming systems exhibit features similar to natural ecosystems including defined patterns of nutrient cycling, population regulation, dynamic equilibrium and energy flows (Altieri, 1987; and Carroll *et al.*, 1990). They differ from a natural one in that they respond to socio-economic pressures as well as ecological influences. Although exposed to human manipulation, processes in indigenous farming systems still operate like natural ecosystems where the degree of difference between the two relates to the intensity of disturbance (Altieri, 1987; and Conway, 1985). Indigenous farming has been described as being rooted in deep ecological rationales, displaying socio-economic stability, biological productivity and resilience, and resource conservation (Altieri, 1987). Indigenous knowledge forms the basis of agricultural production that has often been sustained for generations. The complexity of indigenous farming systems, comprising strategies, practices, beliefs and customs makes it difficult to reduce it into a "system" for study (Moore and Vaughan, 1994). Regional differences in agricultural practices will vary greatly because of different political economies and cultural histories influencing them (Edwards *et al.*, 1993). There are, however, certain characteristics common to most indigenous farming systems. These include (from Altieri, 1990; Beyer, 1980; Cleveland, 1990; Dewalt, 1994; UNDP, 1995; and Woodhouse, 1992):

1) Reliance on local resources, including human and animal energy
2) Use of local varieties of crops, wild plants and animals
3) Exploitation of mico-environments in fields to maximize productivity
4) Biological pest suppression versus agrochemical pesticides
5) Nutrient recycling
6) High labor and low capital demands
7) Production of foods for local consumption
8) Adaptive strategies for use at times of stress (e.g. drought)
9) Emphasis on minimizing risk

Most forms of African farming are dependent on local rather than external resources, and are heavily dependent on family and community labor rather than machinery. Biodiversity is maximized temporally and spatially (e.g. timing of planting, intercropping, etc.) and risk is minimized as food provisioning is the main goal in indigenous agriculture. The benefits from African farming are summarized briefly, but are not limited to, the following. By interplanting nutrient depleting crops with other crops that add nutrients (e.g. leguminous crops increase soil nitrogen) soil fertility is maintained (Vandermeer, 1990). The complex planting structure provides a diversity of habitats for natural enemies of crop pests and thereby reduces crop loss to pests (Andow and Rosset, 1990). Monocultures often require more land to produce the same yield than a field which has been intercropped with several different crops. Intercropping has been traditionally practiced in Africa for centuries (Vandermeer, 1990). By mixing different species and varieties of crops, environmental conditions are modified and therefore less favorable to the spread of diseases throughout the crops (Altieri, 1987). Weeds can be reduced by intercropping species which inhibit weed growth thereby reducing competition (Weiner, 1990). The agricultural practices are not only ecologically compatible but also socially as they are rooted in local beliefs and customs (Altieri and

Yurjevic, 1995). Maintaining indigenous farming systems thereby helps the preservation of cultural identity.

In spite of the positive attributes, is indigenous knowledge alone enough to promote sustainable agriculture and conserve natural resource? Although sustainable at one time, perhaps IK is no longer enough on the basis of the following. First, Woodhouse (1990:189) points out that historical records of changes in "indigenous African farming" indicate that it has been influenced by numerous adaptations of foreign technologies by African farmers (also supported by Brokensha *et al.*, 1980; Richards, 1985; Warren *et al.*, 1995). Thus, what is observed as "indigenous" may be more ambiguous. Secondly, in the face of rapidly increasing populations, and changing social and economic conditions, traditional African agriculture seems unlikely to be successful without continued modification from exogenous sources (Cleveland, 1990:194). On this point, however, Moore and Vaughan (1994:30) argue that perhaps indigenous farming systems are sustainable under large populations because their fields do not supply all of their subsistence requirements. Income generation and off-farm wage labor may actually help to preserve traditional farming which might otherwise not be able to survive in the face of increasing population pressures. Thirdly, it is also asserted that, similar to the Green Revolution approach, indigenous technologies do not assure fair access to resources for poor farmers (Woodhouse, 1990). Although I feel this latter point is extreme, just as indiscriminate industrialization is not appropriate on economic and political accounts, neither is a complete reliance on current indigenous knowledge systems likely to reduce inequalities in rural development.

Building On African Indigenous Knowledge for Sustainable Agriculture

Principles of sustainable agriculture, which parallel traditional farming systems, differ fundamentally in their approaches from that of the Green Revolution (Table 2.1). SA takes a more holistic approach and uses locally available resources thus, making technologies more economical for poorer farmers. Subsequently, the results of this approach are more ecologically sound because they recognize and integrate local farmer knowledge instead of radically transforming the local ecosystem (Altieri and Yurjevic, 1995). Examples of innovative agriculture based in SA include Integrated Pest Management (IPM), Agroforestry, and Intercropping (Carroll *et al.*, 1990).

Norgaard clearly acknowledges the potential of indigenous knowledge for improving agricultural development:

> The nature of the potential of social and ecological systems can best be understood by studying how traditional farming cultures have captured the potential. Objective knowledge, the knowledge gained from studying traditional systems, the knowledge and some of the inputs developed by modern agricultural institutions can be combined to improve significantly both traditional and modern ecosystems. Agricultural development through agroecology [sustainable agriculture] will maintain more cultural and ecological options for the future and have fewer detrimental cultural and ecological effects than modern agricultural technologies alone (1984:876).

He suggests modern agriculture alone is insufficient because it is based on scientific knowledge which presumes objectivity, separability of problems, and generality of applied solutions. These presumptions, which justify centralization and bureaucracy, have made it difficult for government agricultural departments and development agencies to apply locally-specific decisions and recognize systematic interdependence in agriculture (Norgaard, 1984).

Table 2.1. Comparison Between the Green Revolution and Sustainable Agriculture

Characteristic	Green Revolution	Sustainable Agriculture
Crops affected	Cereal crops (wheat, maize, rice, etc.)	All compatible crops
Areas affected	Mostly flat lands and irrigated areas	All areas, especially marginal areas (rainfed, steep slopes)
Dominant cropping system	Monocultures	Polycultures
Dominant inputs	Agrochemicals, machinery; high dependency on external inputs and fossil fuels	Nitrogen fixation, biological pest control, organic inputs, high reliance on local renewable resources
Impacts on health hazards	Chemical pollution, erosion, salinizaiton, pesticide resistance, health risks with pesticide use and residues in food	None
Crops displaced	Mostly traditional varieties	None
Capital costs	Relatively high	Relatively low
Cash returns	High, rapid results, high labor productivity	Medium, needs time to achieve highest yields, low to medium labor productivity
Research skills needed	Plant breeding and other conventional agricultural sciences	Ecology and multidisciplinary knowledge
Participation	Low, mostly top-down	High, socially activating, inducing community involvement
Cultural integration	Very low	High, extensive use of indigenous knowledge and local forms of organization

Adapted from UNDP, 1995: 18

Although the objectives of sustainability are the same, the requirements to achieve sustainable agriculture are different in Africa than in the North (Okigbo,1990). Sustainability in Africa is affected by rapid population growth; intensive cultivation resulting in serious environmental degradation (e.g. cultivating slopes); increasing reliance on import foods and foreign inputs; adverse economic conditions resulting from escalating burdens of debt; and political instability (Okigbo, 1990). Colonization, commercialization of agriculture, mechanization, and other pressures of modernization, as discussed earlier, are the underlying causes of these changes. Strategies to achieve sustainability on the continent have placed a stronger emphasis on self-reliance and self-sufficiency in agriculture and food security (Duru, 1990). Appropriate technology[4] has also been stressed for realistically meeting the goals of sustainability to improve the quality of lives. Sustainability has been suggested as a changing process, as what is sustainable at one time may not be in another. Thus, farmers must also be allowed to fully participate in the production of solutions (Flora, 1992). Ultimately a sustainable and self-reliant agricultural strategy requires empowerment of indigenous farmers to decided what is sustainable at a particular time and place (Flora, 1992).

Given their strengths and weaknesses a synthesis of indigenous and "modern" agricultural methods may be the best approach to fully exploit the creativity and innovations of both. This emerging integrated approach is strongly supported as a means

[4] Appropriate technology is technology that is socially, environmentally and economically compatible with the culture it is introduced to. It is site-specific, making use of locally available resources, and is developed in conjunction with the people who will use it. In this sense, it is more appropriate than a completely foreign technology which may result in more harm than good.

to achieve sustainable agriculture (DeWalt, 1994; Rajasekaran and Warren, 1991; Kloppenburg, 1991; Flora, 1992; Titilola, 1994; Warren, 1991; Cleveland, 1990; and Roling, 1994). How to practically "synthesize" or "integrate" different knowledges though represents a difficult challenge. I feel a more realistic approach, as is suggested by Thrupp (1989) and Clarke (1995), is to build on what knowledge is already available locally. Modern agriculture, can provide a broader array of options for farmers by identifying practices suitable for adoption and adaptation, and help to create a better balance among those who can access it (DeWalt, 1994). Although indigenous knowledge is criticized as being "local" or contextualized, its holistic knowledge can be applied to similar circumstances in other regions. Indigenous knowledge can provide useful guidelines to direct agricultural research towards more socially and ecologically sustainable systems. This requires linking farming with resource conservation and considering the principles of community-based resource management. Both sustainable agriculture and natural resource management require the use, management and conservation of the natural resources to ensure the attainment and continued satisfaction of human needs.

Many questions remain. Will the concept of building on indigenous agricultural approaches be accepted by international research institutes and governments? Will the social and ecological aspects of sustainable agriculture be weighted equally with the economic and agricultural science aspects? Will the sustainability of food systems also extend beyond the farm to include the broader environment?

Resource Management: Who decides?

Indigenous peoples have evolved systems compatible with the environment and adaptable to changes (Quiroz, 1996). These systems are often referred to as traditional or indigenous resource management systems, which are an inherent part of indigenous knowledge systems. An important characteristic of IKS is that they tend to protect the environment by vesting group and individual interests in property rights to environmental assets. It is important to point out that "property" is a social phenomenon and denotes the "right" to resource use, not ownership over the particular resource itself. Property relations arise when institutional arrangements, or regimes, are established to protect the right of individuals or groups who have an interest in the resource (Bromley and Cernea, 1989). Common property theory provides some general guidelines and policy prescriptions for the success of indigenous peoples-based conservation and management of natural resources. Common property regimes for managing natural resources, however, have been frequently misunderstood. In the property debate, four resource management regimes are generally identified: state property; private property; open access (non-property); and common property (Murphree, 1993). It will be useful to briefly discuss different resource management regimes before entering into a discussion on indigenous communal resource management.

State property is the most common form of resource management whereby the government determines how and by whom the resource will be used (Bromley and Cernea, 1989). Groups or individuals are sometimes given rights over the resources for

a set period of time, however, they are not granted titles over the land. Correspondingly, with private property, an individual or group controls the land and its related resources while excluding all others. Although state and private property regimes appear to be stable and adaptive because they are able to limit excess population, and limit unwanted intrusions, they can be exclusionary of age, gender, class, religion, and ethnicity (Bromley and Cernea, 1989). When resource management is solely in the hands of government or corporate interests it lends itself to marginalization of management potentials by the local people (Murphree, 1993). Open access is a situation where resources are the property of no-one (a free-for-all) and therefore no property rights exist to control use of the resources. Open access is therefore not truly a property rights regime, nor a management regime as people use the resources without actively managing them (Murphree, 1993), insuring that the resources will eventually be seriously degraded or completely depleted. The open access situation result from the absence, or the breakdown, of a management and authority system whose very purpose was to introduce and enforce a set of norms of behavior among participants with respect to resource utilization (Bromley and Cernea, 1989).

Common property represents private property for the group who regulate resource use themselves and exclude others (McCay and Acheson, 1987). Not all resources under collective use are, however, managed through a common property regime. Resources are deemed common property where there exists both a clearly identified user group and a known and respected set of rules regulating the rights to the resource, including the right

to exclude access (Arnold, 1990) The effectiveness of this property regime is thus dependent on the user groups' compliance with their co-determined rules as well as the ability to ensure that those excluded also respect this relationship (Bromley and Cernea, 1989). The property-owning groups under this regime are usually social units with common cultural norms, such as tribal groups or extended families. When enforcement of these socially determined codes of behavior fail or are deligitimized, an open access, free-for-all situation results (Lynch and Alcorn, 1994). Hardin's (1968) "tragedy of the commons" theory described this as the unwillingness to support a resource for the "common good" because the perceived benefits to individuals outweigh the benefits of a communal managed system. In this scenario, the cumulative impacts of many individuals maximizing their usage of a shared resource cause it to collapse. Hardin's model of tragedy of the commons, however, fails to recognize the role of collective action and the existence of social relations to guide resource use behavior (McCay and Acheson, 1987). Indigenous enforcement on common property can limit access to resources and thereby obviate a "tragedy of the commons" situation.

A common property system, in contrast to open access, builds on years of traditional resource use, where community level rules regulate the behavior which is deemed acceptable. This is often the case of indigenous communities whose land and forest resources have been regulated by customary laws, religious beliefs, fear of bad luck, and fear of ostracism by the community (Basiago, 1995). Examples of common property in an indigenous society are grazing land, village territories, and certain forest products

such as firewood, wildfruits and mushrooms. In indigenous resource management, individuals often hold land in trust on behalf of their ancestors which has led to shrewd use of the environment. Private property rights within indigenous management systems are held by those who have made a substantial investment of labour in a resource, such as planting trees, and those who have prior claim on a resource by descent, such as old trees planted by ancestors (Basiago, 1995). Village management is generally respected and prevents conflicts over resource use. The continued existence of customary law and local regulations demonstrates the flexibility of these indigenous resource management systems (Fox, 1993:303). Traditional natural resource systems have an important role to play in sustainable development. These management regimes are characterized by:

> ...community ownership and management and limited government intervention. Whilst not established to protect the environment, they nonetheless establish protocols that maintain ecological systems, and thus amount to a regime of indigenous environmental law and policy...they establish a more sustainable paradigm of land use than the land-, capital-, and energy-intensive Western system that is encroaching (Basiago, 1995:209).

In many parts of the world, centralized governments have placed the control of rural communities and resource in the hands of government agencies and corporations that lack either the will or the means to manage resources in a sustainable manner (Fox, 1993). It is a naive belief that only national governments can solve resource degradation by creating more government control and centralization (Bromley and Cernea, 1989). The resulting process is a loss in the ability of communities to restrict use on the land, while governments struggle to restrict access due to limited financial resources and organizational capacity. Global acceleration of deforestation, desertification, soil

erosion, etc., however, indicates that these centralized governments are failing to manage the resources sustainably (Murphee, 1993). The conversion of common property into state or private property fails to recognize community rights and the potential for local authority to effectively sustain resource use (Fox, 1993). The ability of the traditional structure to effectively manage the land has been seriously eroded by their tenure status where the state has denied rural people access to certain resources. The result is a distorted communal property regime. Conflict between communal and state systems inevitably results in resource mismanagement and degradation. Characteristics of an open access situation develops as traditional management systems breakdown. It is understandable, thus, how open access has been typically confused with common property regimes and why communal lands are experiencing the greater environmental degradation. When indigenous people's control and access to resources are lost, and the environment which helps to create indigenous knowledge systems becomes degraded, the basis of IKS itself becomes threatened.

The development of resource management systems which empower local people to manage local resources appears to offer a way out of this scenario. This demands more than trendy plans to "involve" local people or promote their "participation" in development planning. It requires that people be given the right to decide how, to what extent, and whether or not to use a resource at all (Murphree, 1993). Although difficult to relinquish power, governments must recognize traditional management systems as manifested in local customary laws and develop clear approaches to the joint management of resources.

Community-Based Resource Management (CBRM): Respecting Indigenous Systems of Resource Management

The call for alternatives to state controlled systems of resource management and recognition of the role of traditional communities has, not surprisingly, led to a people-centered approach (Ghai and Vivian, 1992). Community-based natural resource management (CBRM) has "recently" emerged as a promising option. Ironically, CBRM is hardly new as communities have developed practices and technologies over the centuries which restrict access to critical resources and control harvests.

Numerous definitions of CBRM have been put forth. Broadly defined by Fellizar: "[CBRM is] a process by which the people themselves are given the opportunity and/or responsibility to manage their own resources, define their needs, goals and aspirations, and to make decisions affecting their well-being" (Fellizar, 1993:141). CBRM has been described as a strategy for achieving people-centered development where the focus of the decision-making responsibility with regards to sustainable resource use, lies within the community. The resource management decisions may be made collectively or by individuals. CBRM implies that people have access to, and control over, the natural resources. It also implies that they have the knowledge, expertise and technology, inherent in traditional resource management system, to productively and sustainably use these resources.

Many of the CBRM principles share underlying themes with indigenous knowledge systems and give further insight as to how IKS might contribute to the process of development. Drijver and Sajise (1993) have synthesized the most important principles of community-based resource management which are: linking the environment with development; cultural appropriateness; incentives; conservation and sustainable use of natural resources; local participation; people-centered approach; and decentralized control and decision-making. The following discussion will expand on each of these principles.

It is generally recognized that in order to achieve sustainable economic development, a healthy and productive environment is required. In order to achieve this, however, other factors such as food security, water supply, basic sanitation, health, and education must be addressed. Management of the environment and development are therefore inherently interconnected. Linking culture with the environment and development is also essential to appreciate the great diversity of peoples, settings, problems and therefore solutions (Ghai, 1992). CBRM requires that natural resource management be viewed in culturally sensitive ways that do not undermine indigenous systems of knowledge and management.

CBRM also requires that people must receive some form of economic benefit for the opportunity costs of complying with conservation policies (Drijver and Sajise, 1993). An example of this is directing the benefit of revenues from the sale of culled animals from game reserves to bordering villages. Governments, however, should be cautious of viewing this as a form of bribe to coerce communities, and be aware of the risk in

unequal distributions of rights and gains within the communities. Economic incentives may have a great impact in *obtaining* participation, but working with and respecting local management systems requires that governments allow people to take part in decision-making.

CBRM principles emphasize sustainable development. Conservation and sustainable use of the natural resources requires identification of conservation priorities within a community, and socio-economically feasible options for using the surrounding resources. To achieve this, it is necessary to work in close cooperation with the community in order to understand local people's perceptions and knowledge of the local resources (Drijver and Sajise, 1993). It is important to realize a community is not uniform with respect to their knowledge and perception, thus it is important to involve all users groups with respect to age, gender, status, religion, ethnicity and education. Sustainable livelihoods can not be realized if natural resource management results in further accentuation of inequalities and marginalization (Ghai, 1992). It must be clear who the beneficiaries are from using IK.

CBRM, although cautious of the rhetoric, also advocates community participation. The reasoning is that a community will be more likely to support resource conservation and management when they become active participants in the process (Bromley and Cernea, 1989). Resource management strategies should respect and serve the interests of the people as it is the local communities who will be the most affected by the strategies in

question. Participation should also consider addressing the basic priorities of the community at the earliest possible stage in the resource management strategy (Pretty, 1995). There has been much debate over the issue of "participation" of local communities on development projects. Some of the caveats of participation are that the level of participation should be clearly determined at the start, whether consultation or local control is the objective; and care must be taken to ensure equitable participation to avoid overlooking the poorest of the poor or gender biasing (Oakley and Marsden, 1984). The concept of participation will be discussed more fully at the end of the chapter.

The dominant strategy during the industrial era was production-centered development whereby a single-minded focus on production would inevitably lead to increased benefits to the people. Contemporary forms of resource management, including CBRM, now view people-centered development as the only way to truly achieve accountability over the resources. Central concerns of people-centered development are to enhance human growth and well-being, equity and sustainability (Korten, 1990). This involves empowerment of people in order to allow them to control their own lives and resources. Questions of governance thus become critical, which brings me to the final point: decentralized control and decision-making.

The key to building local support for the management of natural resources is a decentralization of control from centralized governments (Western and Wright, 1994).

Under CBRM, resource control should ideally be devolved to the people who have the most direct contact and interaction with the resources (Drijver and Sajise, 1993). The transfer of power and responsibilities over natural resources parallels the trend in development of decentralized decision-making to achieve more pluralized and democratic governments (Cernea, 1994). Restoring autonomy over natural resources may be difficult as it requires respect of traditional systems of land tenure and use, and a willingness on the part of centralized bodies to release their control and legitimize and empower local level institutions. A caveat states that "...except where specified in legislation, devolution of formal authority to a subsidiary level of government does not necessarily imply that further devolution to communities will occur" (Abregana *et al.*, 1996:3). Furthermore, assumptions can not be made with devolution of control that local levels of government have the competency or capacity to take on greater managerial responsibilities. What then, should be the extent of devolution? As Abregana *et al.* (1996) point out, devolution of control does not necessarily mean sufficient resources have been devolved along with the responsibilities. They refer to this as "devolution fatigue" leading to the general failure of management systems. In addition, African countries, and many other developing countries, are experiencing a breakdown of traditional social authorities. Under such circumstances is it wise to devolve control to the traditional authority level? Capacity building, and even creating new community institutions, may be necessary first and foremost to ensure responsible local development.

Most countries have a long way to go with regard to common-property management policies and their lack of reference to indigenous values and property rights (LaDuke, 1994). Much is yet to be learned about how to best integrate traditional knowledge systems and government forms of management. As CBRM recognizes that indigenous people have the knowledge, expertise and technology to productively manage their resources it appears to offer some answers on how to secure traditional ways of living on the land and the cultural framework on which they lie.

PART THREE: A REVIEW OF THE AFRICAN IK LITERATURE

Indigenous Knowledge Systems in Sub-Saharan Africa

Indigenous knowledge research is based on perspectives from numerous disciplines and experiences in many countries around the world which supports the growing appreciation for the importance of IK in natural resource management. This review reflects the current emphasis on multi-disciplinary approaches to development, particularly the natural and social sciences, emphasizing knowledge and skill sharing amongst people from different areas of specialization. The literature ranges from descriptions of specific forms of IK resource knowledge to discussions on broader indigenous environmental management strategies. The greatest body of sub-Saharan African IK literature undoubtedly relates to agricultural practices. More recently, the complexity of indigenous decision-making and problem-solving have been investigated. Although the validity of IK is being acknowledged by national governments, research institutions and NGOs in sub-Saharan Africa, there is little emphasis being placed on IK's role in policy making and

development planning. There is also limited evidence in this literature review which indicates IK research is considering the diversity of knowledges within communities and addressing inequalities. In the following discussion I only attempt to synthesize IK research which has been conducted in Sub-Saharan Africa in order to limit and focus the literature review.

In the field of forestry, Brokensha and Riley (1980) examine ethnobotanical knowledge of the Mbeere people of Kenya and suggest specific areas where indigenous practices should be incorporated into development planning. More recently, Clarke (1995) has focused on the uses of trees and their importance to the farming systems in Zimbabwe. The value people hold for trees is evidenced by their spiritual beliefs associated with trees. She discusses both family and village level woodland management practices and offers a framework for Woodland management by forestry extension staff which builds on existing local practices.

The most widely researched area of IK has been the link between agriculture and rural development. An early study by Belshaw (1980) explores the benefits of traditional intercropping in East African farming systems over the orthodox approach of modern agriculture to plant pure crops stands. Perhaps the most widely known researcher in this field is Paul Richards (1985) who authored the book *Indigenous Agricultural Revolution*. His work investigates the diversity of indigenous farming practices in Western Africa in an attempt to improved indigenous capacities which clearly have empirical and

technical merit. In a broad spectrum analysis, Beyer (1980) attempts to summarize the general nature of existing traditional resource management practices in sub-Saharan Africa. She covers shifting cultivation, multiple cropping, soil management, water conservation, fishing, forest management, wildlife conservation, weeds, pest and disease control. Soil scientists Kerven and Gata provide insights into farmers ability to classify a variety of soils. Kerven *et al.* (1995) collected information on indigenous terms, descriptions and uses of local soils in Northern Zambia and found that farmers could name 73 different types of soils according to the soil's most significant and empirical features. Their findings were compared and contrasted to technical soil research available in Zambia and were found to be equally, and in some cases, more descriptive than exogenous information. Gata (1995) describes 10 types of traditional soil classification in Zimbabwe which Shona people distinguish based on taste, smell, color and texture. He also discusses various local varieties of rice and maize which the local farmers have been able to classify and maintain separate races of the crops. Traditional soil improvement and land use, the benefits of mixed cropping, and fallowing which farmers have been using and adapting on for generations are also discussed. More recent studies have determined the success in linking IK with Western knowledge systems. McCall (1996) describes the evidence for the past and present indigenous technical knowledge (ITK) in East African farming systems, and emphasizes the potential which ITK has for promoting empowerment in farmers. Radcliffe *et al.* (1995) provide a framework for bridging exogenous science with existing local farming practices using neem extracts as a natural pesticide. It is one successful example where Western and indigenous

knowledge systems have been integrated.

The feasibility of indigenous wildlife conservation and broader environmental management of IKS are considered by a number of authors. Ntsala (1994), in studying the traditions of the Batswana, reveals a picture in total contrast to the myth developed during colonialism that tribal African people had no concept of wildlife conservation. Nstala provides examples indicating that tribes did, and still do, have wildlife "laws" which were strict, complex and based on rational and sound principles. One example he cites is the controlled harvesting of tortoises, a vulnerable species, by village elders. Based on an IDRC workshop, Roach (1994) addresses the sustainable responses of indigenous management systems to the degradation and desertification of semi-arid lands. These areas are characterized by low and variable rainfall and fragile soils, therefore making them prone to desertification. Roach's study illuminates how several African societies have been able to adapt to the changing climatic conditions typical of their environment. Dyasi (1985) explores Ghanaian conservation of water resources at shallow wells and the prevention of soil degradation by various land use practices including fallowing, burning, and contour ploughing. He suggests that due to the influence of industrialization, traditional practices are not all sustainable now. He cites examples where the Ghanaian government has married traditional practices with contemporary knowledge for environmentally sound management practices. For example, medicinal prescription used in the health care system that are made by traditional healers, and an environmental education program which consults with indigenous leaders to solve local problems.

Varied and complex soil and water conservation strategies are also practiced by farmers in Mali (Ayers, 1995). The techniques, both biological (e.g. rotations, mulching) and mechanical (e.g. ridging, contour ridges) demonstrate that farmers experiment with a considerable level of sophistication.

Given the importance of cattle in African societies, several researchers have focused on pastoral aspect of IKS. The knowledge of Nigerian pastoralists and their traditional way of sharing and exchanging cattle is investigated by Scott and Gormley (1980). In response to the Sahelian drought during the early 1970's, when most nomadic pastoralists suffered drastic herd losses, a voluntary organization successfully reintroduced and reconstituted adaptive herder strategies in an attempt to reinforce the herders own survival strategies, and to encourage self-reliance rather than dependency on relief aid. An extensive study covering arid and semi-arid Africa considers a wide range of issues centered around natural resource management among pasoralists (Niamir, 1995). She considers the complex systems which regulate their movements and minimize risk, and their means of enforcement. This allows pastoralists to maintain an equilibrium between livestock and resources.

Other disciplines of IK are also described in the African literature, including medicine and fisheries management. Munguti (1997) discusses the use of herbal medicine by the Tugen people of Kenya used to effectively treat diseases. Munguti postulates that their widespread use of herbal treatments among the Tugen is the result of their belief in its

efficaciousness and the high cost and inaccessibility of Western health care. Price (1995) describes project results from synthesizing scientific fisherfolk practices with government technical services in Niger. Fishermen in Niger have are known to possess a profound knowledge about fish biology, river ecology and regional environmental change. A consequence of the marginalization of local authorities by the French colonial government has been radical transformations in gear use, and declining water flow in local rivers which have added to the deterioration of local management. The recent management approaches developed by NGO's allowed the fisherfolk to become joint managers of the fish and have primary responsibility over the resources, including enforcement.

Current interests in IK research indicate the important role of decision-making in indigenous knowledge systems. Coping strategies during African famines are addressed by Walker (1995). Victims perceive and react to famine in a qualitatively different way than aid agencies. This realization could provide valuable lessons in the way outside agencies should conduct their relief operations. Hanyani-Mlambo and Hebinck (1996) review networks of knowledge established among farmers to exchange information on forestry conservation in Zimbabwe. They discovered that sources of IK come from innovative farmers, opinion leaders, village elders, distant family members while also maintaining links with government forestry extension staff. This has allowed the complementary use of formal and informal knowledge networks. de Voogt (1996) investigates problem-solving among the people of Zanzibar through the use of an

African board game called Bao. He shows that Western concepts of education do not always provide the most appropriate or effective option as bao players, regardless of formal education, are extremely skilled at problem-solving which has been acquired from informally learned experience.

Over the last 10 years a number of regional IK committees and organizations have been established. Although their specific objectives vary, all of them are in some way seeking to foster a better understanding of IKS and people in the region, and bridge various systems of knowledge for local sustainability. In late 1993 a committee on Indigenous Knowledge Systems and Peoples in Southern African was formed with support from the World Bank and IUCN. Countries with organizations currently supporting African IK research centres are: Nigeria; Burkina Faso; Ghana; Sierra Leone; Cameroon; Kenya; Madagascar; Tanzania; South Africa; and Zimbabwe (refer to Appendix 1 for the contact addresses of these IK centres). There is also a globally distributed IK journal, *Indigenous Knowledge and Development Monitor*, produced by three IK organizations working in close cooperation.

Indigenous Knowledge Research in Malawi

I carried out a literature review in Malawi to determine what existing research there is on indigenous knowledge systems in the country, specifically environmental knowledge. All of the government departments and NGOs which were contacted are listed in Appendix 2. The following is a summary of what I consider to be the most relevant documented works.

The earliest reports giving any reference to environmental knowledge in Malawi were conducted by anthropologists in the 1950's. Rangeley (1949; and 1956) published detailed descriptions of a system of spiritual beliefs, particularly rain shrines in the Southern Region. Carrying on from Rangeley's research, Schoffeleers (1978a) investigated the Mbona cult in the Nsanje District (the Mbona is a central figure in oral history whose spirit is associate with the arrival of the annual rains). The Mbona cult is documented in *Guardians of the Land* (Schoffeleers, 1978b), a book which also deals with Malawian social interpretations of environmental processes and the fundamental African philosophies of the earth. The merit of these early works is that they draw attention to the complex beliefs and customs which reinforce moral conduct and social organizations. These beliefs reflect people's world view and how they should conduct themselves within the environment.

Systematic research on medicinal plant use in Malawi was first conducted in the late 1950's. A still widely used book entitled *Useful Plants of Malawi* (Williamson, 1956) was published as a result of this research, and documents local uses in 11 different Malawian languages. An updated version of this book from a more socioeconomic perspective is currently being written by a British ethnobotanist, and long-time Malawi resident, and is due to be published in the near future (Morris, 1996). Vaughan (1987) has also looked at local plant knowledge in her research on famine food and coping strategies used during the late famine of 1949-50.

The Forest Research Institute of Malawi (FRIM) in collaboration with the Center for Social Research (CSR) has recently started to use PRA to investigate forest knowledge among communities in the Central Region. To date, FRIM has published a few internal documents on their research (Coote *et al*, 1993a, 1993b; and Lowore *et al.*,1995). Apart from these references, I have seen little evidence that farmers are being consulted regarding forestry knowledge, needs or priorities.

Limited research has focused on indigenous wildlife conservation. Various anecdotal accounts of hunting taboos and wildlife use have been published (Hayes, 1972; and Phiri, 1980). More extensive social research conducted by the Wildlife Society of Malawi (WSM) has investigated local community use of natural resources within and around two national parks. The findings from this research that was based on local knowledge and needs, suggested several income-generating activities which could be derived from resources harvested from the parks (Abbot, 1994; and Gibbons, 1996). Several studies have also focused on traditional forms of wildlife conservation contrasting the ineffectiveness of the government protected areas systems that are based on rigorous enforcement and exclusion (Hough and Sherpa, 1989; Kandawire, 1986; and Munthali, 1993). The references have reached essentially similar conclusions that integrated approaches are needed where rural people contribute and fully participate in the planning of protected areas.

Given Malawi's strong dependence on agriculture, it is not surprising that most of the contemporary IK research in Malawi has focused on farming systems. Understanding farmer's use of trees in farming as a potential for improving soil fertility has been the topic of recent national symposiums and publications (FAO, 1984; GOM, 1996b; and Saka *et al.*, 1991). Maumbeta (1994) has also addressed the importance of fruit trees for farmers. Hansen (1986) initiated a two-year research program on farmer use of hybrid varieties of maize. The research demonstrated many technical assumptions by agricultural researchers and highlighted the complex selection process farmers use to assess the usefulness of local varieties of crops over hybrid varieties. In an earlier study (1981) Hansen investigated why and how farmers intercrop particular crops and suggested recommendations for agricultural extension. Babu (1991) examined the potential of using Moringa , an indigenous tree which contains high levels of vitamin "A" and "C" in its leaves, to improve the diets of rural Malawians. This research expands on existing indigenous knowledge as they describe that the fruits, flowers, and leaves are already an important part of people's diets in many parts of the country.

The most current research is being carried out at Malawi's two major Agricultural Research Stations, Bvumbwe and Chitedze. Chitedze is working on a Bean/Cowpea research project that looks at farmer crop selection criteria and crop genetic diversity. An article summarizing the project was recently published in the *Indigenous Knowledge and Development Monitor* (Ferguson and Mkandawire, 1996). Bvumbwe station has carried out investigations on Integrated Pest Management (Riches *et al.*, 1993). Their current

research program uses PRA techniques to elicit farmer knowledge on pest management strategies. Benefits and constraints of various tillage systems in the Northern and Southern Regions have been considered by Kumwenda (1990).

Gender issues in Malawi, particularly agriculture-related, have increasingly gained importance in the development and implementation of projects, as outlined in a recent national workshop on gender equity (Nkunika, 1996). Spring (1985; and 1990) argues that the contributions of female farmers in Malawi has been undervalued and often ignored by agricultural extension. Her research demonstrated that lack of access to land and capital as well as differences in training and extension contacts were the critical factors effecting knowledge differentiation among male and female headed households. Bean research by Ferguson (1992) gathered information on the sociocultural factors which influence choice of bean variety throughout the country. Her summarized findings indicate that female farmers, if they have sufficient land, use diverse criteria to select bean crops in order to meet multiple household needs (diet, fast cooking time, and income generating) and also as a conscious risk-reducing strategy. Recommendations were made to preserve local germplasm of farmers desired varieties, and support farmers in their efforts to tailor bean varieties according to their specific circumstances and environments.

In the context of IK research in sub-Saharan Africa, there have been only limited studies which describe Malawian practices and strategies. Malawian philosophy and knowledge regarding plant and wildlife uses have been explored; however, there are fewer comments on how this knowledge relates to rural Malawian priorities or needs and how it can be

linked with national development planning. Emphasis has been placed on agricultural practices, as in the sub-Saharan literature, but none of the literature addresses their sustainability. Sustainable resource management and conservation are still typically equated with government regulation and rarely viewed as a part of rural Malawian's farming systems. Only the gender-based research in this literature review has broached the subject of knowledge differences in villages. Other social indicators such as wealth, age, and kinship are barely given mention. Emphasis on methods required to access IK have received little attention.

This literature review has identified several gaps in what is currently known about indigenous knowledge in sub-Saharan Africa and Malawi. I intend to address some of the gaps with this research, specifically, sustainable resource management, knowledge differences, and recommendations for more integrated development planning. Participation, as an approach to increase people's involvement in research, and therefore obtain more accurate perceptions of their situations, will be discussed in the following section.

PART FOUR: METHODOLOGICAL CHALLENGES

This final section explores participation and empowerment as current approaches for more sustainable and appropriate development. These approaches draw attention to previously neglected knowledge/power and gender issues, and can be used as a means of exposing the richness of indigenous knowledge.

Participation: A Concept and Method

The literature focusing on participation is vast, and continues to increase. Participation has evolved on many different levels and takes many forms, to the point that it has become an umbrella term in research and development. The broad range of interpretations of participation can be presented as a continuum from mere token involvement, to the opposite extreme of spontaneous participation (Maclure, 1990). Participation is a term generally used to describe a particular type of leadership approach or decision-making strategy (Awa, 1989). Oakley *et al.* (1991) argue that there exists three interpretations of participation in relation to development projects: as contributions by rural people; as structured organization; and more recently, as empowering. Each of these categories, however, is not mutually exclusive. Each one may act in relation to the other. Another common way to view participation is to distinguish it as a means or an end (Oakley *et al.*, 1991). Participation as a means indicates it is being used as a way to achieve some predetermined goal or objective. Participation as an end is quite different and refers to a process whose purpose is to develop and strengthen the capacities of people to intervene more directly in development initiatives.

Majid Rahnema's (1992) more metaphysical description views participation as four antithetical categories: transitory or intransitive; moral or immoral; forced or free; and manipulative or spontaneous. Rahnema warns, however, that the greatest danger in the ambiguities surrounding participation is:

> Participation, which is also a form of intervention, is too serious and ambivalent a matter to be taken lightly, or reduced to an amoebae word lacking in any precise meaning, or a slogan, or fetish or, for that matter only an instrument or a method. Reduced to such trivialities, not only does it cease to be a boon, but it runs the risk of acting as a deceptive myth or a dangerous tool for manipulation (1992:126).

With all of these meanings and interpretations it is difficult to assess the outcome of participation in a development project. Typically full participation in these projects is meant to foster trust and build cohesive working groups in an organizational activity (Awa, 1989). All too often though, rural development projects fail to elicit participation, as they are planned by the outside agencies and are therefore perceived as detached and foreign by the local community. Most development agencies use what Awa (1989) terms a "consultative system", characterized by limited interactions between those in a superior position (e.g. development agencies) and those in the subordinate position (e.g. rural villagers). When and to what extent the subordinates "participate" is frequently determined by those in a superior position (Awa, 1989). This seems to be the very antithesis of what participatory approaches strive to accomplish. To overcome some of the ambiguities of participation, development workers, extension officers and researchers should strive to define the level of participation they expect to promote and at least be aware they are dealing with an unfolding process (Oakley *et al.*, 1991). Willing participation will only come about in development projects if rural people are treated as full partners in the entire process from the idea stage to planning and implementation. The respect and seriousness for true participation is being developed through research into indigenous knowledge systems.

The Relevance of Participatory Approaches to Indigenous Knowledge Research

Participatory approaches to investigating indigenous knowledge can be valuable in providing a grass roots view of development. Understanding rural people's perspectives is also critical to promoting an empowering process. Participation may promote empowerment. Recently participation has focused on empowerment through activism, confrontation of previously neglected social issues, and local-level learning. This radical approach to indigenous knowledge research is necessary in order for rural people's knowledge to be articulated productively along side other knowledge systems. For research and development work concerned with enhancing livelihood strategies in rural communities, the local practices, perceptions and priorities must be exposed. By accessing local knowledges, allowing people to participate fully in the process, and sharing information, there is a better chance to make a real contribution in creating opportunities for rural people to improve their own well-being.

The relationship between indigenous knowledge and participation should be based on a power-equalizing decision approach (Awa, 1989). This implies exogenous and indigenous knowledges must operate through a two-way flow or exchange of information in order to be deemed participatory. Development is often "top-down" and insensitive to local beliefs, values and expectations. Instead of fostering cohesiveness it tends rather to build resistance among local people to adopt "foreign" ideas.

In the beginning of the chapter I discussed some of the shortcomings of earlier development approaches towards resource management and agriculture. Many believe part of this failure lies in lack of understanding and appreciation of local knowledge systems (Chambers, 1983; Richards, 1985; Warren *et al,* 1995). As the literature implies, "indigenous knowledge" is not only a catalogue of technical skills in agriculture, forestry, health, etc., but is also based on strategies which allow people to maintain their livelihoods in the face of adverse conditions and to cope in times of extreme stress (Fairhead and Leach, 1994). Attempts to simply blend or integrate local knowledge into existing scientific procedure falsely assumes that indigenous knowledge is an easily extractable and distinct body of knowledge. Participatory approaches can be powerful methods to illuminate local realities and assist in our understanding of the complexities of rural livelihoods. In discussing the importance of indigenous knowledge and participatory approaches Richards states that:

> The case for participatory research is based on the argument that it is an efficient way of meeting localized research needs and of mobilizing local skills and initiative. The point about "mobilization" is that this is not just a way of acquiring useful skills "on the cheap" but that organizing around a project which makes effective use of local skills and knowledge provides a launching pad for additional skills formation and thus improves prospects for self-reliant development (1985:152).

As Park (1993) describes, the path from knowledge generation to knowledge use is more direct when participatory approaches are taken. Participatory approaches recover indigenous knowledge in the form of practical skills, ancient lores, collective wisdoms etc., that are used daily, but remain hidden to the outsider. Non-participatory

approaches are criticized for making those who are the subject of the research feel invalidated and useless. Participatory approaches appear to provide a means for rural people to regain their ability to innovate, depend on themselves, remember their history, and revive their culture (Park, 1993). In order to be effective, participatory approaches must use a diversity of methods to reflect local perceptions and priorities, and create direct interaction between researcher, development worker, and participants thereby enhancing the appreciation of local knowledge (Cornwall *et al*, 1994). The sharing of ideas and information is perhaps more a true development aid to rural people rather than trying to bring them into a monoculture world.

Recognizing IK as a means to Empowerment

Participatory approaches emphasize that local people should take charge at all stages of the development process, implying that it is part of an empowering process. A person can be empowered in many ways such as being given the opportunity decide, being allowed to participate; being provided with education, etc. Empowerment is a multiphase idea that is synonymous with freedom of mind, and is therefore difficult to measure. Thrupp (1989) feels that the best way to legitimize rural people's knowledge and abilities is to realize that local knowledge is a means of power, and thus a source of empowerment.

Empowerment can strengthen rural people's beliefs in their own knowledge, build dignity and enhance their own practices and insights (Thrupp, 1989). It also may increase rural people's ability to be more selective and critical of exogenous knowledge and adapt or

reject technologies which are not appropriate to their way of living. Empowerment, through active participation, can build community strength thereby increasing a community's political bargaining power (Thrupp, 1989). This view of *building* indigenous knowledge is contrary to the romantic view of *preserving* it. Thrupp (1989) concludes that in order for development projects to truly bring about empowerment they must be accompanied by the creation of economic opportunities (e.g. income generation), structural change in the form of land redistribution, increase access to resources, and resolution of inequalities.

Limits to empowerment and participation are not as obvious as their potential. The lack of many successful guiding models, the impact of Western orthodox development strategies, and the struggle in breaking away from traditional hierarchical relationships remain problematic towards achieving full participation and empowerment of rural people in the development process (Ramphele, 1990). den Biggelaar (1991) warns that in many countries, efforts to empower and recognize indigenous knowledge systems may be seen as politically subversive to the local or national power structures. This adds further emphasis to the importance of being sensitive to the traditional hierarchy channels when conducting research or initiating development projects. Townsend (1993) asserts that grassroots organizations are already taking on tasks in the name of empowerment which they do not yet have the capacity nor experience for. Their failure could lead to the discrediting of the idea that rural people should be empowered to take charge of their own lives (freedom of mind).

Past failures with participatory and empowerment approaches have been deemed by some to be a result of development practitioners viewing the local people as only part of the solution and not part of the problem. In a strong warning Pelkey states that:

> ...by its very nature [participatory approaches] often reach[es] out to those who are the least successful in their traditional occupation...turning all development decisions over to those groups is akin to taking one's car to the least successful mechanic in town (1995:22).

Pelkey's view, however, is just a mirror image of top down development e.g. believing that local people are the source of the problem which thus makes it difficult to see them as part of the solution. What is needed then is to first determine *why* people are part of the problem, whether it is a result of lack of management skills, restricted access to resources, or the introduction of inappropriate technologies, and then work with them to solve the problems.

The primary purpose of documenting, reinforcing, and reinstating IK should be orientated towards increasing farmers' power and independence. There is a risk that by focusing on indigenous knowledge, despite good intentions, efforts to empower local communities may lead to further control by outsiders (Haverkort, 1993). Thus, empowerment efforts may be accompanied by undertones of intervention, of the more powerful coming to the assistance of the helpless and powerless rural poor (Long and Villareal, 1993). Striving to achieve empowerment shows the potential paradox of participatory approaches. Facilitation by a multidisciplinary team of so-called "experts" can turn into a manipulative session where the direction of dialogue is imposed by the facilitator. This

brings us back to the initial issue which I raised at the start of the chapter about recognizing a diversity of interests in people. As conflicting interests and ideologies are implicit in human relationships, it is important to be aware of this if the goal is truly a participatory approach.

The most important step in empowering indigenous knowledge systems will be in creating a balance with Western knowledge (den Biggelaar, 1991). Although extremely difficult to accomplish, as evidenced in the previous discussion, it will enable people in the less industrialized countries to take steps to alleviate their own poverty.

Participatory Rural Development (PRA)

Those who subscribe to the participatory approaches discussed above have developed a variety of techniques for interacting with communities in a way which allows them to become part of the process of development. A number of disciplines, for example applied anthropology, participatory action research, agroecosystems analysis and farming systems research, have inspired the techniques of what is termed Participatory Rural Appraisal (PRA) (Mikkelson, 1995).

Participatory Rural Appraisal (PRA) is increasingly recognized as a sensitive approach to community development. PRA stresses the involvement of community members in the development process in order to ensure learning is generated from within the community rather than imposed from outside. The use of mapping and diagrammatic techniques are

essential in obtaining the perceptions of non or semi-literate people, and visualization of people's perspectives is also a very powerful medium of communication.

PRA has been referred to as a means of placing the production of knowledge and generation of solutions in the hands of those who's lives the research is focusing on (Mascarenhas *et al.*, 1991). General principles of PRA which Chambers (1993) describes are that it: places emphasis on learning from people (role reversal); offsets biases by seeking out and listening to more marginalized groups (e.g. the poorest and women); optimizes trade-offs of obtaining what seems like useful information against quantity, accuracy and timeliness; offer a variety of techniques which provide a natural means of cross-checking information and allows a researcher flexibility under the varying circumstances of communities; it supports facilitation and participation by encouraging people to share their knowledge; and it promotes self-critical awareness and innovation in the user. A variety of techniques will take into consideration different learning formats and experiences. It will also allow for cross-checking ("triangulation") of different opinions and observations which is essential in both quantitative and qualitative research methods. Cornwall *et al.* (1994) see PRA's strengths in its use of oral history which allows personal reflections of experiences and events and that it acknowledges that each person has his or her own perceptions of events.

Conclusion

In terms of achieving sustainable resource management, it is clear there are important links between indigenous knowledge, SA and CBRM. From the literature it is evident there is a growing acceptance of the need to involve local people in all aspects of the development process. Emphasis is on investigating knowledge differences and access to and control of resources and power relations are current issues for debate. It is now widely accepted that the top-down, imposing approaches to development are achieving little for the rural people in the South. Acknowledgment and validification of indigenous knowledge systems is a powerful means of challenging these ineffectual conventional ways of development. This means analyzing how differences in age, gender, status, wealth, political influence, *etc.* affect "who knows, who does not, and why." This will contribute to an understanding of the process by which such social differences are expressed and indicate that these differences play a significant role. The methodological challenges to access this knowledge in my research are the focus of the next chapter.

CHAPTER 3

PARTICIPATORY RURAL APPRAISAL (PRA) - COMPLEMENTARY METHODOLOGY FOR IK RESEARCH

Introduction

This chapter outlines how I spent five months in Malawi conducting research on indigenous knowledge. It describes my rationale over choosing a case study approach, and why I felt Matengambiri village fulfilled the criteria. I describe the important ethical consideration of carrying out cross-cultural research, and explain who the participants of the research were and how they were chosen. The research strategy is outlined and an overall view of my methodological framework is provided. A description of each of the 20 PRA techniques used to collect information is summarized, followed by a recounting of my personal experiences with PRA, including the highlights and criticisms. I briefly explain the statistical analysis I used to interpret sections of the data. The chapter closes with an in-depth description what I feel are the major assumptions and limitations of this research.

The Case Study Approach

My research has taken a case study approach of one village in the Chikwawa District of Malawi. Case studies are a valuable method of inquiry and is an appropriate research approach for investigating indigenous knowledge. Casely and Lury (1981) support case studies as a valid method for research in international development for a number of reasons. They provide an in-depth and detailed analysis over a period of time. As a

result, large sample sizes are de-emphasized to obtain high quality data. Case studies use a variety of methods and consequently are very flexible. The open-minded nature of case studies allows for discovery into more unexplored and poorly documented phenomenon. Case studies are essential where detail and precise information are required and thus, an important method for studying the dynamics of change over time. Case studies can provide information for a larger framework and help to influence policy for the benefit of those who have exposed themselves for the study. I experienced each of these benefits in my own research and feel that case studies are an extremely useful way to study indigenous knowledge.

A case study on rural poverty in Malawi undertaken by Roy Trivedy for Oxfam in 1987-88 confirmed the valuable insights gained by choosing this method over using structured questionnaires country-wide. Considerable time was spent by the researchers establishing trust and equality with the community which resulted in quality data from the people themselves about their problems, coping strategies and priorities (Trivedy, 1990).

A frequently expressed concern with such an in-depth approach is that it may obscure many of the broader processes one wants to investigate and limit extending the findings over a larger area. My case study involved both household and village-level data, and was complemented with an extensive literature review in order to maintain a broader focus.

Throughout this thesis I often use the terms household and community. Realizing there are many ways of interpreting these words I define them within context. Based on my past experience working in Malawian villages I identified a household in this thesis based on the heads of households, which are almost always males. It was sometimes difficult to determine whether a household was dependent or independent of another household. If a son or daughter was married, but still sharing meals with their parents I considered them as dependents and part of the same household. I define community at the village-level of interaction. Malawian villages are spatially separate from other villages and are identified by their village headman.

Site Selection Rationale

The site for my research was selected on both CURE's priorities and needs, and my own criteria. CURE has been linked to several development initiatives within the Chikwawa District for a number of years and viewed our affiliation as an opportunity to strengthen their research capacity there. A regional project staff who had been living and working with villages in the District for over 7 years, was able to provide important social and political insights into many of the villages. My own criteria for site selection considered the relative isolation of the village, the village population, and housing, all of which are described below.

I considered site isolation from major towns, roads and government facilities important to ensure that IK data obtained had not been greatly influenced by external knowledge. For

example, close proximity to a town may erode IK or make it more difficult to distinguish between what a "modern" technology and a local farming technology. Complete isolation, however, was impossible and perhaps inappropriate as knowledge is a reflection of dynamic interactions from many sources. Population size was also a determining factor in order to collect data effectively within the time frame. As only myself plus one research assistant were actively involved in the data collection I determined (based on Trivedy's findings, 1990) that the population of the village should not exceed 200 people. Finding a village of this size which fit all the other criteria was, in the end, not possible. The final site was a village of more than double 200 people. Furthermore, rented accommodation was required for both myself and research assistant for the 3 month period spent in the village. It was also deemed important that the accommodation was representative of housing conditions in the village to ensure actual village experiences were realized.

Who was involved in the Research?

Primarily my research assistant and translator, Miriam Chinyama was involved in the research process. Her sense of humor and insights to village life helped to ensure the success of this research. I hired Miriam with assistance from the Center for Social Research. Miriam is a third year student at the University of Malawi with previous experience in participatory research techniques and translating. Miriam and I spent one week of intensive preparation before moving out to our study site, Matengambiri village, at the end of August. We focused on principles of participatory research techniques, how

to conduct semi-structured interviews, techniques in translating, and importance of cultural sensitivity[5] .

Participants were selected on the basis of their knowledge for particular activities. I approached the village headman and other village elders for suggestions of possible participants, who often led to more suggestions[6] . I also viewed all situations where I was participating in an activity (e.g. collecting water) as an opportunity to ask questions. The purpose of the research was to access local knowledge about agriculture and natural resource management. Informants were subjectively chosen for the resource collections as I wanted to find the most knowledgeable people in the community regarding each particular resource. To obtain data on farming techniques and village-level resource management knowledge I tried to maintaining a cross section of age, gender and wealth. Women, girls, boys and men took part in the research. The youngest participant was 7 years old and the oldest was over 80.

Ethical Considerations

While much of the ethical considerations to be discussed are standards for social research anywhere, Warwick (1983) stresses the need to take these considerations particularly seriously in a cross-cultural setting. Dangers in poor quality research are particularly

[5] I found Mascarenhas *et al.* (1991), Chambers (1992), and NES (1992) to be useful training tools.
[6] Referred to as snowball sampling. For further information see Bernard (1994).

high for participants in the poorest of countries where political instability may result in more severe impacts.

As a researcher I felt obliged to the community by being honest about the required time commitments, objectives of the research, and sources of funding. I considered situations where information might have affected a person's job security or well-being. The community was kept informed of research progress which was done through community leaders. Particular care was given to avoid actions which might have isolated ethical or cultural understandings. My research assistant also acted as a "cultural interpreter" to explain issues which may have involved misunderstandings if translated inappropriately. Both my research assistant and I made every effort to avoid embarrassing or demeaning questions.

Throughout the research project Miriam and I made ever effort to respect the rights of privacy of each person involved. We discussed the purpose of the research with each participant and explained that they had the right to refuse to take part in it at any stage. I tried at all times to remain open-minded and approachable to give people the opportunity to ask questions about the research or about our lives. Almost all the information was discussed in the local language, Chichewa. All information provided by the participants remained confidential and field notes were kept stored to assure privacy. To avoid overinterpretation of data I try to report the detailed complexity of my research findings versus simplification, and describe findings honestly and openly rather than hiding them in technical jargon.

Research Strategy

My research can be summarized into five phases. **Phase one** involved an extensive literature review into indigenous knowledge systems, current issues in natural resource management, methodological approaches for cross-cultural research, and a historical review of Malawi. This was accomplished out over a ten month period. Predeparture language training, with the assistance of a Malawian fellow student on campus, was extremely useful as a refresher, for focusing on specific areas of my research (e.g. learning the Chichewa concept of environment), and translating my base-line questionnaire. Once I arrived in Malawi, **Phase two** consisted of a six week refamiliarization with Malawi including becoming familiar with current national environmental issues. It also provided an opportunity to meet CURE staff, learn about CURE's projects, refine my research objectives and strategy within an appropriate framework for CURE, and select a research site. **Phase three** was carried out over three months between August and November, 1996 in Matengambiri village. My research coincided with the slowest time of the agricultural cycle when farmers had the most time to participate in PRA activities and interviews. **Phase four**, one month, concluded my research in Malawi after 3 intensive months of research with the people of Matengambiri village. It was used as a time to withdraw emotionally and physically from village life and reflect on what I had learned. During this one month period I conducted a country-wide literature review to determine the extent at which indigenous knowledge has been considered in agriculture and natural resource management development initiatives. Finally, I met with various government and NGO representatives to discuss their thoughts

on the relevance of IK in development planning. Final data analysis and report writing for my sponsoring agency and CURE were also completed during this time. I presented my research to the staff at CURE, followed by discussion and feedback. **Phase five** was my return to Canada to complete data analysis and undertake the writing of this thesis.

Permission to conduct this research was gained from the Chikwawa District Commissioner, Mr. Mpanyula, Programme Manager of Ngabu Agricultural Development Division, Mr. Kaunda, Village headman Matengambiri, village elders, and the village residents themselves.

Description of PRA Techniques Used in this Research

PRA techniques have been used, and seem relevant, for eliciting indigenous knowledge and understanding local conditions (Barker, 1980; Cornwall *et al.*, 1994; Grandstaff *et al.*, 1987; Langendijk, 1996; Rajasekaran *et al.*, 1991; Richards, 1980; Schoonmaker-Freudenberger, 1994; Scones and Thompson, 1994; and UNDP, 1995). As IK is discontinuous, dispersed and unsystematized, it requires a multidimensional analysis. Certain characteristics of PRA enhance its effectiveness in studying indigenous knowledge systems: it demands investigators be exploratory and open-minded to exercise their curiosity and pursue leads; it uses a diversity of methods which more accurately reflect local perceptions and priorities; and it creates direct interactions between the research and participants thereby enhancing the researcher's appreciation of local knowledge (Cornwall *et al.*, 1994). In order to illuminate village priority concerns, PRA

allows researchers to go beyond a snapshot view and explore how conditions have evolved over time (Schoonmaker-Freudenberger, 1994). PRA techniques allow a deeper probe into community life and a more accurate reflection of who knows what, and how they have come to acquire this knowledge.

As mentioned in the literature review, participation should, as an end, entail empowerment. As the purpose of this research was to use PRA as a means of allowing people to participate in the gathering of IK information, my research can only be viewed as part of a broader participatory process. By being affiliated with an organization which subscribes to a participatory paradigm, I believe the end result has a better chance of being realized. I chose PRA for the purpose of both collecting and analyzing data (e.g. diagrams), and as a means of communication.

Mascarenhas *et al.* (1991) offers an extensive list of 33 PRA research tools which have proven successful in practice including; participant mapping, transect walks, semi-structured interviewing, time lines, folk-lore, intriguing practices and beliefs and daily activity profiles. Numerous other techniques have evolved and are continuing to evolve with more experimentation (e.g. Chambers, 1992; Thesis and Grady, 1991; and the National Environment Secretariat, 1991). For the purposes of my research, I chose 20 PRA techniques from Mascarenhas *et al.* (1991) which I felt would be able to adequately address my research questions. A detailed description of the 20 techniques are described in Appendix 3. Table 3.1 provides an over view of the methodological framework.

Table 3.1. PRA methodology framework used in Matengambiri village

PRA technique	Target	Purpose
Review of Secondary Data	n/a	Become Familiarized with current information
Self-correcting notes	n/a	Keeps track of data, focuses on gaps and problems
Base-line Questionnaire	Men and women	Introduction to the village; to collect base-line statistics
Direct observation	Men, women, children	Observe domestic and agricultural activities
Participatory observation	Men, women, children	Understand day-to-day village activities by role reversal
Semi-structured interviews	Men, women, children	Informal, conversational, but controlled and structured questioning
Historical time lines	Village headman & elders	Gives historical perspective
Transect walk	Village elders	Identify boundaries and natural resources found in and around village
Wealth ranking	Village elders	Ranks households based on wealth, wealth criteria determined by the participants
Daily activity profiles	Men and women	Identify labour divisions
Farm mapping	Men, women and children	Medium for interviewing about cropping techniques, pests, soils, etc.
Resource mapping	Men and women	Medium for interviewing about resource use, village conservation strategies, etc.
Resource collection	Men, women and children	Learn local classification systems, uses and importance of resources
Matrix ranking	Men and women	Learn criteria, choices and importance of individual items
Seasonal Resource calendar	Men, women and children	Understand resource availability throughout the year
Historical resource matrix	Village elders	Visualize environmental trends
Case studies and stories	Men and women	Understand how people cope and solve problems
Key probes	Men, women and children	Ask key questions to obtain specific information
Folklore	Men, women and children	Reveals values, history and beliefs
Future possibles	Men and women	Determine people's hopes and expectations for the future
Night halts	Village	Build trust and rapport by staying in village

Personal Experiences of PRA Techniques

Although I found PRA very appropriate for eliciting indigenous environmental knowledge, I experienced some shortcomings with the methodology. I feel it is important to raise these issues for the benefit of future researchers who interested in employing PRA, and also in the hopes they can be improved upon.

PRA does emphasize group work in many of the techniques in order to stimulate discussion. There has been some criticism with PRA that during group exercises, attention is given to particular people who are the most vocal throughout, so that the end results are not representative of all members of the community. I decided to work mainly with individuals as I was concerned over raising villagers expectations, and having equal participation during discussions. Working one-on-one with people in an active village, however, can be trying. On several occasions when we carried out activities with women, male onlookers became uninvited participants by expropriating the marker out of the women's hands during mapping or by intervening during interviewing. This is not to exclude dominant women. There were some very vocal women in the village who dominated PRA activities when they were not the original targets of the research. It was necessary to repeat some of the activities when the more dominant household members were not around.

PRA stresses flexibility of tools and allowing the community to direct the research. I had to predetermined, however, most PRA activities that were used in the research in order to

fulfill the rigorous requirements "data collection". The goal of this PRA was not to come up with a community development plan, as it often is, but as an initial step towards this process. The different demands on PRA is something that researchers and development workers alike should be aware of.

I found the children to be extremely good informants throughout the PRA activities. PRA seems to be particularly geared towards children as they enjoyed making maps, collecting resource samples, and telling folktales. Researchers should not overlook the important knowledge children hold, nor their participation in household and village activities. Although some information obtained from children may be exaggerated, I generally found children to be more honest and sincere than adult informants.

Overall, I found the mapping exercises to be the most useful of the PRA tools for my data collection. The maps served as a medium to initiate semi-structured interviews. The diagrams lead us to ask questions we might never have thought to ask. The farm maps were conducted at the map maker's fields, where possible. I found this particular useful as it allowed us to escape any distractions which may have occurred while mapping in the village, and allowed us to carry out a reconnaissance walk with the farmer prior to mapping so details were fresh in his/her mind. Resource maps were all conducted in the village. Most participants felt comfortable using pen and paper, however, we often had to help the individual get started by suggesting what to draw first (e.g. field boundary). Some of the women were not accustomed to using a pen or conceptualizing on paper. In these instances we tried to make them feel as comfortable as possible with the idea of

illustrating and let them take as much time as they needed. Often the map maker was very pleased with the result and surprised of her capabilities to make a map.

I found participant observation, night halts, mapping and resource collection the overall most informative techniques. The transect walk was the least informative, and the time lines and future possibles were the most difficult to carry out due to the difficulty most people had in conceptualizing the future or remembering dates and specific events. Table 3.2 summarizes my PRA experiences using some of the more important techniques.

Statistical Analysis

Chi-square tests were performed on the tree and soil collection data to determine the significance of the alternative hypothesis that there is a difference in knowledge based on gender and age. In comparing men and women's knowledge, and older and younger women's knowledge, seven categories were used for the tree collection chi-square test: firewood; building materials; medicine; fruit/nuts; ceremonial/spiritual; tool/utensils; and leaves/roots. The categories: ceremonial/spiritual; tools/utensils; and leaves/roots were combined for the chi-square test comparing younger and older men's knowledge as the number of samples collected by the men for these categories were small. Combining categories when sample size is small is required by the test.

Table 3.2 Summary of PRA experiences

PRA Technique	Personal Experience with Technique
Participant observation	Necessary for cross checking other PRA activities and to more clearly understanding villagers perceptions.
Historical timeline	Most productive when undertaken with two or three individuals, preferably elders who have an extensive knowledge of the village history. Most had difficulty referring to dates, but key events helped.
Transect walk	A useful starting tool as a general introduction to the area, but did not provide comprehensive information.
Wealth ranking	Useful for determining the economic status of households. Should be conducted early on to avoid biasing other PRA activities. Participants should know all households in village to rank, thus best to involve village elders. Must be careful with family names.
Daily activity profiles	Useful for understanding the division of labour.
Farm/resource mapping	One of the most useful techniques for eliciting IK as the map provided a medium with which to base further discussions and key probe questions. May not be the best technique to use with women, especially non or semi-literate women, as some had difficult conceptualizing their farms on paper.
Resource collections	Time consuming but very informative. Allow enough time, but do not start too early on. Crucial to know which village members are the most knowledgeable for this activity.
Historical resource matrix	Particularly useful after doing timelines. We used the time divisions and resources identified in the timeline discussions to base a predrawn matrix on. Again, most productive with two or three village elders.
Seasonal resource calendar	Was useful to use months rather than seasons to obtain more detail. Best conducted late in the research. A very informative tool for showing importance of natural resources.
Night halts	Necessary to build trust and a good rapport. Also important for direct and participant observation so researcher is not missing out evening activities.

Assumptions and Limitations of Research

Resulting from the complexity of people-focused research within a community setting, this research can not be considered a straight forward description of fact. In contrast it is an interpretation by myself and informants. I am critically aware that there is a cultural difference between myself and those who are the subject of my research, even though they were involved in its direction and collection. Most of this thesis was written greatly removed, in time and space, from the circumstances of field work which may also be a factor in interpretation.

Western researchers and development workers often face socio-cultural errors in their data. This is usually a result of Western formats for asking questions or presenting issues which may prove embarrassing to the participants involved. The result may prompt incorrect answers, raise suspicions or cause fright (Chambers, 1983). I attempted to overcome this by being continually aware of cultural differences and remaining sensitive to cultural needs and concerns of the people the research involved. I required this of Miriam as well.

Jones (1983) raises the aspect of courtesy biases when interviewing or conducting surveys. Courtesy bias refers to participants "expressing only views which they think the interviewer or investigator wants to hear" (Jones, 1983:253). Solving this problem involves not only understanding why this occurs, but also effort must be made to word questions so there are no "pleasing" answers. During interviews Jones (1983) stresses that one should maintain an excellent rapport and anonymity of informants, and provide a

relaxed atmosphere. I strived to follow these steps and used the positive elements of courtesy, such as accepting food or drink offered to me during an interview. Miriam and I spent considerable time establishing our own integrity to the community.

The research required considerable mental and physical stamina due to the heavy demands of constant observation, participation, note taking and re-checking of notes. It also required that both Miriam and I maintained a constant rapport with the people involved, which was particularly draining at the end of a day. Carrying water daily, sometimes twice daily, and doing laundry at the well became very time consuming as the nearest shallow well was approximately 1.5 km away, over an hour long return trip. Miriam and I were up before sun rise to draw water, and not in bed until we had discussed the days results and wrote up field notes, long after most of the village was asleep. This meant long exhausting days which sometimes affected both our enthusiasm and stamina for research. The afternoon heat added to the challenges as neither of us were accustomed to the high temperatures in the Lower Shire Valley during the dry season.

Being present during only one period in the agricultural cycle was a limitation of the research. Although my observations and activity profiles reflect the daily and seasonal activities, as much as possible I tried to question informants about yearly activities to gain a larger imagine of socio-economic factors.

With participant observation there is the chance of researchers "over-identifying" with the community in which they lived. As I had already developed many positive relationships in Malawi I was aware and prepared that this might happen. Being female resulted in my exclusion from participating in various activities or ceremonies, although it was generally not limiting. I found most men did not treat me as they would have a Malawian woman, and thus I was rarely excluded. In situations where I was excluded, to avoid missing potentially valuable information, I remained observant and asked key probe questions to people about the activity in question.

Another foreseeable concern with conducting research in rural areas is the risk of raising local expectations of what the research might yield for the community. To avoid this as much as possible I remained completely honest and open about the objectives of the study from the beginning and regularly informed and updated people about the research progress. This seemed a problem initially with some of the exercises (e.g. mapping) as participants knew what to expect when we arrived. In the end it was actually beneficial as we began to receive requests from people who wanted to be included in the activities. For example, people seemed excited about wanting to show us their fields on maps. Despite initial efforts to explain the objectives of my research, some people in the community were convinced my presence in the village meant a borehole would be installed. This initially affected discussions during research as people's expectations of me were raised. It did, however, raise my awareness of the water access problem in the village. Several weeks after arriving, my role as researcher was clearer to people which I

believe was a direct result of participant observation - specifically, the fact that Miriam and I were drawing water daily from the well along with other women. People knew I was acutely aware of the water problem and would have done something about it immediately had I the authority to do so.

As I have never conducted PRA research before, I was required to make decisions regarding choice of tools and how next to proceed based on intuition and trial-and-error. Chambers (1992) however, does reinforce the notion of the "learn-as-you-go" nature of PRA and encourages researchers to benefit by error and make changes if necessary along the way.

Although farmers did seem proud of their knowledge and were openly willing to share it with us, people still tended to view us as more knowledgeable because of our university education. Farmers would often ask us for advice on farming or forestry and said they were "just villagers" implying they felt their knowledge was inferior.

Finally, language was a barrier to certain aspects of the research. In rural areas in the Southern Region the spoken language is primarily Chichewa. Having undergone previous basic Chichewa language training WUSC had provided me with a basic level of Chichewa. Even after refreshing my Chichewa skills, however, I was still not fluent enough to carry on a conversation alone. I came to depend much more on Miriam as a facilitator than I had hoped.

Conclusion

A case study approach and PRA seem appropriate for eliciting indigenous knowledge. They allow an in-depth investigation while at the same time allowing flexibility in techniques. There are several assumptions, however, associated with social science research in less industrialized countries. The assumptions, in addition to the limitations of this case study, have been discussed in order to clarify the circumstances under which the research has taken place. Chapter four examines the broader political, economic, environmental and social setting.

CHAPTER 4

THE SETTING

Introduction

Malawi is a land-locked country in East Central Africa bordered by Mozambique, Zambia and Tanzania (Figure 4.1 inset). The country's dominant feature is the African rift valley trough which traverses the country from North to South. Lake Malawi occupies two-thirds of the trough, draining into the Shire River, and eventually into the Zambezi. The Shire Valley forms the latter one-third of the rift trough. Malawi's geographical location and physical features have made agriculture the central activity of the country. The country has 56% arable land, most of which is already under cultivation (GOM, 1993). Currently, agriculture is considered the backbone of the country's economy, and is the focal point of Malawian culture. Agriculture, however, has evolved in the contrasting settings of traditional agriculture, imposed British practices, and an independent Malawi in search of sustainable management use of its land. Malawi is predominantly composed of rural farmers who are tied to the land and their fields. My case study was conducted in Matengambiri village, which I consider to be a fairly typical Malawian community.

To place my research in context, it is necessary to briefly examine the socioeconomic and political factors which have helped to form present-day Malawi, and Matengambiri

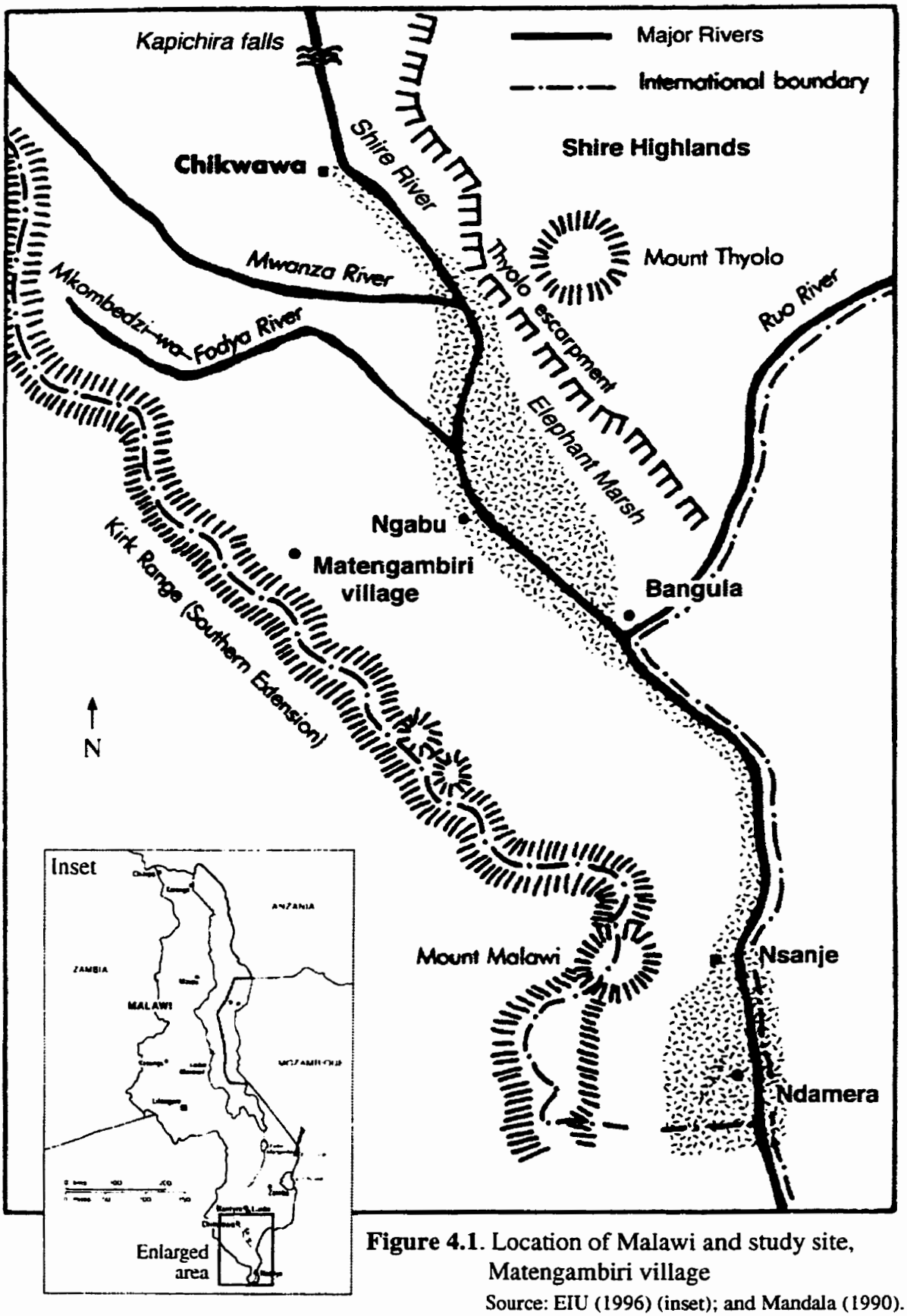

Figure 4.1. Location of Malawi and study site, Matengambiri village

Source: EIU (1996) (inset); and Mandala (1990).

village. Firstly, colonial and post-colonial policies and practices; the macro-economic setting and rural society; political structure; agricultural structure; and current environmental concerns at the national level will be discussed. Secondly, the biophysical setting; sociocultural organization; political structure; village life; and demographics and farming of Matengambiri village will be addressed.

MALAWI: BALANCING AGRICULTURE WITH THE ENVIRONMENT

Colonial and Post-colonial Policies and Practices

Colonial rule in Malawi (then Nyassaland) spanned more than 60 years during which time the British assumed a hegemonic presence, typical to British colonies of the time, over the indigenous people (Pike, 1968). At various times throughout colonial and postcolonial Malawi, the government encouraged the production of cash crops, including cotton, tobacco, and groundnuts for sale and export (Vaughan, 1987). Cash crops were emphasized at the expense of traditional crops such as finger-millet, sorghum and brush-millet which were widely grown before maize became dominant[7] due to their drought resistant qualities and wide range of temperature tolerance (Vaughan, 1987).

Local agricultural systems were seldom understood and mostly were overlooked during the colonial era. "Western opinions at the height of colonialism believed that the societies of Africa were primitive, pagan, and backward and should be "civilized" as soon as possible" (Pike, 1968:3). Vaughan (1987:64) provides evidence of an increasing

[7] Maize had probably been grown in Southern Malawi since before the eighteenth century, but did not become the primary crop until the early twentieth century (Vaughan, 1987).

prophecy of doom emanating from the Department of Agriculture and trading company, the British Central Africa Company (BCAC), in the 1930's in a quote from the manager of the BCAC: "if the natives of this country are left to their own devices they will starve themselves in a very few years - soil erosion, deforestation, poor husbandry and complete disregard of soil fertility will completely impoverish the land of this country". Consequently, agriculture officers throughout the country attempted to enforce the construction of boxridges and bunds to replace the traditional *matuto* (mounds of earth into which seeds are planted) (Vaughan, 1987). In essence, the Department banned or discouraged many long-held practices. These were considered the radical solutions needed to overcome the foreseen strain on the land, but they did not go unnoticed as many farmers resisted the changes. This was emphasized in the establishment of Agricultural Training Centers in the 1950's which initially sought to curb 'harmful' traditional agricultural practices and direct agricultural development in pursuance of colonial policies (Vaughan, 1987:153).

Historically, the colonial Department of Agriculture never considered the adaptive ability of local agricultural and social systems to survive changing circumstances (Vaughan, 1987:69). The only influences they saw which the local farming systems had were damaging ones. The Department continually advocated fallowing and the use of animal manure, however, as Paul Richards (1985:57) explains, the European technique of using manure is labour intensive and not necessarily better for managing soil fertility than traditional African practices of intercropping and crop rotation.

In 1964 Malawi gained independence from the British protectorate of Nyassaland and adopted policies which closely followed those of former colonialists (Vaughan, 1987:154). The view of development as economic growth directed independent Malawi to emphasize export crops, large-scale agriculture, and further conversion of customary land into estate land[8], thus reducing arable land for the growing rural population (EIU, 1996). Farming on customary land was seen as inefficient and therefore a constraint to increasing productivity (Napuwa, 1996).

Just as the land tenure policy has alienated farmers, the country's forest policy has focused on plantation development for economic incentives, and stiff control and regulation of trees on customary land (GOM, 1996a). The message conveyed by the Forestry Department was one of complete government ownership over all the country's trees, which clearly provided disincentives for community reforestation projects. The independent government became decidedly against community supported natural resource management under an administration which increasingly focused on didactic approaches (Stevenson, 1997). Although the government which has promoted these approaches is now out of power, these systems have created a great deal of distrust and animosity among farmers toward the Government.

Following the first multi-party elections in 1994, the newly elected government has made substantial policy changes. Significant developments include: the development of a

[8] In a 1990 government report it was estimated that only 28% of estate land was actually under cultivation (EIU, 1996).

National Environmental Action Plan (NEAP), progress towards a land reform policy, a revised National Forestry Policy, and the formation of the Ministry of Research and Environmental Affairs (MOREA) whose mandate is to guide these changes.

NEAP was the consequence of two factors: Malawi's participation in the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, 1992, and the government's commitment to greater environmental responsibility under a new constitution drafted in 1994 (GOM, 1994). The new Malawi Constitution, Chapter 111, Section 13 (d) requests the government to:

> ...manage the environment responsibly in order to: 1) prevent the degradation of the environment; 2) provide a healthy living and working environment for the people of Malawi; 3) accord full recognition to the rights of future generations by means of environmental protection and sustainable development of natural resources, and; 4) conserve and enhance biological diversity of Malawi (GOM, 1994:3).

NEAP's purpose is to act as a reference document for planners and developers to ensure that environmental protection through environmentally sound practices is integrated into all development programmes, with emphasis on greater public participation.

In addition to NEAP, the government is currently in the process of formulating a National Land Use and Management Policy, the first set land policy in the history of the country (Napuwa, 1996). The draft policy recognizes the inequitable and unsustainable use of land resources since the country's independence. Thus, NEAP provides guidelines and strategies to enable Malawi to restore balance among government departments and

agencies, particularly in favor of smallholder farmers, to achieve sustainable resource management on a national level (Napuwa, 1996).

The Ministry of Natural Resources has finally recognized that the *Forestry Act* of 1942 is outdated and inadequate in enabling local communities to participate in forest conservation and management (GOM, 1996a). Included in the goals of Malawi's new National Forestry Policy is the removal of former restrictions on access to the use of forests and forest products, and the promotion of equity, participation, and forest ownership by local communities (GOM, 1996a).

The Macro-Economic Setting and Rural Society

Of Malawi's 11 million inhabitants 90% live in rural areas (World Bank, 1995). Malawi's economy is intensely dependent on agriculture, and is facing severe pressure from a rapidly increasing population of 3.3% annually (EIU, 1996). More than 80 percent of the total population obtain their living, directly or indirectly, from farming (GOM, 1993). Agriculture is characterized by a dual structure of large estates, contributing to 70 percent of agricultural exports, and smallholders, accounting for 30 percent of exports in addition to feeding itself (Spring, 1988). Although contributing little to national exports, the smallholder group accounts for 80% of the national population (World Bank, 1995). Large estates produce export crops including tea, tobacco, groundnuts, cotton, sugar, coffee, pulses and rice. Due to the lack of mining and limited industry, the country relies heavily on foreign capital and foreign exchange

realized from agricultural export to provide the capital for developing other sectors (Chirwa, 1992).

The majority of Malawians live in dwellings made of locally available materials (Nelson *et al.*, 1975). The most common house in rural areas is a hut made of a frame of branches with mud packed walls and floor, grass thatched roof and a wooden door. Wealthier houses and commercial establishments such as tearooms and grocery stores are often distinguished by baked brick instead of mud and a corrugated iron roof instead of thatch. Rural households, and many in urban areas, rely on wood for fuel and use a simple three stone fire to cook on.

The average size of a smallholder Malawian farm is less than 1 hectare, which is diminishing with population growth (GOM, 1993). Local varieties of maize, over hybrid varieties, are preferred by farmers. Maize is the dominant smallholder crop and used in the national staple meal called *nsima*. The remaining land is cultivated with other food crops and a smaller portion (6%) is allotted to cash crops (GOM, 1993). Smallholder agriculture is characterized by hoe cultivation and minimal inputs - most farmers (70%) do not use commercial fertilizer (World Bank, 1995). Inadequate access to land has forced many smallholder (56%) to seek wage employment and casual labour (*ganyu*)[9] for income needed to acquire food supplements, pay for school fees, clothes and agricultural supplies (GOM, 1993). Smallholder labor constraints are at their peak during the most

[9] Data on smallholder annual income (both cash and in-kind) is unreliable.

critical agricultural period, planting and weeding, which coincides with the time when the poorest farmers must also seek *ganyu*. Economic differences among smallholder farmers relate to size of holdings, amount of off-farm income, use of farming inputs, adoption of technologies, and the level of education (World Bank, 1995).

A distinct sexual division of labour is reported for Malawian agriculture. According to the 1977 National Census, 70% of all farm work in smallholder agriculture is carried out by women (GOM, 1993). Vaughan (1987) describes crop residue burning as solely a male responsibility while women help clear the land, plant, hoe and cultivate along with men. Harvesting, seed selection, and the storage and processing of food crops, however, are entirely the responsibility of women (Vaughan, 1987). Increasing demands on the off-farm labour of men has meant that women have taken on more responsibility for agricultural production (Vaughan, 1987).

Major constraints facing smallholders are intense land pressure, soil erosion and environmental degradation (GOM, 1993). As the population grows, further divisions of agricultural land is occurring which will result in increasing soil erosion, decrease of soil fertility and an overall decrease in land productivity. Competition for agricultural land was intensified with the conversion of customary land into estate land. As this practice has been stopped it is hoped some of the pressure for agricultural land will be relieved. Depletion of forests, caused by the increasing demand for fuelwood and building poles is also threatening the quality of the environment. Whether or not traditional farming

practices and environmental management is still adapting to the environment under these pressures will be addressed in Chapter five.

Political Structure

The administrative system in Malawi consists of Central and Local Governments and Traditional Authorities. Eight National District Administrations directed by District Commissioners (D.C.s) are the main link between the Central Government and Traditional Authorities (GOM, 1993). D.C.s, in addition to coordinating development activities, also work closely with the Rural Development Programmes (RDP) and supervise the Traditional Authorities. Under the District structure are Area Development Committees (ADC) representing several villages under the authority of the Traditional Authority (TA). These committees are chaired by TAs and coordinate development activity at their level. At the village level there are Village Action Committees (VAC) chaired by village headmen. The structure of the organization of VACs, and level of participation by villagers varies from village to village and is greatly dependent on the energy and enthusiasm of the VH. Both committees, the ADC and VAC, are responsible for identifying local priorities for development which are passed on to the District Administration for funding consideration. The political system is generally considered well structured with the necessary channels in place to reach the local level. Lack of decentralization and devolution at the local level in terms of decision-making, and limited interaction with villagers to promote participation, however, have limited the systems effectiveness (GOM, 1993).

Although the Traditional Authority system in Malawi still remains strong and adherence to customary law persists, authoritative responsibility between traditional and local governments are becoming blurred. Geographically close villages are grouped into areas which fall under the rule of a Traditional Authority who overseas a hierarchy system from group headmen, sub-village headmen, down to the village headmen (VH). The VH represents the top authoritative position at the village level and is responsible for law and order and settling minor disputes within the village. He is usually a descendant of the head of the lineage which first settled the unoccupied land and is considered the owner of the land (Nelson *et al.*, 1975). The Chichewa term *mfumu*, used to honor people of high rank, is also interchangeable with "village headman". The most important function of the VH is the allocation of land to villagers (Nelson *et al.*, 1975). Land is considered communal property in the village and rights to use a plot of land is inherited within a family line, however, when one leaves their land unattended or uncultivated for a period of time, the VH has the authority to redistribute it (Pachai, 1973). Under the VH are the council of elders, mostly male, and various committees for directing forestry, agriculture, health, and other sectors. These levels, from VH to committees, are responsible for overall development of their villages.

Other influential bodies in Malawi is a large non-governmental organization (NGO) presence, although their involvement is limited to small geographical areas and concentrated in specific parts of the country with donor driven agendas. There is a need for greater NGO and local institutional involvement in the Government's decision-making process to create alternative and flexible mechanisms to develop the grass-roots level (Nkunika, 1996).

Agricultural Structure

In light of the importance of agriculture in the economy, the government has focused on this sector since independence (Chirwa, 1992). With slow increases in national agricultural production and the realization that smallholders have been neglected in national development planning, the government launched the National Rural Development Programme (NRDP) in 1977 (Chirwa, 1992). The NRDP was designed to increase production of the smallholder sector (which had lagged behind the estate sector) by concentrating on improving agricultural inputs and services, research, extension, credit and marketing (Spring, 1988).

Administered by the Ministry of Agriculture, the NRDP has become the main system for instituting research and agricultural extension services for farmers. The NRDP is divided into eight Agricultural Development Divisions (ADDs) covering all regions of the country. Although ADDs were created to decentralized decision making, reduce bureaucratic constraints, and facilitate participation and involvement of local farmers (Chirwa, 1992), ADDs are still highly directed through policy by the Ministry of Agriculture headquarters in the capital (Mkandawire and Ferguson, 1990). Each ADDs had two to five Rural Development Projects (RDPs) which are funded by donors or government revenue. With the RDPs are Extension Planning Areas (EPAs), the smallest units in the agricultural extension services hierarchy which have identifiable topographical boundaries that each contain an average of 5,000 farm families.

At the local level, the linkage between Government and farmers is through Field Assistants (Fas). FAs are the ones who carry out day to day agricultural extension, but typically receive little inservice training. They are responsible for carrying extension messages over EPAs by foot, bicycle, or occasionally motorcycle. Ngabu ADD, for example, employs 125 extension staff for 100,000 farm families over a 6,840 Km^2 area (Venema, 1991). Thus, each FA is responsible for reaching 800 farm families and covering more than 50 Km^2 by bicycle each week, excluding the daily commute from their homes to work. Problems of scattered settlements and lack of transportation make it difficult to reach many farmers, although it is surprising how extension messages are carried even between remote villages through farmer-farmer communication.

Despite its potential, extension services have been criticized as giving commodity specific advice in a "blanket form" regardless of the farmers needs or the existing farming system of a given area (Mkandawire and Ferguson, 1990). Farmers are often viewed as targets of change whose participation is limited to applying recommendations as instructed (Mkandawire and Ferguson, 1990). Extension messages revolve around the use of hybrid varieties, application of fertilizers and pesticides, thus farmers who have capital to invest in such purchases tend to be the only benefits of theses extension messages (Mkandawire and Ferguson, 1990). Farmers who have little capital realize the extension messages will do little to improve their farming techniques and therefore eschew the training sessions.

Smallholder agriculture in most regions of the country is characterized by a *munda-dimba* cycle. *Munda* (plural *minda*), also a term for field, is a rain-fed agricultural regime based upon the cultivation of fertile drylands (*mphala*) (Mandala, 1990). Farmers grow major staple and cash crops (e.g. maize, sorghum, millet, cassava and cotton), which tend to be drought resistant varieties, on minda. The word *dimba* in Chichewa denotes a supplementary field (often termed a garden) cultivated on floodlands (*dambos*), but since the early nineteenth century these have contributed almost as much to national food security as the *munda* system (Mandala, 1990). *Dimbas* are more fertile due to the annual replenishing of nutrients from flooding and thus, can support more diversity than *minda*. *Minda* are cultivated for a period of about 7-8 months from November to May, during the rainy and cool seasons. *Dimbas* are cultivated during the dry season for 3-4 months on areas normally underwater in the rainy season. The significance of the *munda* system in any region depends on the availability of *dambo*, which in turn is dependent on annual water levels (Mandala, 1990).

CASE STUDY DESCRIPTION: MATENGAMBIRI VILLAGE

Biophysical setting

Most of the information in this section, and the remaining chapter, was collected from a base-line survey carried out in Matengambiri village. Details of the base-line survey are discussed in Appendix 4.

My case study took place in Matengambiri village located in the semi-arid Lower Shire Valley (LSV) region within the Chikwawa District of Malawi (Figure 4.1). The LSV is bounded by the Kirk Range along the Western Malawi-Mozambique border and the Shire River and Thyolo escarpment in the East.

The vegetation in this low lying area is described as Brachystegia, or dry savanna, woodland named after the dominate tree species found here (Shorter, 1989). In general, the Brachystegia woodland in the hot dry climate of the LSV is characterized with leafless trees half the year, areas of grass scattered with trees, and bushy thickets which quickly regrow after cultivation or heavy grazing (Shorter, 1989).

Agriculture in the LSV holds productive potential, but suffers from a low and unreliable rainfall . Due to the presence of the vast Shire River the area has historically been seen as an ideal site for large agricultural development projects based on irrigation. The LSV is currently a major area for smallholder cotton production (introduced at the turn of the century) and contains a large irrigation-fed SUCOMA sugar estate. The natural regions and land classifications for the LSV are highly diverse. The area around Matengambiri village is described as having gently undulating hills, stony shallow soil with more fertile pockets, and hazards of erosion on slopes (GOM, 1975). Recommended land use is moderate to low intensity cultivation and grazing (GOM, 1975).

Matengambiri village is under the Traditional Authority (TA) of TA Ngabu. The village is approximately 5 Km West of the Mozambique border and 15 Km East of the town of

Ngabu where the nearest operational health center is located. Ngabu maintains one of two district Agricultural Development Divisions (ADDs) and a Rural Development Programme (RDP). Between Matengambiri and Ngabu is a government run maize and cotton trading center (ADMARC), employing people from surrounding villages. The closest government protected area, Lengwe National Park, lies approximately 20 Km to the North.

There are no roads to the village, only foot and bicycle paths (Figure 4.2). The one major stream, Chimbamira River, and the many smaller streams surrounding the village, are seasonal and dry up in the hot, dry season. Thus, the quality and availability of water presents major problems. Heavy rains in the rainy season contaminate the streams with soil, and animal manure. During the dry season, 3 to 4 shallow wells are dug into the Chimbamira River bed where people from 3 surrounding villages and their livestock compete for the limited resource. During the hottest months a woman may have to wait up to a one hour to access water which takes away time from other tasks (Plates 4.1 and 4.2). Although other shallow wells and a borehole are in the vicinity of the villages, Chimbamira is the most reliable throughout the dry season. Other problems characterizing the area agricultural land shortages, the overabundance of livestock, and lack of a nearby market or clinic.

One basic primary school, with one employed teacher, is located near the village and serves Matengambiri as well as many of the neighboring villages. The village has four

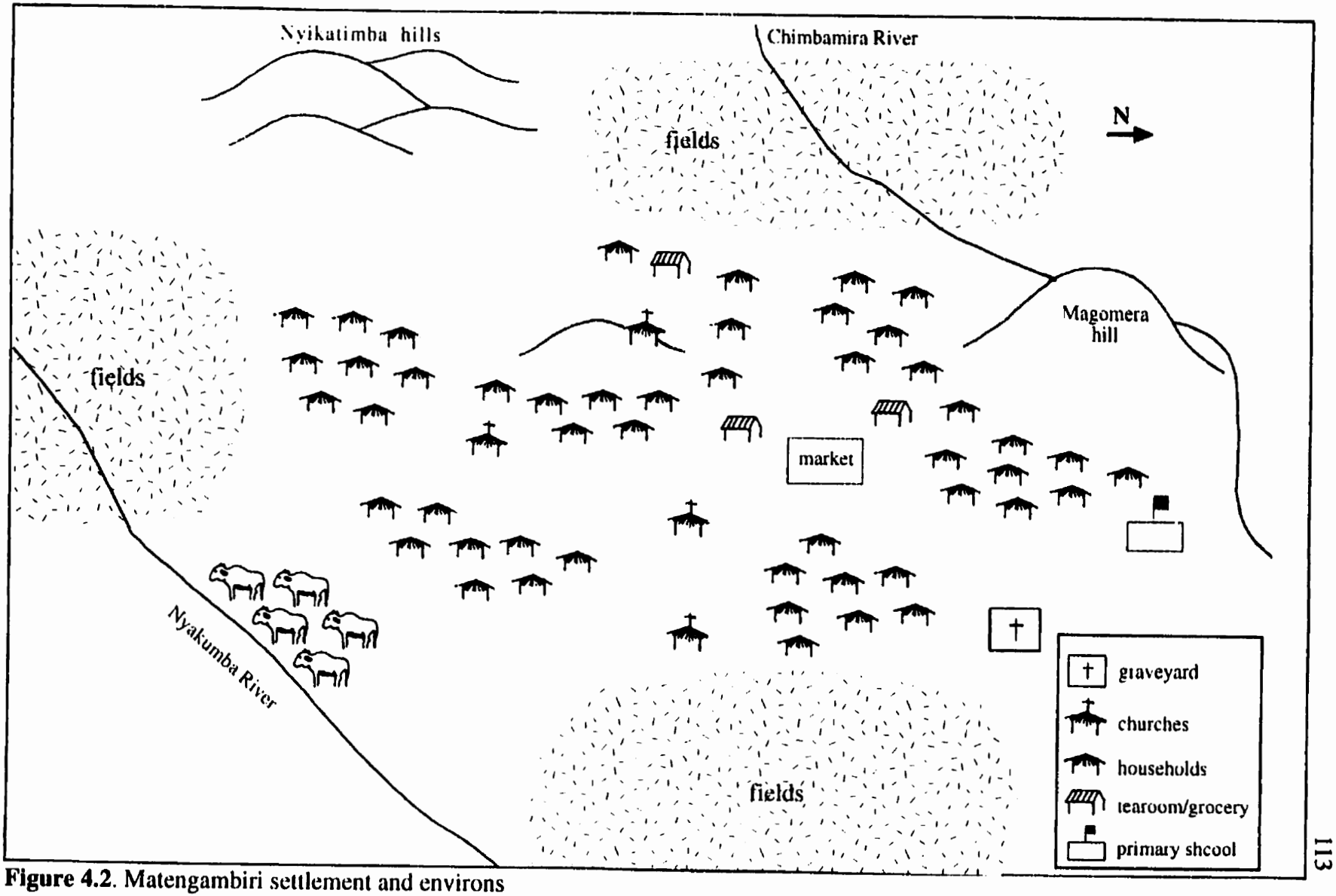

Figure 4.2. Matengambiri settlement and environs

Plate 4.1. Women of Matengambiri village and surrounding villages collecting water at a shallow well at six in the morning.

Plate 4.2. Water collecting during the dry season when the water tables are low requires more time to fill buckets and inevitably longer waits at the shallow well.

churches (Seventh Day Adventist, Jehovah Witness, Evangelical, and Nyassaland Mission), one basic grocery store, and two tearooms. Under a very large *mtondo* tree in the center of the village, people from Matengambiri village and neighboring villages sell fresh vegetables, beans, homemade cornmeal cakes, and dried fish from Mozambique. One to three people, three to four times per week can be found selling food at the small, informal market.

Interviewed informants described three annual seasonal changes in season: the cold season (June - July); the hot, dry season (August- October); and the rainy season (November-May). This classification agrees with the Ngabu meteorological data, shown in Figure 4.3. The agricultural cycle described by informants start with the arrival of the rains and commences with planting in November. From mid-December to the end of March constant weeding and guarding of crops against predators are required. Informants commented that the demand for agricultural labour is at its peak during this period. Harvesting of maize and millet occurs in April, followed by sorghum in May. Cotton is more labor intensive as it is a semi-perennial requiring two harvests (July and August). Land preparation occurs throughout August to October which may result in competition with *dimba* garden cultivation and harvest.

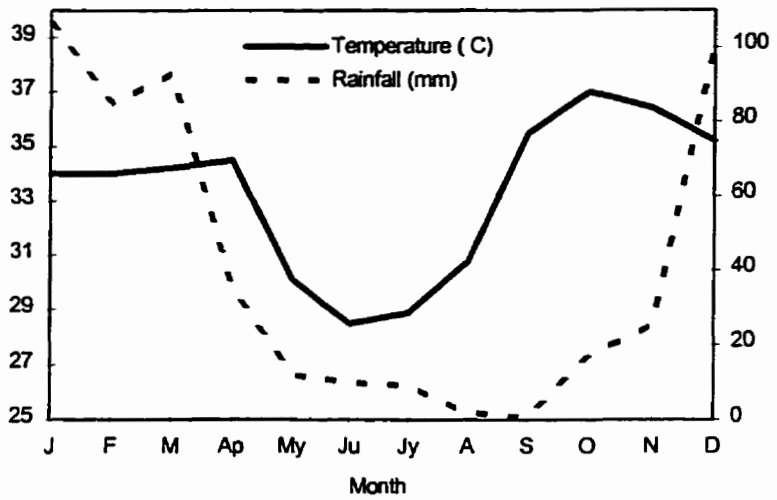

Figure 4.3. Average daily maximum temperature and average daily rainfall for Ngabu Boma over a five year period (1991-1996).
Source: data was compiled from the Ngabu ADD Meteorological center

The transect walk across Matengambiri village highlighted four distinct biophysical zones: *dimba* gardens; hills; central village; and main fields (Figure 4.4). The areas differ significantly differ in terms of soil type, hydrology, natural vegetation, food and cash crops grown, and presence of livestock. *Dimba* gardens and fields may be as close as 0.5 km to as far 5 Km from the village. Farmers explained the far distances were a result of village expansion, location of fertile areas, and control of livestock predation to the fields.

Social organization

The LSV was traditionally dominated by the Mang'anja peoples who are descendants of the early Maravi thought to have immigrated from the Congo basin before AD 1500 (Nelson *et al*, 1975). Turbulence in neighboring Mozambique as result of Portuguese rule during the early 1900's prompted the Sena people to filter into the LSV and settle in

Approximate distances 0 Km — 1 Km — 2 Km

Elevation (metres) 280 - 240 - 220 -	Dimba Gardens		Hills	Central Village	Main Fields (Minda)
	Chimbamira River →				
Soil	Yachulu and Yoyers		Yamiya; Mchenga; Yamiya	Nseti; Mkande	Nseti; Nchete; Mkande
Water	Flooded in rainy season; moist in dry season.	River	-	-	-
General Vegetation	Bounded by many species of trees (Mpacassa, Ntete, Mvunguti, Njale); taller grasses (Wanje and Mlaza)		few trees (e.g. Mtondo); mostly shrubs; and tall grasses used for thatching (Kambalembale, Nsanu)	Many species of trees (Mlambe, Nfula, Ntudza); short grasses (Kumbumbu, Mtsinde)	Many fruit trees; mixed grasses (Kangona, Nenjere, and Tsekera)
Food Crops	tomatoes, cabbage, maize onions, peppers, lettuce, rape, potatoes, sweet potatoes, banana, papaya		-	-	maize, millet, sorghum intercropped with potatoes, beans, peas, cucumbers, and pumpkins
Cash Crops	mango, banana, sugar cane, groundnuts		-	-	maize, cotton
Livestock	-		goats and cattle	chickens, pigs, doves, goats, ducks, cattle	goats and cattle
Comments	low lying area; very productive; used mainly during the dry season		some soil erosion and signs of overgrazing	trees planted to control wind erosion; water shortages; many livestock	agroforestry, intercropping, and allecropping practices

Figure 4.4. Transect walk across Matengambiri village

villages under Mang'anja headmen. Although originally in reference to people from the Mozambican town of Sena, the blanket term "Sena" is used for all immigrants who trace their origins from the Sofala and Tete provinces of Mozambique (Mandala, 1990). Today, the Sena ethnic group occupies most of the Nsanje District and the Southern portion of the Chikwawa District (Nelson *et al.*, 1975).

The composition of Matengambiri's people is a reflection of these ethnic group dispersions. Located on the Northern limits of the Sena distribution and Southern limits of the Mang'anja distribution, Matengambiri village has a mixed ethnic composition. Although the precise composition of the village was difficult to determine, many of the villagers claim Sena ancestry. This is evident since the village's patrilineal[10] system of marriage and inheritance, a Sena characteristic, where cultivation rights pass from a man to his eldest son. Both Chichewa (the language of the Mang'anja) and Chisena (the language of the Sena) are spoken in the village, although Chichewa is dominant.

From my discussions with village elders, I found that most long established community members belong to one of three main families. Limited time, however, prevented us from pursuing kinship interrelationships amongst and between families. Kinship in the village is often distinguished by subgroupings of huts where relations live in the near vicinity of each other. Kinship, or the extended family, provides a form of social security in the village. This is categorically expressed in times of stress such as floods or locus

[10] The patrilineal system is linked with the practice of having a married couple reside in the husband's village.

plagues. Sharing food supplies and meals with relatives is one of the main coping strategies to relieve food insecurity. It is uncertain whether or not the extended family has the capacity to continue buffering the situation of land shortages and food insecurity in the future (GOM, 1993). Traditions of self-help are also seen through informal social networks evident in examples such as reciprocal work on each other's lands, borrowing tools, and exchanging food items. Sharing is as much of a social obligation as an economic necessity for the survival of the village. Family segregation, however, results from friction amongst family members. Groupings among non-related families also occurs from religious similarities.

An informant indicated that more than 50% of the villagers regard themselves as Christians or Muslims. The villagers believe in a Supreme Being called *Mulungu*, which has provided a convenient point for Christian missionaries to introduce the concept of God. Part of the village belief system has been eroded or replaced by Christian elements is evident by the disappearance or alteration of certain ceremonies traditionally held in the village. In spite of religious affiliation many continue to believe in ancestral spirits, witches, traditional healers, and diviners. Traditional value systems still guide the day-to-day lives of the community, despite the obvious presence of a Western influence. Traditional beliefs and practices are closely tied to the environment and ancestral spirits (*mzimu*). Maintaining harmony between the environment, spirits and other community members, often determines and guides people's course of actions. Witchcraft, for example, operates between villagers when disputes arise and fear of it provides a

mechanism for social control, such as fear of conspicuously owning more resources than someone else. The efficacy of traditional medicine and traditional healers is believed even by the more well-educated, and wealthier villagers who can afford Western medicine and health clinics. People will consult a traditional healer first with medical problems and will only visit health clinics when traditional medicine has failed. Major ceremonies associated with special events in the life cycle (birth, puberty, death), stages in seasons involving cultivation and harvest, and honoring spirits are still practiced. The importance of traditional beliefs and practices will be examined further in chapter five.

Political Structure

Knowledge and management of natural resource relates to issues of control, access and ownership which are not homogeneous in the village. The same general knowledge is shared throughout the village, however, different groups have access to different types of information. Protecting this information maintains one's status and position in the community. As discussed earlier in chapter two, knowledge also becomes a source of power. Knowledge and power divisions within the village are based along lines such as political leadership, age, gender, wealth, and kinship.

Different forms of decision making are found within the village. The positions of VH, elected political party representatives, and the village elders are the most recognized and influential. Village headman Mebisoni has been VH of Matengambiri for 5 years, and is the third VH of Matengambiri village. He is also group village headman for 5 villages

within a 10 Km radius of Matengambiri. Although not originally from the village, the current VH was asked to take up the position, and relocate from his home 20 Km away, due to kinship ties with the former VH. The VH is generally considered a good village leader, however his outside origins has created a degree of distrust in the current VH who is still viewed by some as an outsider.

The village Malawi Congress Party (MCP) and United Democratic Front (UDF) representatives, who are male and are also part of the village council of elders to whom people seek advice. Their positions, along with other male village elders are fairly influential. There are no women on the council of elders, although there are powerful female elders who people informally seek advice from. The traditional healer also holds an influential position in the village based on his vast knowledge of medicinal and spiritual uses of plants. The traditional healer receives money for applying this knowledge which significantly adds to his farming income. He recognizes the value of this knowledge and guards it carefully.

Men are often the head of the household and make most decisions regarding land use and money expenditure. Control over the use of land is usually determined by men which disadvantages women's position in the village as land is highly valued. Women's social position requires respect and obedience for male authority and limited participation in decision-making at the village level. Men tend to take on more community leadership

roles and as a result, women are often under-represented on village decision-making bodies.

Women's social responsibilities are centered around the family and farm. Women's responsibilities and allocation of time for household and farm activities are greater than those of men. Results obtained from activity profiles with 3 women and 3 men clearly show that certain tasks are gender specific (Table 4.1).

Table 4.1. Women and men's daily activity profiles

Activity	**Approximate Time Required to Complete Activity (hours)**	
	Women	**Men**
Personal (hygiene, eating)	1.5	1.5
Agriculture	6	6
Collection of firewood/water	2.5	-
Washing (clothes, dishes)	1.5	-
Pounding grain	1	-
Cooking	2	-
Tending livestock	0.5	1
Construction/repairs (fixing roof, fencing)	-	1.5
Rest (visiting, reading, listening to radio, playing games)	2	6
Sleep	7	8
Total	24	24

Non-agricultural activities are clearly defined along gender divisions. Firewood and water collection, food preparation and washing clothes/dishes are entirely the responsibility of women (Plate 4.3) , while men's main responsibilities are construction and maintenance of buildings and kraals, and feeding/herding livestock. I observed other tasks not included as daily activities which also follow gender divisions. For example, women are the clay-pot makers and constructors of mud walls and floors of houses, while tasks like grass collecting, grass mat making, tool making, thatching, and hunting are left solely to the men (Plate 4.4). Gender division of tasks also reflects knowledge differentiation between men and women regarding aspects of village life. Knowledge differences among women also depend on if they hold a midwife position. Knowledge differentiation along gender lines will be expanded on in chapter five.

Wealth and kinship also effect degrees of control over resources. In Matengambiri village, wealth and kinship are linked in that the oldest family residents are also the wealthier families. These families tend to have the larger plots, best agricultural land and maintain dimba gardens. Some of the families are also part of the council of village elders. Poorer households tend to be the more recent immigrants and they also farm less fertile areas and do not own dimba gardens.

Demographics

The baseline data indicated that Matenbambiri village is comprised of 70 households, with a total population of approximately 432 people. The majority of the population are children (307 children: 125 adults). The average number of people per household is six.

Plate 4.3. A women in Matengambiri pounding maize kernels into flour.

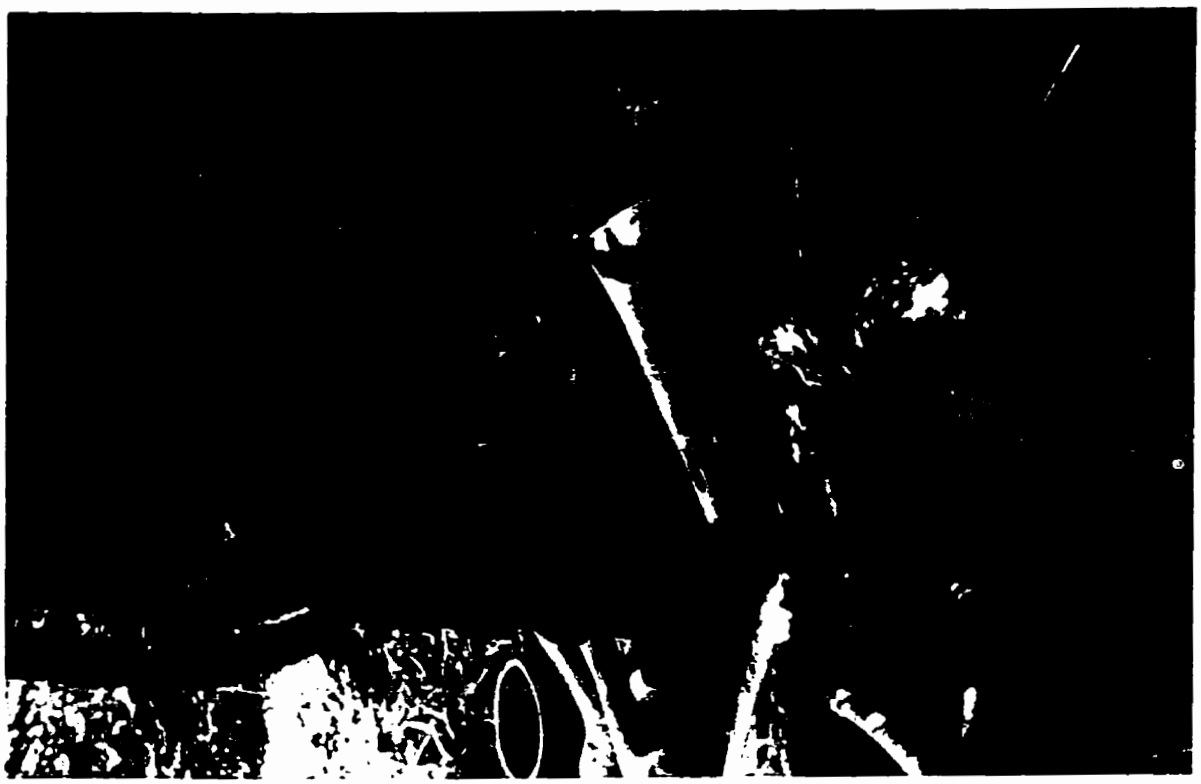

Plate 4.4. A man in Matengambiri village making a hoe.

Housing in the village is nationally typical of the rural mud and thatched buildings described earlier in the chapter (Plate 4.5). General attendance at schools is low. Malawi's formal education system is based on a three tiered system of a primary level (standards 1 - 8), secondary level (Forms 1 - 4) and university. Only a small percentage of the adult population is educated beyond a primary level (Table 4.2). Women have a low attendance (40%) compared to men (82%). According to the national level, over 50 % of the country's population have attended some level of schooling (GOM, 1993). Matengambiri village is comparably higher, where at least 59 % have obtained some level of education. Of those who have attended school, men finished at a higher level (standard 5) than women (standard 3).

Table 4.2 Adult Formal Education in Matengambiri Village[1]

Education Level	Females	Males
No formal education	58 %	13 %
Primary	40 %	76 %
Secondary	none	6 %
University	none	none
Not sure of level attained	2 %	5 %

[1] The source of this information was compiled from the base-line questionnaire.

Less than a quarter of the adult population (22 %) are employed in off-farm work (Table 4.3). Only 5 out of 28 people who work off-farm are women. Only one (the teacher and his family) of the 28 does not farm in addition to his off-farm work. Almost all households, therefore, are involved in farming, growing most of the food they consume. Basic items found in all households include soap, cooking oil, matches, and salt which

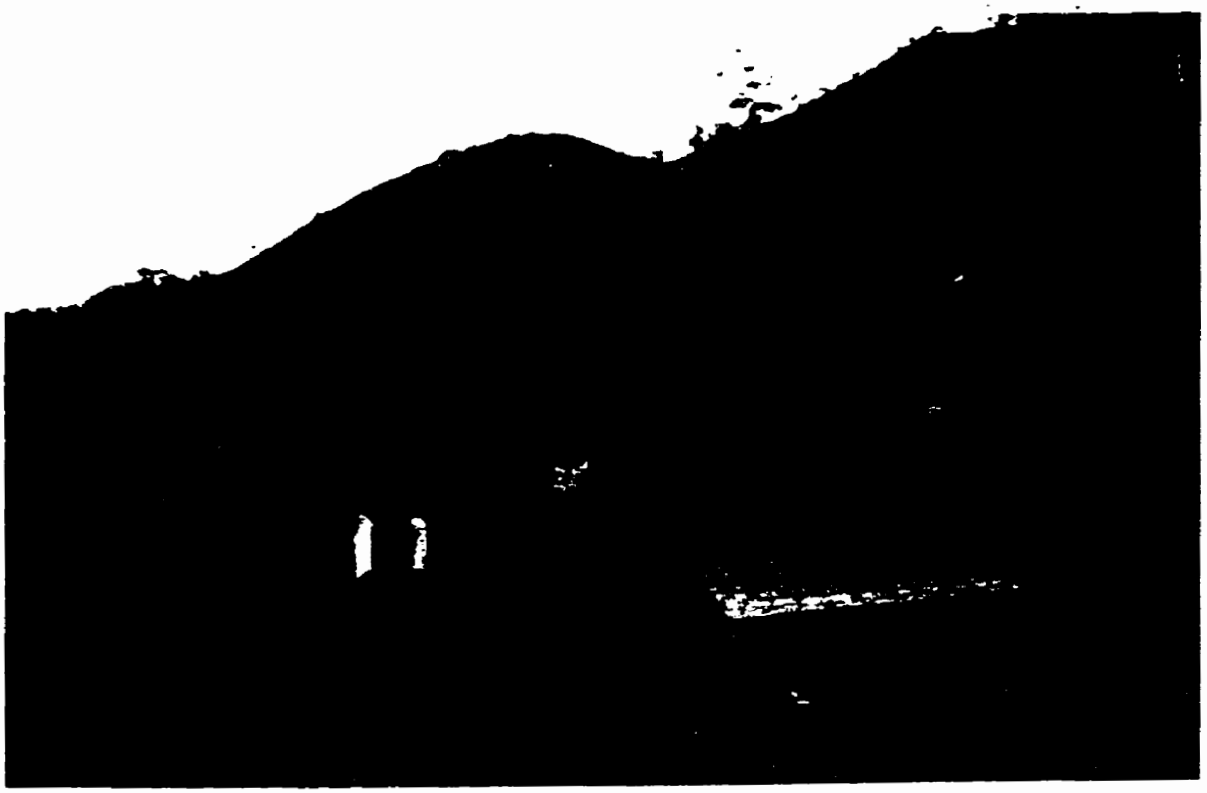

Plate 4.5. A typical house in Matengambiri village with mud walls and grass thatching.

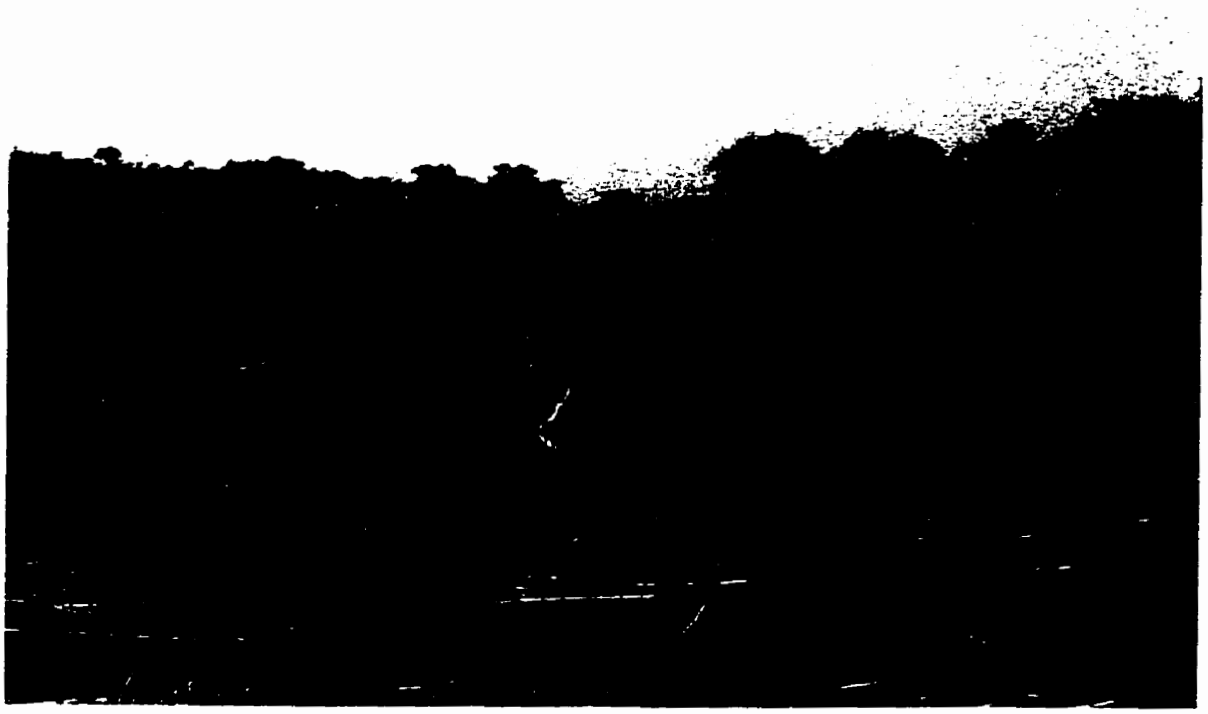

Plate 4.6. A women in Matengambiri village cultivating her field.

can be purchased or bartered for in the village or neighboring villages. Wealthier households may posses tea, sugar, and rice which they must purchase in Ngabu as it is not locally available. Income-generating activities are important to village life and include: beer and *kachasu* brewing that is traditionally controlled by women, collecting and selling thatching grass, wild fruits, and surplus vegetables done by women and children, and making agricultural tools, mortar and pestles, mats, and baskets which is performed by men.

Table 4.3 Off-farm employment in Matengambiri village[1]

Position	Number of People
Health extension officer	1
Teacher	1
Cotton factory labourer	4
Private farm labourer	11 (5 are women)
District council staff	1
ADMARC labourer	9
SUCOMA labourer	1
Total	**28 (22 men; 5 women)**

[1] The source of this information was compiled from the base-line questionnaire.

There is a cattle farm near by which provides jobs to 11 men and 5 women in Matengambiri village. Women and children sell fodder grass to the farm and thus, indirectly benefit. Overall many people are grateful for the farms economic opportunities, however, the cattle effect the quality and quantity of the water. There are also conflicts between the cattle owner and the villagers over rights to access the water resource in the dry season when the water is limited. The farm owner prevents villagers from access one of the shallow well so that a pump can be installed in order to bring

water up the hill to his cattle. People are unhappy and inconvenienced with the farmer during the dry season, but no one has yet raised the issue with him as they are fearful of loosing the revenue his farm brings to the village.

Farming in Matengambiri

Matengambiri farmers are subsistence farmers[11] obtaining most of the food they eat from their land and selling excess produce. Similar to the nation's smallholders, Matengambiri farmers are hoe-cultivators (Plate 4.6) and use basic farming implements (Table 4.4). The average land holding size per household is 1.4 hectares, which is slightly more than the national average. All smallholders own or rent their agricultural land. Although complete landlessness among households is almost nonexistent most farmers commented that they could use more agricultural land.

The main crops grown are maize, millet and sorghum. Cotton is the major cash crop and is grown by most farmers and requires cash output for pesticides. Cotton is harvested twice from the plants in one growing season. A diversity of other crops are grown together with the main crops in the *munda* (main fields). In addition to *minda*, farmers with access to the resource also cultivate dimba gardens along seasonal streams which support a greater diversity of crops. Most farmers keep a few livestock, primarily goats and chickens, which are used for both household consumption and sale.

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[11] Subsistence farming is generally defined as farming which produces food mostly for farmers own consumption. "They [farmers] do this by producing food that they need to consume, and/or indirectly by producing commodities for sale to earn money to buy goods and services they need but do not produce themselves" (Bernstein, 1992:31).

Table 4.4 Farming data for Matengambiri village[1]

Farming Characteristic	Description of Quantities and Type
Farming implements used	hoes, axes, panga knives, sickles, oxcart (1), ploughs(2)[2]
Average farm size	1.4 hectares[3] (3.46 acres)
Main crops	maize (98%)[4] millet (87%), sorghum (84%), cotton (80%)
Dimba garden and other crops	okra, pumpkins, peas, beans, Irish potatoes, sweet potatoes, cassava, tomatoes, groundnuts, papayas, bananas, sugar cane, mangoes, watermelon, cucumbers, onions, cabbage, Chinese lettuce, rape, and other *masamba*.
Number of households keeping livestock	58 (83%)
Livestock kept	goats (50%), chickens (41%), pigs (29%), ducks (9%), doves (7%), and cattle (5%)

[1] Source of this information was compiled from the base-line questionnaire.
[2] only one farmer owned an oxcart and two owned ploughs
[3] many people had difficulty estimating their land holdings, e.g. several farmers told us they owned more than 8 hectares which we found to be incorrect when we visited their farm. Those answers which were suspiciously large were cross-check with informants and incompatible data was omitted from the calculations.
[4] percentage of farmers growing the crop or keeping livestock

Farmers do not use artificial fertilizers on their *munda* or *dimba* gardens. Very few farmers use animal manure, the reasons for this were raise by Richards (1985) and discussed earlier in the Chapter. Farmers indicated the soil around Matengambiri is fairly fertile. Artificial pesticide purchased from the local ADMARC is used by 81% of farmers. Most farmers (80%) use it for their cotton cash crop and a smaller percentage use it on maize crops. Numerous conservation strategies are employed by farmers and will be expanded on in chapter five.

Apart from what is grown, diets are supplemented with wildfruits, nuts, mushrooms, insects (grasshoppers, flying ants, sand crickets) mice, small wild birds, wild grass seed, and occasionally bushmeat (e.g. bushpig, klipspringer, duiker, bushbuck, hyrax, rabbit, and francolin) . Informants stated, however, that bushmeat is difficult to find these days. Wild grass seed, which is pounded into a flour and used as a substitute for maize meal, is generally only harvested during times of food stress, but is critical at those times.

Conclusion

In summary, the colonial and post-colonial influences in Malawi have had played a large role in shaping Malawi's agricultural-focused economy and policies. Rural Malawian farmers and their practices, throughout Malawi's history, have been considered an obstacle and a constraint towards the development of the country. Their input and insights have generally not been acknowledged in past agriculture and natural resource policies. Current environmental trends in the country, however, allude to the fact that this approach has not been effective in managing and conserving the country's natural resource base. Farmer's knowledge has resisted, adapted, and evolved under this settings. Matengambiri village has provided a representative setting to allow me to listen, understand and learn how farmers relate to their environment. The following chapter describes the results of this effort.

CHAPTER 5

PRA ANALYSIS OF INDIGENOUS ENVIRONMENTAL KNOWLEDGE AND ITS IMPLICATIONS FOR NATURAL RESOURCE MANAGEMENT

> For most Africans, land is more than a source of wealth; it is sacred. It gives people life, and so they believe that they were entrusted with it and must, in return, treasure it (Jefferson and Skinner in Dyasi, 1985:98).

Introduction

This chapter examines the indigenous knowledge findings of agriculture and natural resource management in Matengambiri village. The results are divided into three parts. Part one describes villagers' natural resource knowledge of trees, grasses and soil. Part two examines ten aspects of indigenous farming techniques. Part three investigates village-level resource management based on traditional laws, customs and spiritual beliefs. In each section I describe the farmer's or village perceptions of their environment and then discuss the practical implications of how this knowledge contributes to the management of agricultural land and surrounding natural resources. The differentiation of knowledge in the village will be discussed along selected socioeconomic criteria, specifically; wealth, kinship, gender, and age, and the ramifications of this for control and access to resources will be considered. Throughout the chapter, I discuss and compare my findings with other existing information in Malawi and link my results to the literature review.

PART ONE: NATURAL RESOURCE KNOWLEDGE AND CLASSIFICATION

The following three sections describe farmers' identification, classification, and use of trees, grass and soil. Resource collections undertaken by the farmers and subsequent discussions with farmers showed that empirical features are used to identify and classify plants and soil types. This information, along with practical experience and use of a resource, are factors which assist farmers in making important decisions throughout the agricultural cycle. Although there is no one name for "plant" in Chichewa, collector's generally divided them into four basic categories: *mtengo* refers mainly to trees; *chitsamb* describes shrubs and small woody plants; *maudz* are grasses and grass-like plants; and *bowa* are edible fungi (although not in the plant kingdom, they are grouped with plants by villagers).

Tree Identification and Classification

Two men, two women and two children participated in a leaf collection which took place over one month. A total of 116 trees were identified by participants, but only 100 were able to be scientifically identified. Appendix 5 lists the common and scientific names, and local uses of the trees collected. A "sample" consisted of a small branch with at least two leaves, and, where possible, one fruit and/or flower from the same tree. A small incentive of 50 tambala (about 5 Canadian cents) was offered for each leaf sample collected. The amount was small as I hoped it would be viewed as an incentive for participation rather than payment for a task. Samples were collected within a 5 Km radius of the village. Collectors tended to visit our house in the evening following work

in their fields, bringing the samples as they collected them each day. This proved an effective system as the samples were generally fresh, making identification easier, however, collection and identification took much longer than expected. I initially did not stress to collectors the importance of mature leaf samples, which may appear quite different from young leaves of the same tree. When young leaves were the main sample, collectors were asked to recollect samples. Certain trees were difficult to positively identify, particularly those belonging to the genus Acacia because of the small and indistinct differences between species. Where identification was in doubt, two to four more samples were requested of collectors to verify tree characteristics. Positive identification of scientific names was made possible with the expertise of the National Herbarium staff in Zomba, and the use of botanical reference books (Coates Palgrave, 1991; Shorter, 1989; and Williamson, 1956). Most of the samples were from indigenous species, however, I have included exotic and naturalized trees as the collectors indicated they are also important to village life. As a final note on identification, there were some discrepancies with common names. For example, the letters "M" and "N" are interchangeable in the Chichewa language as are the letters "L" and "R". Where the spelling of common names varies I have indicated the alternative versions (refer to Appendix 5).

Interviews with collectors revealed that Chichewa common names for trees are by no means ambiguous, but rather are descriptive and based on vegetative, reproductive, physiological and agronomic characteristics. This is interesting because it indicates that

the indigenous and Western classifications rely on similar criteria, namely phenotypic characteristics. The collectors classified trees based on shape, smell, size and color of leaves; appearance of seeds; seed development; shape, size, smell and color of flowers; timing of flowering; absence of flowers (male trees); presence or absence of fruit; as well as the ecological considerations - climate, soil, slope, and altitude. Local tree names used by the villagers also distinguish male and female trees of the same species. Two names, *Mwamunatsanya* and *Tsanya*, are used for the species Colophospernum mopane (mopane tree), where the prefix *Mwamuna* refers to male. Local plant names also tend to have a functional purpose. The tree name *Kafupakapendae* gives reference to the strength of its wood by comparing it to fish bones: *fupa* meaning "bone", while the name *Gonanibwino* refers to the tree's edible leaves: *gonanibwino* means "sleep well", which is what one does on a full stomach. Similarities between scientific and traditional African plant taxonomies have been documented by other researchers (Brokensha and Riley, 1980; Morris, 1980, and Gata, 1995). Although not thoroughly investigated in this research, ascertaining traditional plant names and classifications have demonstrated that they have an intrinsic interest in their own right. Efforts should be made by extension staff and development workers to learn the local names of plants and animals which may provide further insights about the local culture and land-use systems. Furthermore, the villagers' perceptions of the environment are also reflected in their management practices which will be discussed in part two and three.

Tree Use Amongst Different Social Groups

Upon receiving the tree samples, the collectors were interviewed about the uses for each tree. Thirteen uses were cited by collectors including: building and fencing; ceremonial and spiritual; fertilizers; fibre; firewood and/or charcoal; edible fruits and nuts; edible leaves; medicinal; pesticides; poisons; resins; tools and utensils; and windbreak and shade trees. Table 5.1 summarizes tree uses by the four collectors.

Table 5.1 Summary of Trees Uses by Gender and Age

	COLLECTOR					
	Females		Males			
USES	<50 yrs (n=56)*	>50 yrs (n=37)	<50 yrs (n=50)	>50 yrs (n=71)	12,9 yrs (n= 42)	TOTAL[1] SPECIES
Firewood	30	27	2	20	7	53
Building materials	3	10	16	26	22	50
Medicinal	5	18	13	20	8	45
Fruit/nuts	17	14	7	10	16	22
Windbreak/shade	-	-	7	9	11	13
Ceremonial/spiritual	9	5	2	4	4	12
Tools/utensils	1	5	8	7	4	11
Leaves/roots eaten	5	4	1	2	4	10
Fibre	-	-	2	6	2	7
Resins	-	1	1	2	1	4
Poisons	1	-	1	2	-	3
Fertilizers	1	-	-	3	-	3
Pesticide	-	-	-	1	-	1

* n = number of samples collected

[1] Total number of different tree species for each use obtained by all collectors

The most common tree uses, as shown above, are firewood (53%), building (50%), and medicinal purposes (45%). Medicinal cures using the roots, leaves, bark, seeds, stem fluid and fruit of trees were purported for a wide variety of ailments. Examples include lesser ailments such as stomachs, headaches and sore throats, to serious diseases like malaria, bilharzia and venereal diseases (detailed in Appendix 6). Table 5.2 summarizes the medicinal uses of trees. Leaves, bark and roots are the most commonly used tree parts for medicine. I observed prudent harvesting of various tree parts for medicines which ultimately had the effect of preserving the health of the trees and thereby sustaining harvests for the future. For example, one man collecting a tree root for medicine selected a large tree of the species required, cut only a small portion of the root he needed, and was mindful to cover the remaining root with soil. Also where bark removal occurs, people rarely return to the same tree which saves individual trees from being completely girdling, and thus killed. These examples suggests practices that avoid interference of tree growth and health and result in the conservation of vital trees which is important for future harvesting. The end result of these practices is sustainable use of the resources.

Table 5.2 Summary of Medicinal Uses of Trees

Part Used	Number of Species	Number of Uses
Root	19	15
Leaves	22	20
Bark	12	13
Seeds	2	2
Stem fluid	2	2
Fruit	1	1

From semi-structured interviewing I found that midwives and traditional healers have a specialized knowledge of trees which other villagers do not possess. Elderly women appeared to be particularly knowledgeable about tree species used for childbirth, contraception and maturity ceremonies. Female elders are often midwives and seen as a source of wisdom to younger women, which their medicines help to reinforce. The knowledge of the female elders is gradually passed on to younger women relatives by informal teachings and observation. Traditional healers also possess specialized knowledge of medicinal tree uses which they, on the otherhand, carefully guard. Although most members of the village possess knowledge on how to treat common aliments, the traditional healer is used for diagnosing and treating more serious medical problems. He is also sought for fortune telling, witchcraft, aphrodisiacs, and to perform spiritual ceremonies. As this is a source of income to the traditional healer, he closely guards his knowledge of medicinal trees and recipes for treatments. The traditional healer informed us that he will start to pass on his medicinal knowledge to his young son when he becomes old enough, thus specialized knowledge tends to remain in the family. After two months we did gain the trust and respect of the traditional healer who allowed us to join him on collecting expeditions and thus, was willing to share some of his recipes. He was extremely cautious of listening ears, however, and let us know that he left out at least one ingredient in each of his recipes to protect them. This was a caution to prevent them from being reproduced.

Given people's intimate connection with, and dependence on, their surrounding environment, it was not surprising to find many different uses for trees around the village. Collectors described many of the trees as multipurpose - 64% were indicated as having more than one use. Farmers are not only able to identify valuable tree species, but they are also aware of which trees are the most threatened from overexploitation. Men frequently indicated that a number of important species used in house construction are becoming more difficult to find. Trees such as *Ndama*, *Nkunku*, *Mpacassa*, and *Kagolo* were mentioned as once being very common. A similar concern over firewood and fruit trees was repeatedly mentioned by the women during informal discussions. Women noted the above species shortages for firewood, in addition to *Nchelenge*, and *Bwemba* fruit trees. Although overexploitation of resources is perceived by men and women, the difference in exploited species is an indication of division of labor and knowledge.

The tree collection revealed that knowledge of trees is not uniform throughout the village. As expected, elderly farmers are more knowledgeable about tree uses than younger farmers. Chi-square testing using the data on Table 5.1 revealed that difference in tree use knowledge between the younger (<50) and older (>50) women collectors (chi-square = 24.71775; df = 6; $P<0.005$), and between the younger (<50) and older (>50) male collectors (chi-square = 8.400746; df = 4; $P<0.1$) were significant. The greatest differences in knowledge of uses between the younger and older collectors was found for building materials and medicines. I was surprised at just how many species the two children identified. This may be attributed to learning from observing and through

assisting at very young ages with adults in their work. Overall, age and gender were found to be factors in knowledge differentiation in the village.

In order to address differences in knowledge between genders, a chi-square testing was conducted using data from Table 5.1. The test revealed that differences in knowledge are significant between women and men (chi-square = 42.87146; df = 6; $P<0.005$). The differences indicate that women possess more knowledge about which trees make good firewood and which trees produce edible fruit, while men have more knowledge about which trees make better building poles and tools. As women are the primary wildplant and fuelwood gatherers, they are aware of the plant's growing conditions, locations, and limited species, as compared to men. Men however, are solely responsible for selecting and cutting trees for construction and tool making and thus, are intimately familiar with various wood strengths and their resistance to insect. Children also hold a wealth of knowledge with regards to wildplants as they are often required to assist their mothers or older female relatives with the harvesting. In general, awareness about gender and age divisions in perception of tree importance should be highlighted, as the needs of women are often still not considered in forestry programs or agriculture training. Womens' participation and decision making in farm work is dismissed as insignificant in the planning of development programs as a result of the traditionally dominant role men exercise in Malawian families.

Knowledge of Fruit Tree Seasonality

Based on information from the tree collection (Table 5.1), discussions were held with six collectors to determine the extent of knowledge regarding the twenty indigenous species identified as bearing edible fruit. Four discussion groups were established and composed of: two children interviewed together; two women interviewed together; and two men interviewed separately. I intended to interview the men together, but continuously conflicting schedules resulted in separate interviews. Table 5.3 illustrates the results from these discussions regarding the seasonal harvest time of wild fruits. Women were aware of a greater number of fruit bearing trees than the men, which corresponded with the tree collection data (Table 5.1). Women and children gave broader ranges for fruit harvest times than men. During participant observations I found women and children were primarily responsible for collecting wild foods during firewood and water collecting trips and during their return from the fields. On a few occasions I observed men carrying fruit back to the village following work in the fields, however, the fruit was from naturalized species (e.g. mango, papaya or masawo) which were growing in their fields. I never observed men actively searching for wild fruit off their fields.

The summarized results in table 5.3 show that edible wild fruits are harvested throughout 10 months of the Gregorian calendar year. No wild fruit is available in the months of March and April, and only one type of fruit is available in February and May. This has implications on food security as wildfoods are major diet supplements and are limited during these four months of the year. Consequently, these months also coincide with the period of greatest food stress for most households prior to crop harvest. Periods of food stress results in households relying more heavily on kinship support and greater

dependence on wild foods. Development interventions which aim at increasing food security should consider not only the importance of wildfoods to rural diets, but also the timing of their harvest in relation to other farm activities, economic value of fruits, and who the primary gatherers are. As women are also responsible for a large degree of the farm labor, a decline in wildfruits and increasing time spent on harvesting would have an impact on the entire family.

Table 5.3 Wild Fruit Seasonality Based on Four Discussion Groups

		Months											
Common name	**Scientific name**	**Ja**	**F**	**M**	**A**	**M**	**J**	**Jy**	**A**	**S**	**O**	**N**	**D**
Bwemba	*Tamarindus indica*							1*	2	4	4		
Dowa	*Cardiogyne africana*								3	3	4	4	2
Kasikiribanda	*Deinbollia nyikensis*										2	4	4
Masawu	*Zizyphus mauritania*					2	4	3	3				
Mtondo	*Cordyla africana*	3	2								1	4	4
Matondobwinja	*Staphania abyssinica*	2										3	3
Mfuma	*Diospyros mespiliformis*							1	3	4	3		
Mkuyu	*Ficus sycomorus*										4	4	
Mlambe	*Adansonia digitata*						2	4	4	4			
Mphimbi	*Garcinia livingstoni*										3	4	4
Nchelenje	*Berchemia discolour*								4	4	3		
Nchuluswa	*Lanea stulmanii*											3	2
Nfula	*Sclerocarya caffra*						2	4	4	3	4	2	
							(fruits)			(nuts)			
Njale	*Sterculia appendiculata*									2	3		
Nsekese	*Bauhinia thonningii*								2	4	4		
Ntacha	*Pleurostylis africana*											3	3
Ntalala	*Zahna africana*	3										4	4
Nteme	*Strychnos spinosa*	3									4	4	3
Ntengene	*Ximenia caffra*										3	4	3
Ntudza	*Flacourtia indica*										4	3	2
Nyongolo	*Friesodielsia obovata*	4										3	4

* numbers represent the total number of people (maximum four) who listed the particular month as a harvestable date for the fruit

The literature review revealed that only general vegetation information exits for the area around Matengambiri village. The Land Resource Appraisal of the Ngabu ADD (GOM, 1991), based on a 1971 vegetation and soil survey are considered the best general land resource data base to date for the Southern Region. It describes 15 common trees for the vegetation zone where Matengambiri village lies. Jackson (1972), however, lists only 14 common species for the region. A more extensive three year study was conducted in Lengwe National Park (20 Km from the village) which identified 75 tree species occurring within the park (Sherry and Ridgeway, 1985). None of the above mentioned sources described the local uses of trees, using only botanical approaches. The only comprehensive document which I have come across which details Malawian plant uses is "Useful Plants of Malawi" (Williamson, 1956). This reference document covers all regions of the country, but describes only 45 of the 100 trees identified in this research. Scant information of fruit tree knowledge in Malawi is available. Mauambeta (1994) conducted a broad literature review for his M.Sc. thesis on the role of fruit trees in farming systems in Eastern and Southern Africa, including Malawi. The Forestry Research Institute of Malawi (FRIM) (Coote *et al.* 1993a, 1993b; and Lowore *et al.*, 1995) have undertaking several socio-economic studies throughout the country to investigate how indigenous trees are being used and what interest and opportunities exist for communities to become more involved in their management and access. The work by both Mauambeta and FRIM are the first attempts to address forestry limitations and potentials in Malawi by investigating existing knowledge and practices of rural villagers.

Limitations in the exogenous literature in describing the importance of trees from the perspective of the local people is, in part, a result of past overemphasis on economically important species by the Department of Forestry. As a result, reforestation, woodlot and agroforestry research in Malawi has focused primarily on exotic species. Lack of success with past government-run programs suggests a need to redirect forestry conservation and management efforts towards understanding which trees are important to who, and why in a community. Ranking species abundance and comparing it with tree use; and determining the value of each species to different socioeconomic groups, would be beneficial in identifying target species for afforestation or reforestation projects.

The Uses and Importance of Grasses

Investigating local grass knowledge was not in my original research strategy, but was included as we became aware that grasses are key environmental indicator species, along with trees, for most farmers. Farmers also described several grass grains used for survival food during years of drought or crop failure. As it was included later, knowledge of local grasses were compiled in a more informal manner as compared to the soil and tree collections, and were based on discussions with male and female farmers while working in the field. From the discussions, a total of 18 different types of grass were identified with the assistance of staff at the National Herbarium and use of botanical guides (Jackson and Wiehe, 1958; and Binns, 1972). Table 5.4 presents the various uses for each grass as described by informants.

Table 5.4 Grass uses in Matengambiri village

Chichewa name	Scientific name	Uses
Bango	*Phragmites mauritianus*	heavy grass used to make mats, walls of houses, doors and sometimes roof
Gugu	*Sorghum verticilliflorum*	building fences
Jogo	*Ischaemum brachyatherum*	sign of soil fertility; birds like to eat seeds
Kambalembale	*Urochloa mossambicensis*	thatching and feeding livestock; only found on hillsides
Kapepe	*Leptocholoa panicea*	seeds eaten during times of food stress
Kavulele	*Aristida adscensionis*	sign of poor soil fertility
Khombombo	*Eragrostis chapellieri*	sign of poor soil fertility
Kumbumbu	*Hyperrhenia filipendula*	top layer of finer thatching grass; fodder for livestock
Luba	*Chloris gayana*	sign fertile soil
Mlaza	*Borassus aethiopum*	making mats, rope, brooms
Msonthe	*Rottboellia exaltata*	sign of fertile soil
Mtsinde	*Sporobolus pyramidalis*	sign of overgrazing
Nkoka	*Brachiaria deflexa*	seeds eaten during times of food stress
Nsanu	*Heteropogon contartus*	sign of poor sandy soils
Nsenjere	*Pennisetum purpureum*	planted to hold moisture; sign of fertile soil
Tedze	*Vetivaria nigritana*	planted to hold moisture
Tsekera	*Hyperrhenia gazensis*	walls in house building; bottom layer of thatching grass
Wanje	*Setaria palustris*	bottom layer of thatching grass; sign of fertile soil

Informants indicated that grasses are mainly important for grazing goats and cattle, and for thatching. I will discuss thatching grass at this point and leave the discussion on grazing and herd organization for part three under the village management systems. Village houses needs re-thatching approximately every 3 - 4 years and requires about 20 - 25 bundles (each one a heavy headload) to cover an average size house of $20m^2$. Thatching is not an easy task as enough quantities of two different types of grass are

needed: a longer, heavier bottom layer; and a finer top layer. Grass collecting sites are considered communal access for the entire village and are located on many hills surrounding the village. There is no active village management of these areas, nevertheless informants did allege that conflicts arise when grass collection sites are burnt during the hunting of small animals or when fires escape from charcoal making. These conflicts are typically dealt with by the village headmen and/or village elders or, if unresolved at the village level, are taken to the traditional court in Ngaub. Access may also be problematic during drought years when poorer households would be competing for grass seeds among each other and against cattle owners for fodder. Economically, grasses are important to specific groups in the village as I observed many women, and some children, bundling thatching grass intended for sale at the local commercial cattle farm and at the Ngabu market.

Only two species were mentioned for agricultural use. *Nsenjere* and *tedze* were recognized by informants as being useful for soil moisture retention. Both of these species are found growing along the banks of the Shire River nearly 40 Km away from Matengambiri village. The Department of Agriculture is actively promoting *Njenjere and tedze*, along with contour ridges, as moisture and soil retaining mechanisms. As I did not see any grasses planted on contour ridges in fields around Matengambiri it appears that most farmer do not practice this, but were aware of the practice from agricultural extension officers or other farmers. The reasons why farmers did not practice planting grasses for soil and water retention were not clear, however, I observed

that all fields around Matengambiri were cultivated on flat or slightly sloping ground which minimizes soil and water run-off. Travel distance to collect the grasses may have some bearing on the farmers' decisions as well.

The Senior Land Husbandry Officer of Ngabu ADD commented during a discussion that *tedze* grass (known widely as vetivar grass) has been promoted within the district for the last three years under a national program called PAPPPA (Poverty Alleviation Program Pilot Project Agroforestry). He said that *tedze* is the only indigenous grass currently being researched in Ngabu ADD, however, he was unaware of any district projects which investigated farmer knowledge and local uses of other grasses (Moussa, 1996). This is consistent with government-run agricultural programs, as discussed in Chapter four, which tend to carry national messages not necessarily compatible with local practices or environments.

Indigenous Soil Classification and Land Use Systems

Two women and two men participated in the soil collection. A small incentive of K1.00 was offered for each "sample" (the equivalent of about 10 Canadian cents), which consisted of a small quantity (about half a cup) collected in a plastic bag (Plate 5.1). Each individual was interviewed about their samples and covered topics including, What is the name for this soil type?, Where is this soil found?, What type of crops can grow here?, and What type of wild plants would normally be found growing in this soil?.

Plate 5.1. A farmer showing his five soil samples.

The collectors were then asked to rank each soil according to its usefulness to them where "1" represented the most useful, and "5" up to "8" represented the least useful depending on the number of soil types collected. Farmers identified eight soil types within a 5 Km radius of the village (Table 5.5). The two elderly collectors identified the greatest number of soils, although the overall differences between age and gender was not extensive.

Table 5.5 Summary of Farmers Participating in Soil Collection

Collector's Age (Sex)	Number of Samples
>50 (F)	8
>50 (M)	6
<50 (F)	5
<50 (M)	5
Total samples	24

The collection revealed that Chichewa soil names are based on color and texture. Farmers described the different soils using qualitative characteristics including appearance, ability to retain moisture, and texture. Soil classification and ranking by farmers are summarized in Table 5.6. Soil samples were subsequently taken to the Ngabu Agriculture Development Division and classified according to the surface texture criteria used by Land Husbandry staff (e.g. clay, clay loam, heavy clay, sandy clay) for comparative purposes. Many of the soil characteristics described by collectors are related to the agricultural potential of soils. For example, *nseti* soil is rich in organic matter and the most preferred soil for all crops. Soils were also classified contextually based on the

Table 5.6 Traditional soil knowledge and classification

Chichewa Name	Rank*	Found	Soil Type	Farmer Description and Remarks
Nseti	1 (n=4)	fields, dimbas, and forest	clay loam	very productive, "strong", brown/grey soil, no need for fertilizers; fairly 'sticky', but not as sticky as Makande; can grow crops even if there is no rain; all crops can be grown on it, especially maize; doesn't break easy; many trees associated with it especially fruit trees e.g., Nchelenje, Masawo, Nkhuku
Makande	2 (n=4)	fields and village	clay	"strong" dark soil; most crops will grow on it; "stickier" than Nseti soil; can be difficult to cultivate; good for making bricks, walls, and floors of house; many trees associated with this soil
Yoyers/Ya Pamamba/ Nchete	3 (n=4)	fields	sandy clay loam	"dusty" when dry; fairly well drained; makande/sand mix; if there is no rain this soil is useless to grow crops; good for sorghum, millet and cotton; ok for maize; used as a paint on the outside of houses; associated vegetation: Ndama, and Bwemba trees, and Khavelele grass
Yofila	4 (n=3)	fields, river-beds, termite mounds	heavy clay	very "strong" black soil, but dries fast so it needs lots of rain to grow crops; "stickiest" type of soil when wet; cracks when dry; cassava, cotton, millet; wild rice; will grow here, but not maize; good for making pots; associated vegetation: Nkhuku and especially Masawo trees; Nsekera, Jogo, and Kavulere grass
Yachulu	5 (n=3)	fields,	sandy clay	some sand in it; very fine and "dusty", no humus; needs lots of rain to grow crop; fair for beans and cotton; poor for sorghum; stronger than yamiya soil; doesn't stick well; breaks easily when dry; associated vegetation: few trees grow here (Ndama); and only short grasses (Khombombo, and Kavulele)
Yamiya	5 (n=3)	hills	loamy sand	"thirsty" soil; cracks when dry; brown; no crops grow on it not very sticky, but stickier than Mchemga; associated vegetation: Ntalala and Bwemba trees; Nkhoka grass
Mchenga	7 (n=1)	hills, river-banks	sandy loam	very "thirsty"; sandy, coarse, gravely; yellow-brown; no crops grow here; associated vegetation: masawo, mango trees; msonthi grass
Yosakan-ikira	8 (n=2)	forest, river-beds	sand	similar to Mchenga soil: loose soil, doesn't "stick"; associated vegetation: few trees grow here (Ndama Kagolo, Nyandima, Chipota); Kavulele grass

*The rank is expressed as the mode (the most frequent rank) according to farmers. "n" represents the number of farmers (maximum 4) that collected the particular type of soil. The total "n" = 24.

environment in which it is found, particularly the associated vegetation (e.g. trees and grasses). When I questioned each collector about the associated vegetation found growing on a soil none of them had difficulty in providing numerous examples.

Farmers must be familiar with the soils in their fields in order to select crops that best suit the soil type. Both men and women ranked soils according to what crops were most likely to grow in the soils. Metaphors are frequently used to portray soil conditions in different states. The men used a *ulesi* factor or "laziness" factor to describe a soil's sand content and "stickiness" to indicate the amount of clay in a soil when wet. "Sticky" soils are considered to be strong moisture retaining soils while sandier soils are considered very "lazy" because they do not retain rain or nutrients well. "Thirsty" describes fertile-poor soil which may be a temporary condition and improved by crop rotation. Both of the men used a "pinch test" to show how easy each soil breaks up and blows in the wind. The term "dusty" was used to describe dry soils with a sand/clay mix of finer particles. Neither of the women used the *ulesi* factor or pinch test to describe the soils but did consider additional criteria for ranking that the men did not use. Women, in addition to crop considerations, also rank soils based on household uses. For example, *yofila* soil is good for making pots and *nchete* soil is used for painting exterior walls. Farmers in Matengambiri village work within small plots taking advantage of any change in microhabitat and plant accordingly. Their classification of soils is relative and site-specific and based on different practical experiences with crop growing.

Soils in the region are generally described as shallow to moderately deep, well drained, medium textured and stony (GOM, 1975). Detailed soil evaluations and land-use criteria have been established from the Land Resource Appraisal of Ngabu Agricultural Development Division (1991). According to the appraisal, soils under Matengambiri village are classified as being moderately to marginally suitable for rainfed agriculture. The principle limiting factors are considered to be rooting depth and low moisture availability (GOM, 1991:106). Extension staff use the appraisal as a guide to assist farmers in selecting appropriate crops and general land-use planning. The appraisal, based on 'agro-ecological zones' uses divisions of not less than 100 km^2 to define agricultural potentials. Given the amount of variation farmers described in soils between neighboring fields and even within fields, this criteria is very broad and may be inappropriate to utilize small fertile plots as Matengambiri farmers do.

PART TWO: FARM CONSERVATION AND MANAGEMENT PRACTICES

Participant mapping exercises were used to gather information about local farming conservation and management practices. Farm mapping was conducted right in the field being mapped, and was preceded by a reconnaissance walk with the farmer which acted as refresh so that details of the field were clear in his or her mind before drawing. Map making lasted anywhere from 1 1/2 to 3 hours for each map depending on the distance of the farmer's field and how comfortable the person was with using pen and paper (Plate 5.2). Participant mapping exercises resulted in 14 farm maps and 8 resource maps drawn

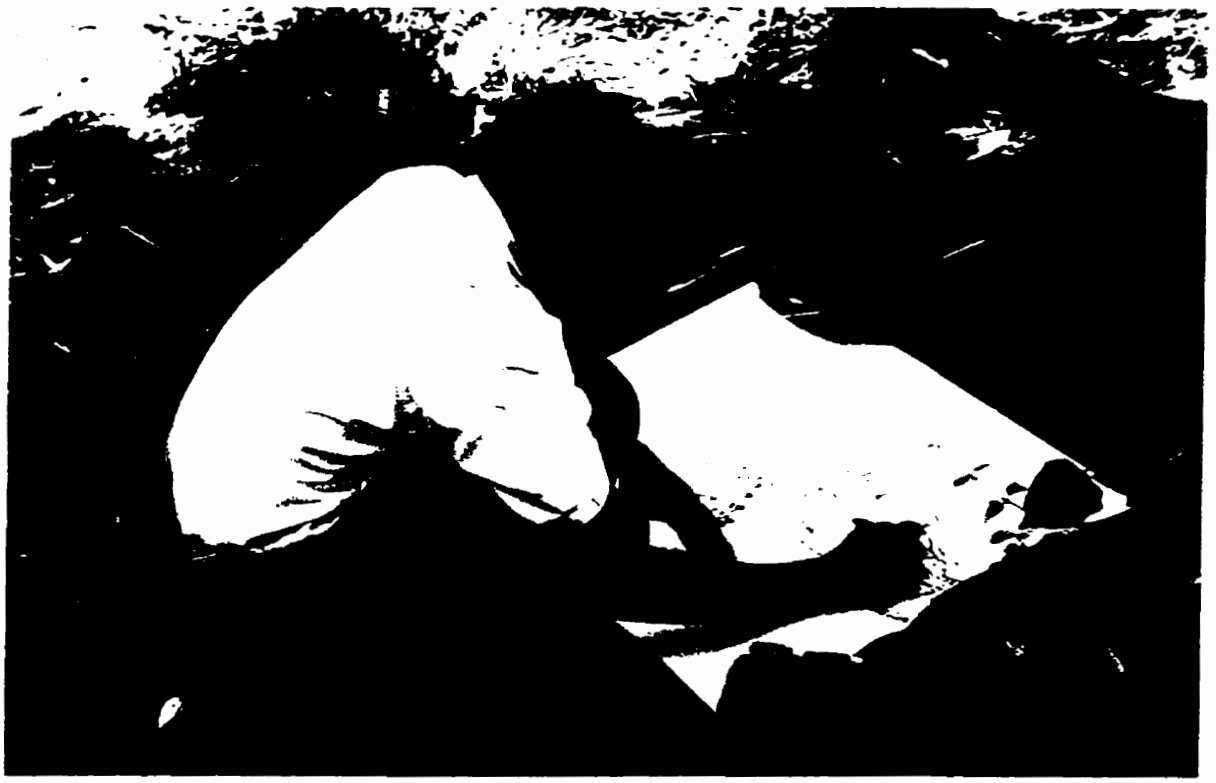


Plate 5.2. A farmer making a farm map in his field.

Plate 5.3. Three children making a map of their family farm.

by 6 women, 2 girls, 2 boys, and 10 men. Backgrounds of the map maker are summarized in Table 5.7. The farm maps are representative of farming in Matengambiri as the participant's fields are located in areas surrounding the village (Figure 5.1). After the map maker completed the drawing we employed semi-structured interviewing to reveal individual farming strategies, village-level natural resource management strategies, and spiritual beliefs associated with the environment. The maps functioned as a medium for the semi-structured interviewing. The maps also indirectly helped the interviewee to feel more comfortable as the focus of the interview was the map rather than the map maker. This section examines the results from the farm mapping, and discussions from resource mapping will be dealt with in part three.

The types of questions I asked participants from their farm maps related to crop type, locations, various farming strategies, associated vegetation, and pest control; Why do you plant this crop here?, Why are these crops growing together?, Why have these trees been left to grow in the field?, and What do you do to control pests here?. Farmer responses to the questions provided information encompassing: farm layout; types of crops grown and why; planting, weeding and harvesting strategies; soil types; topography; hydrology; soil and water conservation measures; pests and anti-pest strategies; trees grown in and around the fields; and environmental indicators. Refer to Appendix 7 for examples of farm maps drawn by the map makers[12] .

[12] For the purpose of thesis presentation, three of the farm maps and two of the resource maps were photographed. The negatives were scaned on computer, reduced and printed.

Table 5.7 Farmers Participating in Farm and Resource Mapping

Map Maker's Age (Sex)	Level of Formal Education Obtained	Type of Map
47 (M)	Std 5	Farm (5)*
>50 (F)	Std 2	Farm (6)
>50 (M)	never attended	Farm (12)
< 50 (F)	never attended	Farm (8)
49 (M)	Std 4	Farm (2)
<50 (F)	never attended	Farm (3)
43 (M)	Std 7	Farm (4)
69 (M)	Std 2	Farm (9)
12 (M) and	Std 3	Farm (14)
9 (M)	Std 2	
11 (F) and	Std 2	Farm (11)
9 (F)	Std 1	
>50 (M)	Form 1	Farm, Resource (13)
<50 (F)	Std 1	Farm, Resource (1)
32 (M)	Std 8	Farm, Resource (7)
29 (F)	Std 3	Farm, Resource (10)
68 (M)	Std 3	Resource
<50 (M)	Std 5	Resource
>50 (F)	Std 2	Resource
26 (M)	Form 2	Resource

* number corresponds to location of map maker's field illustrated on Figure 5.1.

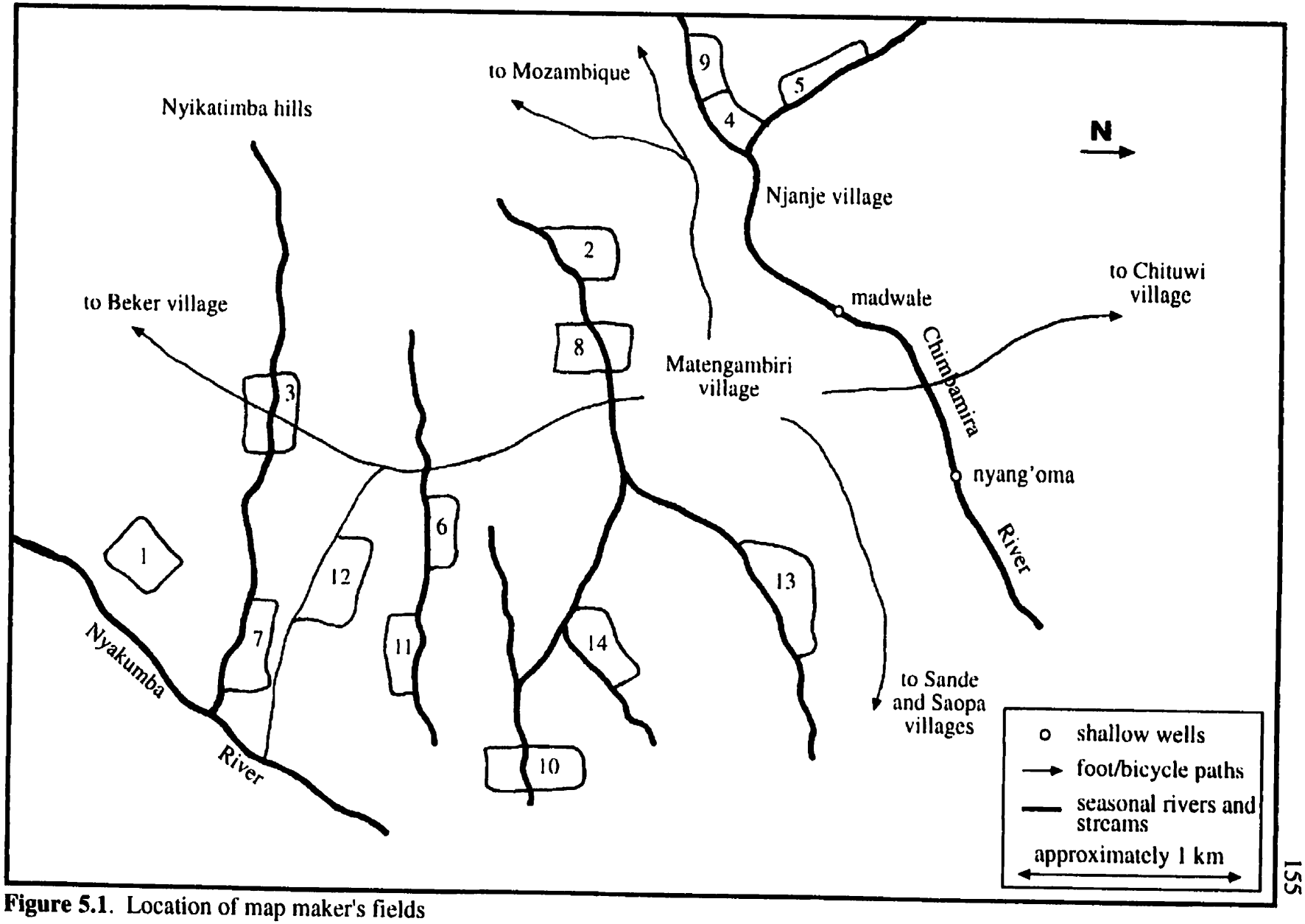


Figure 5.1. Location of map maker's fields

Based on the various farming practices in Matengambiri village I have divided this section into the following: planting strategies; intercropping; agroforestry; fallow systems; water/soil conservation; fertilizer use; pest and weed management; dimba gardens; and environmental indicators. I employed these terms instead of indigenous ones as farmers had no specific names for their farming practices. For comparative purposes each of the terms is defined and explained according to the most commonly accepted understanding in the agriculture literature. Results represent farming strategies from 12 adult farmers who participated in the farm mapping. Although the children participated in the mapping (Plate 5.3) and knew what types of crops are grown in their family fields, they had difficulty answering specific questions regarding farming practices and thus, I have not included their mapping sessions. Despite many of the techniques are practiced throughout the village, I will attempt to reflect the diversity of other farming practices I observed, highlighting and offering explanations for the differences.

Planting Strategies

The planting strategy of Matengambiri farmers are a reflection of their knowledge of field characteristics and their farming suitability. For example, before deciding what crops to plant and where, farmers need to know soil types, as discussed in the previous section, and topography of their *minda*. Soil type appears to be a factor only in making decisions regarding staple crops (maize, millet, and sorghum) and cotton cash crops. It is general knowledge among farmers that maize places higher demands on the soil and thus needs to be grown on fairly fertile soil, such as *makande*. Farmers informed me that cotton,

however, requires fewer nutrients and can be planted on *yachulu* soil which is less fertile. Millet can be produced on poor soils with cotton, but sorghum although it has a high nutrient requirement, it is not as great as maize. Elevation differences within fields are also taken into consideration - maize and sorghum are typically grown at lower elevations as they have a high moisture requirement. Farmers noted that cotton and millet are more drought resistant and can be planted at higher elevations in a field if necessary. The type of crop also dictates the amount of space required. Maize and cotton cash crops will often take up the largest section of a field. Once decisions are made about where to grow the staple and cash crops, secondary crops can then be planted.

All farmers interviewed use early planting, harvesting and weeding strategies to reduce weed growth. One woman noted that "early cultivation allows early planting, which allows the crops to outgrow the weeds." This allows for example, an early harvest and a chance to replant the fields, thus giving two harvests. I observed an interesting farming pattern where economically valuable cotton crops were never planted in fields near the village, and were described as being palatable to goats. Crops are also planted according to the distance between field and village which may be a strategy to protect them from grazing livestock.

Different seeding strategies are used by farmers depending on the availability of labour during certain stages in the agricultural cycle, preference of technique, and the type of crop grown. One poor farmer said he prefers to plant solid crops to minimize available

space for weeds to establish. This farmer is from a household with a limited number of hands to weed, two adults and two small children, and thus labour is a major factor dictating his cropping strategies. Another farmer, also from a poor household, prefers to plant seeds in individual holes in rows as plants are better spaced thereby reducing competition. He said there is much weeding to do from December to February, but as they are eight family members in his house to assist, the benefits from a healthier crop outweighs the labour requirement. Both examples highlight the farmers capacity to adapt the farming practices to specific conditions such as planting revenue and labour availability. Exposure to other areas also affect farming techniques.

Two of the wealthier farmers grew vegetables on raised beds which they said helped to conserve moisture. These were the only farmers who practiced this and are also two of the more innovative farmers in the village. They have both spent many years working in the mines of Zambia and South Africa, and both said that they learned different farming technique during their travels outside of Malawi. This provides further evidence to the importance of knowledge transmission and the idea that a village is not an isolated entity no matter how distant it is from commercial centers.

In addition to crop rotation, intercropping, agroforestry, fallow systems were also present in Matengambiri farming practices. A summary of these and other farming techniques practiced by the mapping participants are summarized in Table 5.8

Table 5.8 Percentage of Map Makers Practicing Selected Farming Techniques

Farming technique	Prosperity Level[1] of Map Makers		
	Rich	Average	Poor
	n=5	n=4	n=3
Agroforestry	100	100	100
Intercropping	100	100	100
Mulching*	80	50	100
Dimba gardens*	60	0	33
Ridging	100	100	67
Fallowing*	60	50	0
Rotation	100	100	100

[1]Prosperity level was determined by wealth ranking, described in chapter 3, and summarized in Appendix 9.
techniques indicating the greatest percentage of difference.

Crop Rotation

All of the 12 map makers said they practice crop rotation, however, the length of time between and during the rotations were quite variable. Commenting on the weeds, one male farmer stated that "The *kaufiti* was taking over the maize field so I have stopped growing it here. I have been planting *mapila* [millet] here for 3 years now." Reasons farmers gave for rotating crops over seasons were that it reduced weeds, particularly *kaufiti* (Striga asiatica), and improves the soil fertility. Continuous planting of the same crop on the same parcel of land is known to lead to such problems as increased insects, plant diseases, weeds and reduced soil fertility (Francis and Clegg, 1990). By temporally rotating crop types on a field the ability to managing weeds and pests are enhanced, and nutrients which may be depleted from a particular crop have a chance to replenish the

following season. Farmers in Matengambiri village are consciously aware of at least some of the benefits of crop rotation.

Intercropping

Intercropping has been a traditional mode of agriculture in Africa well before the interventions of "modern" agriculture. All farmers who took part in map making practice intercropping (Table 5.8). Farmers mentioned numerous advantages for doing this: more efficient use of the land and rainfall; saves labour (planting, weeding, harvesting can be done at the same time); good for the soil; larger crops provide shade for ground cover crops; reduces weeds; and reduces risk of complete crop failure which may occur in monoculture fields in the case of host-specific pest or disease infestation. The tendency of farmers is to plant leguminous crops (beans, pigeon peas, groundnuts) or vegetables with cereal grain crops (millet, sorghum and maize) and climbing plants with cotton.

The largest number of crops recorded growing together was 8. The most common combinations are: pigeon peas, okra, and beans with maize; cucumbers, watermelons, gourds and okra with cotton; beans, cucumbers, pumpkins with millet; beans, groundnuts, and pumpkins with sorghum. Cassava does not seem to be a popular crop as only one farmer was found growing it. Tall strong cotton stalks are taken advantage of to support interplanting of climbing crops such as cucumbers and watermelon. One farmer said the ripening time of cucumbers and melons coincides with cotton harvest and provides snack

food while picking cotton. Interestingly, several farmers mentioned interplanting cotton and maize to increase the productiveness of their maize yields. This is an unusual practice which has not been reported in the literature. It may be useful in future research to determine the reasoning behind this practice.

Border plantings along streams and field boundaries was a common practice. Ten of the twelve farmers cultivated fields beside seasonal streams. The rich soil and water availability during the rainy season allowed for more diverse vegetable growing. The most common crops planted along the streambanks are: potatoes, okra, sugar cane, tomatoes, papaya and bananas. Staple crops are also planted as border crops. For example maize and sorghum are often planted around the edges of cotton and sorghum fields.

Intercropping is the practice of growing two or more crops simultaneously on the same field. Secondary crops may be planted between rows, within rows and around field boundaries of the primary or staple crop. Intercropping has been found to produce the same effect as crop rotation, but in less time (Radcliffe *et al.*, 1995). Due to all the possible combinations and interactions between crops, intercropping is a complex process, but the central logic behind it is that because crop species vary in their resource requirements (light, water, nutrients) a properly established intercropping system will use resources more efficiently than a monculture (Stinner and Blair, 1990).

Apart from the farming strategies previously discussed there does not appear to be any hard and fast rules governing intercropping decisions in Matengambiri. Farmers seem to decide what crops to mix depending on household consumption, food preferences, land availability, type of land and labor availability. Although farmers could not explain how exactly intercropping works, they felt that growing a diversity of crops was better than pure crop stands. Even the literature on intercropping can not fully explain what modifications of the environment is effected by one crop in order to benefit others grown with it (e.g. nitrogen fixation, pest associations, *etc.*). The primary reason farmers plant more than one crop in a field seems to be risk avoidance. Drought, insect infestations, and diseases would more likely result in complete crop failure in the case of a monoculture rather than an intercropped system. As these natural occurrences are impossible to predict, rural farmers are unable to take the risk. This is especially true of poorer farmers. Poorer farmers, facing a greater risk of food shortage if a crop yield was low, tended to have a greater number of intercropping patterns.

Agroforestry

Agroforestry is the deliberate integration of trees with crops and/or livestock in fields (Stinner and Blair, 1990). Similar to intercropping, agroforestry is a new term for an old practice as it has been used across Africa for time immemorial. Trees in agroforestry systems support many functions: fruit, nuts or seeds as food for humans; livestock fodder; increase nitrogen in soil; shelterbelts or windbreaks; boundary or homestead plantings; live fencing; woodlots for timber; and fuelwood. Farmers in Matengambiri also maintain

or plant trees in their fields in an attempt to realize many of the benefits listed above. Agroforestry technologies which are not being practiced, or only occasionally, in the village are the use of nitrogen fixing trees to increase overall soil fertility; livestock fodder; and woodlots for timber and fuelwood.

I observed that planting trees around houses is a common practice in the village for fruit, shade, and most importantly, as wind breaks. Matengambiri village is situated among several hills which seem to tunnel the wind creating strong gusts especially in the dry season. The village headman encourages people to plant trees around their homes to control the dust blowing through the village. He told me that everyone in the village participates in National Tree Planting Day each January. As goats can have a negative impact on the survival of tree seedlings in the village, farmers use "living fences" made from thorny Acacia branches planted in the ground which protect the young trees from being eaten by goats. This innovation has proven very successful. All 12 farmers who participated in the mapping activity reported leaving indigenous fruit trees in their fields (Table 5.8). Only exotic fruit trees (bananas, papayas and mangoes) are actively planted. Fruit trees are left in fields because they are an important source of snack food while working in their fields, and to collect for household consumption. Large trees (e.g. *baobab*, *mpacassa*, *mtondo*) are often left as shade trees to rest under while taking a break from field work. Although, one farmer admitted that he left the trees because they would require too much work to cut down. Other reasons farmers leave trees in their fields are for ceremonial, medicinal use, and spiritual beliefs. For example, *njale* trees are never

cut down in fields as they are associated with ancestral spirits who influence the seasonal rains; *tsanya* roots treat migraine headaches; *nsangowa* is believed to ward off bad spirits.

No farmer claimed to have ever attempted planting a woodlot and only three farmers reported to actively plant trees in their fields. All 12 farmers, however, said they have planted trees around their homes or gardens at one time. Garden and homestead trees are safe from being cut down, as compared with trees in fields, because people generally spend more time in their gardens and near their homes. Informants also confided on several occasions that if they plant a tree anywhere but near their house the tree does not belong to them and may be taken away by the forestry department. Thus, where there is uncertainty over the ability to harvest trees or their products, either from fear of theft or government intervention, trees do not seem to be planted. This indicates conflicts over the rights to land on which trees are planted, and the former Department of Forestry's decree of ownership over all trees may be causing a lack of interest on tree planting by farmers. The issue of property rights is important in this situation, as the observation that the loss of control of over the resources by the local community often results in interest conflicts and resource degradation (see Lynch and Alcorn, 1994; and McCay and Acheson, 1987).

Despite the indigenous knowledge in other parts of Malawi that leguminous trees (e.g. Acacia albida) improve soil fertility, very few farmers seem to be aware of this in Matengambiri village. Only two farmers mentioned trees they have observed under

which crops seem to grow better (*ntangatanga*, *njenjete*, and *nkhunku*), although they did not plant them. Reasons why farmers do not use trees as natural fertilizer should be investigated as it is a valuable and free source of fertilizer to farmers. Farmers are generally receptive to agroforestry programs in Malawi because the use of trees in farming systems is a traditional practice and therefore an agroforestry initiative in Matengambiri village on the part of the Forestry or Agricultural Department may have a good chance for success.

One farmers informed me that he plants *nimu* (Azaderachta indica) trees for *mankhwala* (medicine). He described a process of drying the leaves in the sun, pounding, soaking, then mixing them with the crop seeds when planting. This protects the seeds from being eaten by termites or other insects. He said he read about this process while on a trip to Ngabu. He has also indirectly discovered that this tree is very palatable to goats. By using *nimu* in boundary planting around his field he has noticed that the goats, preferring the trees, will not predate his crops.

Agroforestry research is relatively new in Malawi. Initiatives for research have been undertaken by several of the country's agricultural research stations, FRIM, the Department of Forestry, the Department of Agriculture, and the Bunda College of Agriculture. Although considerable progress has been achieved with agroforestry research in Malawi much of it has focused on a limited number of exotic species (particularly Leucaena), and even fewer indigenous species. A further criticism regarding

agroforestry research is that limited information about research results are being extended to the farmers (Saka *et al.*, 1991). The country's leading agroforestry researchers, acknowledge that limited information is available on indigenous agroforestry practices (Saka *et al.*,1991).

Fallow System

Six (50%) of the farmers participating in the mapping exercises purported to still practice fallowing. Four of these families were from higher economic classes and stated they could afford to leave fields unproductive for a year because their farms are larger than average (Table 5.8). The two farmers who did not leave some of their land idle in a given year gave the prime reason as limited farm land[13]. Apart from land shortages, there were variations on reasons given for not practicing this system. They included: high soil fertility; weed infestation worries; and labor shortages in resource-poor households. Some mentioned weeds were a problem if they left their fields go fallow and that they did not see any great improvements in their crops after a fallow year. An elderly woman commented that their fields are only fallow when they can not possibly cultivate it all in any given year. She said that she is sometimes left alone to cultivate when her husband and son are away working. Traditional agriculture in Malawi has historically been based on shifting or bush-fallow cultivation where agricultural land was left idle for periods of time in order to restore soil fertility, among other benefits (Saka *et al.*, 1991). Land

[13] There is no specific data on land shortages for Matengambiri, however, Ngabu district as a whole is under intense agricultural pressure. Of the 35% land area classified as good or moderate for agriculture in the district, 32% is already under cultivation, leaving little room for expansion (GOM, 1991).

pressures from increasing population pressure and labor shortages have forced farmers to gradually reduced the fallow period to the point where very few practice it anymore (Kumwenda, 1990).

It appears that farmers are evolving responses suited to their socioeconomic position and to the changes in their environment. As land becomes scarce and more farmers are forced to seek work off-farm, the response of farmers is to turn land into more intense practices of great intercropping diversity.

Water/Soil Conservation

Many strategies are employed by farmers to protect their fields from wind and water erosion. Tree leaves and crop residues are commonly used as mulch to both increase soil fertility and prevent water run off. Nine of the twelve interviewed farmers practiced mulching, or green manure, and who reported to cultivate soft-stemmed plants (weeds, remains of vegetable plants and intentional addition of tree leaves) into the soil. Poorer households are more likely to mulch because the quality of their land if often less fertile than that of wealthier households (Table 5.8). The households from higher socioeconomic positions tend to be long established families who were able to choose good quality agricultural land at an earlier stage when land was not in short supply.

In fields which are at lower elevations and face seasonal flooding, drainage gullies are used to divert water in the rainy season. Trees are either planted or protected from cutting

around field boundaries to control wind and rain erosion. Two farmers reported using bands planted with grasses and banana plants to help conserve moisture. Minimum tillage is a practice which is almost non-existent in the village now. Only one farmer reported not cultivating ridges because he felt it conserves moisture and saves labor (Table 5.8). Country-wide promotion of minimum tillage is currently being coordinated under the PAPPPA program for just these reasons (GOM, 1996). During a conversation with the senior land husbandry officer at Ngabu ADD I was enlightened to learn that minimum tillage or "planting on the flat" was originally a traditional and wide spread practice throughout Malawi but was considered "lazy" farming and heavily discouraged, at first by the colonial government and then the independent Agricultural Department, in favour of cultivating ridges (Moussa, 1996). Complete hoe-cultivation of fields was promoted. Increasing evidence against ridging now suggests that it accelerates the oxidation of organic carbon, exposes the soil to further drying, wind and water erosion (GOM, 1996).

Fertilizers

None of the farmer interviewed said they used artificial fertilizers. Their reasons for not using artificial fertilizers included price, unavailability, and that they did not feel it was necessary. While most farmers said they did believe that adding animal manure into their fields would improve the soil only two farmers admitted to actually doing this. Reasons for not using manure were that it was too labour intensive and that most farmers felt their fields were already fairly fertile. As most of the village livestock is allowed to graze freely during the day, collection of manure is difficult. There may be potential, however,

to use this free source of fertilizer from local livestock, for farmers interested in manure additions. Stall-feeding livestock to concentrate manure collection may also be a solution.

Almost all farmers leave some plant residue on the fields to decompose. Two farmers mentioned that they pile up leaves (*ndama* and *mango*) and use the decomposed organic matter as fertilizers. Burning off crop residue stalks just prior to planting, however, is a widespread practice throughout the village. Cotton stalk are burned as they are too tough and fibrous to easily break down. Sorghum stalks are also difficult to break down and are either burned or brought back to the village and used to make doors, floor mats, and compound fences. After the harvest crop, residues are piled in heaps, burned, and the ashes are spread over as much of the field as possible with hoes. Burning has been discouraged by the Dept. of Agriculture as it is believed to be harmful to the soil. There is little information available on the actual benefits to the soil chemicals, however, Moore and Vaughan (1994:28) found that burning is very effective for conferring a high fertility (increases calcium, potash and phosphates) on less fertile soils. Whether or not it actually increases soil fertility, households experiencing labour shortages will continue to burn crops as it is a quick and efficient means of breaking down crop residue.

Pest/Weed Management

Interestingly, there is no word for "weed" in the Chichewa language. Farmers categorize weeds with grasses and refer to both as *udzu*, or if they are edible, *telele*. Indeed many of

the "weeds" in their fields are not considered useless invaders as Western culture tends to view them. Most of the wild plants found growing in the farmers' field were used as food, ground cover to stop soil erosion, mulching, or had medicinal uses. For more problematic weeds hand-pulling is done, however, this is labour intensive and not feasible for farmers who experience labour shortages during this critical period. Of the farmers who specifically talked about hand-pulling weeds, one was from a wealthy family and two were average families (one was a farmer who has a vegetable business). The two farmers who specifically commented that they do not hand-pull weeds were from poorer households. There appears to be a correlation between labour availability and wealth which in turn effects the overall condition of crops, for which weed intensity is not an exception.

Of all the farmers who participated in the mapping exercises, 80% talked about *kaufiti* or "witchweed" as a deterrent for good maize, sorghum and cotton yields. This weed seems to be a common problem amongst farmers from all socioeconomic classes. The name farmers have given to this weed, *kaufiti*, literally means a witch or wizard who is usually associated with something evil. Riches *et al.* (1993) have recently started to investigate the use of farmer knowledge in Malawi to design control measures for *kaufiti*. In their case studies Riches *et al.* have found that although Malawian farmers are not aware how *kaufiti* damages crops (it parasites the roots of host plants), farmers know that it is a crop-specific problem and that crop rotation is the best way to control the weed. Farmers in Matengambiri village have found similar results by rotating their field every 1-3 years

with a crop which can cope better such as millet. Further research into why farmers choose millet, its level of success, and other technologies farmers have developed to reduce or control *kaufiti* infestations should be a major focus of extension staff.

Insect pests such as *mabobo* (leafhoppers) and caterpillars were indicated as problems for 70% of interviewed farmers. These pests are killed with hands and sticks. Farmers from average and poorer households, however, also reported to eat *mabobo*. The impact of insect predation was found to vary with farm size and type of crop. One of the wealthier farmers commented that "of course these [his] fields see *mabobo*, but we have planted so much the losses are not noticed." On the otherhand, independent of land holding size *mabobo* is a concern to all cotton farmers because of its great cash return. Cotton is the only crop which is sprayed with a commercial insecticide, and 80% of cotton farmers in Matengambiri employ the use of commercial insecticide. The main reason 19% of farmers do not grow cotton was due to the cost of the required pesticides.

Mice are also a potential pest, but are usually controlled by eliminating their nests in fields. Most people eat them to supplement protein in their diets. Enterprising children happily offer to rid farmer's fields of mice where they roast the mice and sell them in the village or in Ngabu for 2-5 tambala (1 Canadian cent) each. Some churches discourage eating mice on religious grounds. One woman commented that she no longer eats mice since she joined the Jehovah Witness Church. It would be important, in terms of food

security, to find out what percentage of the village is impacted from the lack of this traditional source of protein because of the introduction of Christian religions.

Farmers remarked on the importance of arriving at their fields early with their dogs to deter large pests such as monkeys, wild pigs, antelope, francolin, and guinea fowl. As stated by one woman "working early hours when wild animals are most active keeps them away and the dogs help to chase the monkeys and dikers". Using dogs seemed to be a preferred system to killing wild animal pests. People realized a benefit to having small birds around their fields to eat insects, however, one farmer admitted to hunting them with a slingshot for food.

Innovative low-cost techniques of controlling pests and weeds should be explored and promoted among farmers, particularly the poor who have less access to costly alternatives. For example, one female farmer described placing fallen, rotten, mangoes around her field to attract insects, thereby deterring them and saving her crop from infestation. Several farmers also mentioned that hanging plastic bags in the trees around their fields was successful for scaring away seed-eating birds. Other farmers reported that termites, which can be a major pest, can by repelled by placing the ash from burnt trees at the based of young crops and tree seedlings.

***Dimba* gardens**

Dimba refer to all seasonally wet areas and are important due to their multipurpose use for water supply, grazing and cultivation (Gata, 1995). Livestock are grazed here particularly in the dry season when grass normally found in other areas is in short supply. *Dimba* gardens are areas of year round cultivation, and are important for food security during the dry season. Typically found on or beside rich soil riverbeds, these gardens are often irrigated throughout the dry season with shallow wells dug into the river beds (Plate 5.4). Due to the high productivity of these areas as compared to *minda*, there are shortages of good dimba plots. Four of the twelve farmers interviewed stated they own a *dimba* garden. Of these informants, three of them are long time residents and from higher socioeconomic families who can afford to hire laborers to carry out the extra field work required in managing a garden (Table 5.8). During a discussion with a woman who had recently immigrated into the village with her family it was explained that they, and other newer families, were left with relatively infertile lands to farm on and had no access to *dimba* plots. Wealth and family status in a village have much to do with obtaining garden plots and therefore improving family nutrition. Extension staff promoting *dimba* cultivation should be aware of the uneven distribution of these gardens in the village.

Plate 5.4. A lush dimba garden in the dry season showing papaya and banana trees interplanted with vegetables.

Environmental Indicators

Before presenting the results on indigenous resource management, the environmental indicators most often used by farmers will be presented. Indicators include plant and animal growth habits (e.g. where they grow, how tall they grow in a given season) and lifecycles (e.g. when they flower), and climatic factors. Forewarning signs of a poor rainy season may help a farmer decide to plant more drought resistant crops or plant in areas of higher moisture content. Soil types tell the farmer what types of crops he or she should be planting in the particular area. Table 5.9 lists environmental indicators which farmers in Matengambiri noted as being reliable most years.

Table 5.9. Environmental Indicators

Type of Indicator	Characteristic	Farmer Interpretation
Grass: Kavulele, and Khombombo	presence	Poor soil fertility
Grass: Nsanu	presence	Poor sandy soils
Weed: Kabache	presence	Soil will be hard to cultivate
Grass: Mtsinde	presence	Overgrazing
Grass: Khambumbu	presence	Ntseti soil or Grey soil
Grass: Jogo, Msonthe, Luba, Nsenjere, and Wanje Trees: Mtubyitubi, Msawu,Mtete, Nkhunku, Mpacassa, Njale, Nkhotamu, Mvunguti, and Nfula Other: Churu (termite mounds)	presence	Fertile soil
Trees: Nyandima, Mtondo, Njale, and Nsekere	presence	Ground water
Trees: Nkunkhu; Mango	when it has many flower when it bears many fruit	A good rain year
New leaves Babobab fruit	start to develop after the first rains; size of a man's forearm	Sufficient moisture to commence planting in the fields (usually November)

For Malawian farmers, planting either too early, or too late, in the agricultural season can mean disaster. As well, too little rain too early, or too much rain too late can be devastating to crops already in the ground. Farmers have little economic surplus to replant following a failed crop. Limited agricultural inputs mean farmers have learned to be acutely aware of indicators in the environment which may tip them off as to when, where and what to plant.

This section on indigenous farming practices has shown that rural people have developed, adopted, and modified their farming skills to deal with resource constraints (e.g. labor, field size, and natural characteristics). It has shown that choice of farming practices is far from haphazard. Farmers response to population growth and land-use conflicts has been to intensify their practices to achieve maximum yields. The use of multiple strategies indicate farmers' ability to exploit small ecological variations to obtain the best possible use of the land. Farmers decisions were observed to be governed by past experiences, environmental consideration, and social and economic factors which in turn enable them to develop farming systems with clear vision of their individual desired goals. Throughout the village people show a great respect for their environment and recognize the ecosystem's role in agricultural productivity. These practices are an inherent part of the culture and give evidence that farmers have a rational understanding of their resources and environment. The flexibility of these farming systems and farmers understanding of their surrounding environment promise sustainability. This is true since all natural and non-natural systems in the earth evolve which is the basis of their

persistence over time. Part three will focus on village-level resource management which extends beyond the farm.

PART THREE: INDIGENOUS RESOURCE MANAGEMENT

Influences Regulating Resource Use

Results in this section were obtained from eight resource maps conducted with 3 woman and 5 men. Mapping was conducted at the map makers home and, as with farm mapping, questions were asked about the finished drawing. Participants were interviewed on locality and restrictions on resources. Examples of questions asked include: Why do you harvest fuelwood here?, Why is this hill protected?, Where can livestock graze?, Where do you collect wildfruits?. The resource mapping results highlighted the areas around the village where people go to collect: building poles, firewood, medicinal plants, wild foods, mushrooms, honey, water, thatching grass, and where livestock graze. Examples of some of the resource maps made by map makers are illustrated in Appendix 8.

Communal land tenure is recognized in the village and refers to the right of each member of the village to independently use resources in a given area. In order to ensure equitable use and prevent overexploitation of resources, village-level management strategies exist and are enforced. These strategies effect resource harvesting within forests, livestock grazing in communal areas, and environmental enhancement. Village-level management in Matengambiri village successfully follows several of the required principles of CBRM as it indicates a people-centered, local level decision-making strategy which respects the

cultural norms (Drijer and Sajise, 1993). The VH and village elders are responsible for drafting informal village regulations, however, the entire village participates with enforcement. For example, once crops have been planted the VH issues orders throughout the village that all livestock be tethered close to houses until harvest. Cattle are allowed out of their *kraals* (corral) only under herdmens supervision and must be taken to specific grazing and watering sites which are away from village fields. Timber collection for building purposes is generally restricted to a communal area referred to as *Nyakatimba* hills which is approximately 5 Km from the village. The communal ownership of this area, however, has not created degradation. This is in contrast to Hardin's (1968) prediction of a "tragedy of the commons". I observed this while on a fuelwood collecting expedition with several women. The *Nyakatimba* area is very diverse with tree species and showed little signs of degradation from overuse. The area seems to be well managed as trees are selectively cut as needed. The long distance from the village seems to have a dual purpose of ensuring protection of the trees around the village and also limiting what users will be able to carry back. Informants, however, did indicate certain timber and wild fruit trees to be more difficult to find now than in the past. The strict government forestry policies of the past have prevented villagers from harvesting and managing other forested areas around the village. If villager's access to other areas continue to be denied, serious degredation of the *Nyikatimba* hills will be inevitiable as the population in the area continues to grow. The forestry policy itself, whose purpose is to enforce restricted timber use, will eventually result in a breakdown of efficient village-level management of the forests. This prediction is supported by

Bromley and Cernea (1989). Fuelwood collection is not restricted to any area, however, the VH and council of elders prohibits the felling of any live tree for fuelwood. Table 5.10 summarizes the influencing mechanisms which, either directly or indirectly, prevent overexploitation and promote the sustainable use of natural resources.

Table 5. 10 Influencing village mechanisms regulating resource use

Resource	Influencing Mechanism	Enforcing Institution	Regulating Action
Graveyards	fear/respect	spirit ancestors, traditions/customs community sanctions	no resource harvesting is allowed
Sacred hills	fear/respect	spirit ancestors, traditions/customs	grass collecting/burning, tree cutting and livestock grazing forbidden; watershed protection
Ceremonial sites (rainshrine)	fear/respect	spirit ancestors, mbona rain god	no resource harvesting is allowed
Water drawing sites	fear/respect, fines	spirit ancestors, village headman	keeps livestock out of area; prevents erosion and dirty water
Taboo trees (fruit trees, ceremonial, spiritual, medicinal)	death or bad luck if cut down	spirit ancestors, community sanctions	trees are preserved
Animals (pythons, chameleons, lions)	bad luck if harmed	spirit ancestors	protects wildlife
Fields after planting	fines against livestock owner if animals graze here	village headman, community sanctions	protects fields from livestock during crop growth
Trees in village	fines if trees are cut down	village headman, community sanctions	protects trees in village to control wind erosion

Despite the introduction of Christianity in the village, there is still a strong respect for the spirit world. *Mzimu* (spirits) are ancestors, believed to act as intermediaries between *Mulungu* (God) and the living, who influence social continuity and environmental forces in Matengambiri village. The spirit ancestors are thought to protect households from evil spirits and maintain harmony in the environment. When wrongful acts are committed by a member of the village either against another person or against the environment (e.g. felling trees in sacred areas) the *mzimu* are believed to provoke serious repercussions such as illness in a family, crop failure, or drought. Spirits may also take on the identity of a variety of animals forms. Snakes, particularly pythons, and lions are thought to be the manifestations of rain spirits who control the arrival of the rains. Upsetting rain spirits is the ultimate discourtesy as the threat of a late rain or no rain could ensue potentially disastrous effects on the entire village. Chameleons are featured in many local folklores as an admirable creature and in close association with *Mulungu*. Its frequent association with the supernatural may stem from the perceived ability of the animal to change colour, its independently rotating eyes and doddersome movements. Villagers informed me that these animals are connected to the spirit world and it is believed that bringing harm to them will result some form of environmental affliction to the entire village. Not only respect of spirit ancestors then, but also fear of community sanction influence social order. In effect this serves as a form of conservation for certain species of animals and the habitats where they are found.

The resource maps also indicated numerous local sacred sites or *mzimu* hills where it is forbidden to cut trees, or collect other wild resources. Magomera hill near the village is associated with spirits and referred to by many as *phili lamzimu*, "mountain of spirits". There are varying explanations of why spirits are there; one elderly man explained that the forest on the hill is home to sacred bees, known to sting people to death if honey producing trees are removed; a woman also fearful of cutting trees on the hill believes that sacred pythons live there amongst the rocks. Several thickets were highlighted on maps where individual trees grow which are considered sacred and associated with spirits. Groves of *Njale* and *mlombe* trees, are two highly revered trees because of this belief (Plate 5.5). One elderly woman believed that spirits can be associated with any tree because trees provide shelter to the spirit world just as they do in human life. This has made her cautious of cutting live trees. The maps also directed informant discussions to the graveyard forest they illustrated. It is visibly apparent in the village and surrounding areas that graveyards are always the site of dense forests. Map makers explained that it is taboo to disturb any plant or animal found in graveyards where ancestors are buried, and any contravention of this rule results in severe punishment (Plate 5.6). These beliefs are generally respected throughout the entire village as was indicated by an old woman who, upon my asking what would happen to someone who cuts trees in the graveyard, responded by saying that she didn't know because she has never heard of anyone breaking this rule. Village beliefs issue and enforce strong directives with regards to the community's use of its environment, that result in non-take areas to cautious utilization of communal resources. The link between ancestral worship/taboos and social control has also been indicated as important by several authors (refer to Clark, 1995; and Basaigo, 1995).

Plate 5.5. A sacred *Mlombe* (baobab) tree in the village.

Plate 5.6. A graveyard near the village bounded by cultivated farm land.

Seasonal and Historical Resource Use

Eight seasonal resource calendars were recorded from four women and four men who were all from households of average wealth. The results were compiled into one table (Appendix 10). Participants described a total of 53 resource related activities which they perform at various times of the year. To optimally benefit from resources farmers require knowledge of subtle changes which take place in the environment from season to season. Celebrated ceremonies at certain times of the year signify a recognition of the connectedness and influence the environment has over village life. *Njole*, celebrated throughout February and March, is comprised of a dance and offering of the firsts fruits of harvest to the spirits. More ceremonies take place during the dry season when grain bins are full and people have more time for leisure. During this time households will perform *thokozani mzimu* or "thanking of the spirits" in annual respect of ancestors. Performance of the rain ceremony is traditionally held just before the start of rains in November to appease the rain spirits, who are believed to be responsible for the arrival of the annual rains. The rain ceremony involves the entire village and may last up to three days.

Time line discussions with four village elders were useful for discussing general changes which have taken place in the village over time. Sessions lasted on average one hour. The participants all seemed to enjoy reflecting back to describe past events and changes which have taken place in the village. Although, informative for general information, it was extremely difficult to determine dates in this activity. We were not able to construct

an accurate time line for the village, but discussions led to the development of 13 criteria for a historical resource matrix. We carried out this activity with two village elders over four separate time periods in the history of the village. The village elders used beans to illustrated decreases and increases in various resources over the years (Table 5.11). The matrix illustrates the population in the village is decreasing. However, in the region as a whole the evidence suggests that it is actually increasing. As the village population increases, families move out to surrounding areas and form new villages. Participants stated that there have been four such splits over the 32 year span of this matrix. During the first time era (1964 - 76) two new villages were created from Matengambiri (Njanje and Beker villages). Between 1976 - 86 Kalavina village was formed, followed by Sande, the most recent, in 1994.

Village elders commented that the rains have been insufficient for the last 5 years and water no longer remains in the streams during the dry season as it used to. Other observations by the participants were that many more people are cutting trees, even from sacred sites, as the population increases; livestock is increasing so amount of grass available for fodder and thatching is decreasing; soil is being eroded as there are fewer trees and grass to hold it; both soil fertility and wildlife populations are decreasing; harvests are smaller and there is less land available (size of farms have decreased); and there are more livestock now than ever before, particularly goats, because the drought forces people to raise more animals to sell to buy food and/or they eat the livestock.

Table 5. 11 Historical Resource Matrix

Resource	Malawi's Independence (1964)	20 years ago (1976)	10 years ago (1986)	Presently (1996)	Overall Tendency (- or +)
People	●●●●●●●●●●●●● ●●●●●●●● (21)	●●●●●●●●●●●● ●●●●●● (18)	●●●●●●●●●● ● (11)	●●●●●●● (7)	-
Fish	●●●●●●●●●●●●● ●●●●●●●●●●●●● ●●●●● (31)	●●●●●●●●●● (10)	●●●●●● (6)	(0)	-
Stream level during the dry season	●●●●●●●●●●●●● ● (14)	●●●●●●●●●●●● (12)	●●●●●●●● (8)	(0)	-
Timber products	●●●●●●●●●●●●● (13)	●●●●●●●●● (9)	●●●●●●●●● (9)	●●●●●● (6)	-
Wildfruits	●●●●●●●●●●●● ●●●●●●●●●●●● ●●●●●●●●●●●● (36)	●●●●●●●●●●●● ●●●●● (17)	●●●●●●●●●● ●● (12)	●●●●●●●● (8)	-
Grass	●●●●●●●●●●●●● ●●● (16)	●●●●●●●●● (9)	●●●●●●●● (8)	●●●●● (5)	-
Soil fertility	●●●●●●●●●●●●● ●● (15)	●●●●●●●●●●● (11)	●●●●●●●● (8)	●●●●●● (6)	-
Soil erosion	●●●●● (5)	●●●●●● (6)	●●●●●●●●●● (10)	●●●●●●●●●●●● (12)	+
Wildlife	●●●●●●●●●●●●●● ●●●●●● (20)	●●●●●●●●●●● (11)	●●●●●●● (7)	●●●● (4)	-
Crop harvest	●●●●●●●●●●●● (12)	●●●●●●●● (8)	●●●●●● (6)	●●●●● (5)	-
Size of fields	●●●●●●●●●● (10)	●●●●●●● (7)	●●●●●● (6)	●●●● (4)	-
Livestock	●●●●●● (6)	●●●●●● (6)	●●●●●●●●●● (10)	●●●●●●●●●●●●● ●●●●●●●●●●●●● ● (27)	+
Temperature in dry season	●●●●●●●●●●●●● ● (14)	●●●●●●●●●●●● ●●●●● (17)	●●●●●●●●●● ●●●●●●●●●● ●●● (23)	●●●●●●●●●●●● ●●●●●●●●●●●● ●●●●●●●●●●●● (36)	+

This corresponds to what interviewees said during the questionnaires. This suggests that informal social sanctions are breaking down to a certain extent. Informants suggested the cause of the changes described above are the result of a depressed economy (rapid inflation, difficult to find off-farm employment), and land shortages. As Fox (1993) and Murphree (1993) have suggested, local people become the cause of environmental degredation when their traditional management systems breakdown which is often attributed to the result of centralized government control and failure to acknowledge rural people's local customary law and management systems.

Conclusion

The results described in this chapter legitimize the importance of indigenous knowledge. IK in Matengambiri encompasses a complex of distinctive, hidden, and emotional characteristics based on a system of knowledge, technology, values, traditions and spiritual beliefs. It has shown that farmers' knowledge is dynamic and that people are constantly creating and experimenting in response to constantly changing circumstances, and that exogenous knowledge also effects farmers' knowledge. It has emphasized that a village is not a homogenized unit of knowledge, but is effected by differences in gender, age, kinship, wealth, and special positions (traditional healer, midwives). These factors distinguish the power lines which are based on knowledge which is relevant as knowledge and power effect control and access to resources. Throughout this chapter the findings have consistently alluded to sustainable agricultural practices and overall sustainable use of natural resources. It has also revealed the constraints that direct farmers

options, the opportunities available, and ultimately the needs of farmers. Knowledge of perceived needs and constraints of farmers is a valuable foundation upon which to build development. So, where do we go from here? The final chapter offers several recommendations as a possible direction forward for sustainable resource management, recognizing that IK is also a valuable resource.

CHAPTER 6

SUMMARY, RECOMMENDATIONS AND FUTURE RESEARCH - DEVELOPMENT BASED ON UNDERSTANDING

Introduction

The findings in the previous chapter have indicated that farmers in Matengambiri village hold significant indigenous knowledge that contributes to the sustainable use and conservation of natural resources. This knowledge is based on generations of experience, community adherence to social sanctions, the blending of outside sources of knowledge, and farmers aptitude for experimentation. Not all forms of knowledge, however, were found to be environmentally sustainable. There are several general conclusions to be addressed which I will outline in seven points. The focus is not to ignore other important aspects of rural development, but to redress the balance and build a case for making IK an inherent part of development. Following the summary I discuss my thoughts for possible recommendations on three levels: Matengambiri; CURE; and nationally. My closing thoughts in this thesis focus on areas for future research.

FINAL SYNTHESIS OF RESULTS

1) Indigenous knowledge shows responsible and sustainable use of natural resources

People use locally available resources, limit external inputs in their farming systems, and show respect for their environment which is couched in their cultural beliefs. It generally subscribes to the principles required in sustainable agriculture by using low external inputs, maintaining diversity, maximizing yields, and being compatible with the social

and spiritual environment in which it operates. The evidence suggests that there is consistent use of intercropping, plant and soil knowledge, and agroforestry. People are aware of changes in their environment and, to a certain extent, use environmental indicators to forecast what is or will happen. Fear of both spirit ancestors and community sanctions appeared to be positive incentives for conserving the common property resources. Whether or not conservation was a direct or indirect effect is irrelevant as the enforcing moral codes have assisted in sustaining the resources. Collective action and the existence of social regulation have shown to guide this resource-use behavior.

2) IK is just as valid as other approaches

Comparing exogenous sources of information helped to build support for the aspects of indigenous practices and technologies which I described. Almost all dimensions of IK which I investigated appear to be valid alongside other available sources. Exogenous sources of information are very general and usually cover an extensive area thus, making it difficult to apply to site-specific situations. This refers in particular to the broad agro-ecological zones which government extension officers use, versus the detailed and local soil knowledge of farmers. Current national forestry research has been limited to exotic species and a few indigenous species, which can limit the application of agroforestry and enrichment planting of wildfruit trees. Agricultural research has been the most receptive agency in Malawi to incorporate IK into its programs, but this research is still not extended to the farmers. Farmers' knowledge in Matengambiri seemed to be weaker in agroforestry, the use of manure as fertilizer, and effective livestock management. This

comparative approach in IK research is useful for identifying gaps in both IK and exogenous sources.

Although comparing different types of knowledge is useful, a cautionary note is that IK should not be *defined* in terms of other knowledge systems (e.g. Western). As this research, and others, have shown, IK is valid on its own. The IK literature all too often tends to view indigenous knowledge in terms of Western knowledge. I feel this is dangerous and sets up a false dichotomy as knowledge is not a distinct package which can be easily defined, but rather is continually interacting with others knowledge systems. This was evident in my research particularly with the blending of extension staff messages, and the incorporation of new information into farming practices as a result of farmer movement among other villages, and even other countries.

3) Knowledge is diverse in the community.

The results have shown that a farming *community* is made up of *individual* farmers. General knowledge of the environment was indicated to be shared amongst all community members, however, farmers have different access to information that was reflected in their farming knowledge. Men have better access to government extension messages and travel outside the village more often than women thus, men have more opportunities to exchange information with other farmers. Farmers with better access to information are able to adapt and experiment with this new knowledge which can lead to

improved farming techniques and higher yields. This also plays a role in individuals being able to advance their socioeconomic position in the village.

Older farmers were generally found to hold more knowledge than younger farmers which they have obtained from years of experience and observation. This was seen particularly in natural resource knowledge regarding trees and soil. Knowledge is both informally passed down from older to younger farmers, and actively sought out by the youth. People in special positions, e.g. traditional healer and mid-wives, also realize their knowledge is unique and are more secretive about sharing it outside kinship lines.

The connection between wealth and kinship was evident as the longest-standing residents are also the wealthier members in the community. Limited access to the good agricultural land was a result of the wealth-kinship association. This was particularly apparent with the *dimbas*, which tend to be kept within wealthy families who have farmed it for decades. Furthermore, wealthier families have less pressure to look for off-farm work. In contrast, poorer families generally farm average quality land and thus, were more pressured to intercrop in order to maximize land use. Moreover, these families have less available labour to help and therefore prefer to plant high diversity on less land (coping strategy to poverty). This may indicate an upcoming trend in Malawian agriculture: increased diversity in response to less available land.

Access to information and to land resources were factors in knowledge differentiation. Development initiatives should be aware of differences when, for example, promoting a innovative farmer's technique within a village. Inequalities may be the underlying reasons for a farmers innovativeness which, when promoted, may not be accepted by all members in the community.

4) Top-down government policies have negative effects on IK

My findings have shown that the community's ability to manage natural resources is impeded by lack of control over common property resources. People feel they do not own the trees they plant on communal or farmland and thus, are hesitant to plant outside house boundaries. This has limited the potential for agroforestry, woodlots for fuelwood, and enrichment planting. Although farmers recognize the importance of conserving existing trees in fields, as the results have indicated, they are not planting trees. The rapidly degrading environment in Malawi indicates that past efforts to manage natural resources have not been sustainable. Recent changes in government policies to both the forestry and land act will help to empower rural farmers by returning more control of the resources to them.

5) IK has depth beyond the visible

This research has shown that IK is more that just the ability of rural farmer to identify different types of trees and pass on folklore. IK represents complex strategies for survival, innovation, adaptation, and contestation. It is not just ecologically bound, but is

also spiritual, political, economic and social. An environmental philosophy is understood from the ritual ceremonies which take place in the village every year and from the great respect held for areas with spirit presence. I found during my discussions with organizations and government agencies in Malawi, however, that although development practitioners are familiar with the concept of indigenous knowledge most believed it to be something that existed in the past, and very few realized its depth. This type of attitude suggests that people involved in development initiates lack awareness of the rural people with whom they work with. Perhaps the first step in Malawi towards "raising awareness" in development projects should be raising awareness of those running the projects. This means cultural awareness of which indigenous knowledge is a part of.

6) Comments on PRA as a Methodology

In general, PRA seemed relevant for accessing IK and understanding the current conditions in Malawi. I found that working with individuals versus groups, was beneficial to ascertain differences in knowledge. Mapping and participant observation were two of the most useful PRA techniques for uncovering IK because farmers could visualize their practices. Researchers should be aware, however, that all participants may not be comfortable with conceptualizing ideas on paper. I found the transect walk was only useful for revealing the general layout of the community. The historical resource matrix was important to illustrate that some local practices are not sustainable.

During my PRA I felt that after 3 months we were only just beginning to scratch the surface towards understanding the community. I feel that time is a great limitation to the way PRAs are currently being carried out in Malawi. Its rapid uptake by organizations, has created "PRA madness" in the country without a complete understanding of its purpose. Rapid two week PRAs can not be expected to gather enough information to fully understand the complexity and rationale behind all the different practices, techniques and beliefs occurring within a community. Development initiatives should instead base their activities on a longer term process which the community members direct themselves.

I believe this research was participatory to a certain extent, as I involved a range of people in the data collection in order to obtain different perceptions (e.g. different types of knowledge). Informants stated that participating in this research made them realize things that were not previously obvious to them (e.g. discussing changes in environment, seeing their fields illustrated on maps). I think it helped to build dignity and strengthen some people's beliefs in their own knowledge. In general, however, people in the village viewed Miriam and I as more knowledgeable due to our university educations and tended to devalue their own knowledge in comparison. Government extension staff and other development workers must place faith in rural people's knowledge and in their ability to make decisions regarding sustainable resource management. I am anticipating that because this research is part of a larger programme, CURE will continue working with and learning from this community and others, with the final objective toward increasing

their empowerment. Determining *how* empowering a project or activity is, however, is difficult to measure as it is associated with gaining control, participating, and decision-making. Empowerment is a process and is not simply something that can be given to people. Through the process of empowerment, collective awareness and capacity building can begin to develop and allow people to organize themselves to take action and bring about change.

7) Rationale for applying and building on indigenous knowledge in Malawi

This research has shown that the existence of IK is significant and plays a substantial role in sustainable resource use. Malawi is facing serious environmental problems, however, which indicates that not all practices are sustainable. This was highlighted in the historical resource matrix which illustrated the overall degrading environmental trends experienced in Matengambiri village. I believe that as IK erodes as a result of outside influences, so too does the environment which supports it. The influences are a result of much broader interactions on a less manageable scale than simply the local-level. This implies policy changes are also needed. Given the current trends in environmental degradation (e.g. soil erosion, loss of forests, drop in water table, etc.), I do not think that IK will remain sustainable in isolation, but will require sensitive and thoughtful ways of building on existing beliefs, practices, and techniques. There is evidence that IK in Malawi is constantly transforming and adapting to modern technologies and economic changes in order to meet people's needs, e.g. more intensive intercropping on less land.

Indigenous knowledge, although not sustainable in isolation, is perhaps more resilient than development initiatives often make it out to be.

RECOMMENDATIONS FOR MATENGAMBIRI VILLAGE

Often when researchers undertake case studies with the hopes it will provide a general basis for larger national recommendation, the immediate concerns of the people involved in the generation of the research are overlooked. Although I protected the names of individual participants in this research, in keeping with social science research ethics, I did not use a pseudonym for the village in the understanding that development initiatives will carry on from my research. These recommendations are aimed at CURE and government extension staff who are actively working in the area of Matengambiri village and have the capacity to consider and implement them. Although all of the recommendations apply to the people of Matengambiri, what I specifically identified as priority areas of concern to the community are the following.

The need for better access to water

People in Matengambiri village rely on shallow wells as their prime source of water. My research has indicated that this system is not sustainable given the rising human and livestock populations. People are directly competing with each other at the shallow wells, and this is particularly time consuming for women. Villagers are also in competition for water with the nearby cattle farm whose livestock effects both the quality and quantity of water in the dry season, the critical time. Past attempts at using trees and

grass species as indicators of good ground water have failed to provide reliable shallow wells. The ground water table is so low that formerly reliable indicators are no longer working. To improve the water situation an investigation of appropriate water technologies may offer a locally feasible alternative. This would be a way to improve on IK, by combining local knowledge with outside technology, and provide something more sustainable for year round water.

The need to address issue of carrying capacity of livestock

The findings indicated that most people in the village own livestock, usually goats. As the demands for a cash income grow, people have chosen to increase the number of livestock they keep. From my observations of soil erosion and overgrazing both in and around the village, and from the concerns indicated by informants, the village is currently beyond its livestock carrying capacity. Possible solutions should focus on providing alternative income-generating sources thereby reducing the need to have more animals to sell. For example, enhancing thatching and fodder grass, and wild grain collection sites may increase income generating activities for women, and provide more of a buffer during years of food shortage. Another recommendation is to investigate the possibilities of creating an enhanced communal grazing area by determining the most resilient and palatable forms of fodder for goats. Rather than introducing grasses into farming systems it would first be beneficial to experiment with the grasses perceived as most useful by the farmers. This may lead to better grazing opportunities and use of moisture/soil-holding grasses which are locally familiar and available.

The need to address issues of inequalities in present local authority

The loss of property rights and subsequent loss of control over resources is a problem currently facing the community. The previous government policy of land conversion from communal to estate ownership has increased the pressure on already scarce subsistence farmland. The most productive agricultural land, particularly *dimba*, is presently farmed by the wealthier community members. Equitable and secure land tenure over land resources for users is a fundamental requirement for encouraging sustainable natural resource management. It should be noted that Land shortages and redistribution are issues currently being addressed under the new National Land Use and Management Policy.

The need to improve agroforestry

Villagers are experiencing a scarcity of certain species of trees which provide timber, fruit and firewood, and have only been able to access certain forested areas at the exclusion of others by the Department of Forestry. There has been limited research on existing indigenous agroforestry practices in Malawi. Agroforestry has the potential to address problems of soil erosion, land degradation, low soil fertility, overgrazing and fuelwood shortages in the Lower Shire. Research, however, should focus on assessing what knowledge already exists, and how it can be improved. Farmers were unaware of the new changes to the *Forestry Act*, and the relaxation on policing and enforcement. Extension staff could play a role in disseminating the information and what this means in terms of accessing and managing resources to the community. The forestry Department

should examine the feasibility of co-managing a village forest reserve with the community that may involve enrichment planting, establishing a woodlot for timber and fuelwood, and promoting fruit tree planting.

RECOMMENDATIONS FOR CURE

Raise awareness of internal staff on IK issues

Developing a greater awareness, understanding, and appreciation of IK and its potential role in development by CURE staff would be required in order to create an IK center at CURE. This may involve such things as participation in conferences, workshops and subscriptions to specific publications on IK. It would also be necessary for the staff to develop skills for identifying, recovering and using IK in development programs which may be assisted through cross-institutional and inter-African sharing of perspectives, experiences and skills for IK development initiatives.

Introduce an IK center as a base for research, documentation and dissemination

Currently CURE is the most appropriate organization with the capacity to manage a national IK center due to their coordination role amongst NGOs and government departments. The aim of documenting IK should not only be for its cataloguing and preservation, but more importantly as an opportunity to advance people's understanding of the environment in all societies. IK and exogenous knowledge systems are constantly evolving bodies of knowledge and should be recognized as having both strengths and weaknesses in the ways each interacts with the environment. Documenting and

disseminating IK should be viewed as a means of sharing useful insights, exchanging technologies which have proven effective, finding local solutions to local problems, promoting local-level decision making, and ultimately empowering people through the recognition of their knowledge.

The role of a Malawian IK center should be to record and share information on environmental indicators, potential uses of trees in agroforestry, and other farming technologies. The emphasis in Malawi should be on indigenous decision-making systems, IK communication channels (farmer groups which identify, discuss and resolve problems), successful innovations and experimentations, and differences in knowledge to promote more equitable development. It may not be feasible for CURE to be actively involved in research, but it could act as a clearing house for national IK information and actively encourage others to conduct investigations. Supporting and encouraging interdisciplinary research on IK would require building stronger linkages with national (agricultural research stations, FRIM, University of Malawi, etc.) and international research institutes (foreign universities). CURE could then disseminate IK information, firstly among farmers, and secondly among organizations and government departments.

There are many supporting institutions which could assist CURE in initiating a Malawian Regional IK Center. I have listed regional African IK centers in Appendix 1, the best sources of which are probably from Zimbabwe because of its proximity (AZTREC, and SAFIRE) and CIKARD. CIKARD promotes the establishment of regional and national

IK resource centers and, upon request, will provide policy guidance, identify sources of funding, and assist in the actual establishment of centers.

Use CURE's current PRA training system as a vehicle to promote IK

It would be a natural step to incorporate the teaching of IK concepts, importance, usefulness, within the existing PRA training workshops that CURE already organizes and implements. The complementary approach between PRA methods and eliciting IK has been discussed throughout this thesis.

BROAD PRIORITY NEEDS IN MALAWI

My research was based on one case study, Matengambiri village, which I consider to be a fairly typical Malawian village on the basis of people's subsistence farming lifestyles, the nation-wide influence of past and current government policies, and the country's macroeconomy. I think there are several areas which can be extrapolated from my case study in terms of national recommendations.

Government decentralization and devolution of control over natural resources

There is currently uncertainty in Matengambiri village, as in many Malawian villages, with regard to access and use of resources. Local empowerment and sustainable livelihoods will be realized when greater control of natural resources is devolved to local communities. The first step may be in gaining the government's respect for customary forms of management by offering specific examples of its success in sustainable use of

the natural resources. In order to develop more community-based forms of natural resource management there is a need for the government to establish clear rules on access, ownership and use of resources. It must also be clear who the beneficiaries are from using IK if control is to be devolved.

Training government extension staff in IK principles and its importance

Government extension staff are the main link between villagers and the centralized government. Despite their limited mobility to reach all villages, these people are key to not only carrying extension messages, but also in communicating farmers' needs. The role of extension officers is currently to relay messages from the central government down to farmers. Extension training, however, should emphasize listening skills, open-mindedness, and knowledge sharing in carrying out extension work. Teaching the principles and importance of IK could be incorporated into government extension training centers. A national IK center could play a role in this training.

Bring IK into formal education programs

Currently the education system in Malawi is still very much based on a colonial structure. Formal education express indigenous or "traditional" practices as inferior over Western philosophies to children whose very lives encompass IK. Many aspects of the Western teachings are not relevant to the lives of most students. Emphasis should instead be on issues which directly relate to student's lives such as teaching the medicinal knowledge of plant species, and how to use trees in farming systems to improve yields (agroforestry).

Incorporating IK into the classroom could help students more fully appreciate and understand the strength in their traditions.

Support networking, cross-farmer exchanges and field demonstrations

There should be greater support for farmer innovation. This research has shown that farmers experiment with ideas obtained from outside the village. One farmer discovered that *nimu* trees grown around his field were palatable to goats and thus, acted as a diversion from his crops. Exploring this farmer's technique may be a successful approach for the entire village as keeping goats out of crops is an ongoing struggle in the village. When promoting progressive farmer technologies, however, the socioeconomic status of the innovative farmer, and who it is being promoted to, should be compatible. Cross-farmer exchanges and field demonstrations of what farmers are doing in other areas would be beneficial in disseminating IK across the country. Farmers themselves are often the best instructors when promoting the efficacy of a practice to other farmers.

Disseminate farmer IK information via radio

All farmers have access to a radio, whether it is their own or a neighbour's radio while socializing. Radio as a medium to disseminate farmer innovations and experiences could be a useful tool in Malawi. It would also involve the illiterate and other marginalized farmers who do not have access to written forms of information. An example could be farmers sharing low-technology ideas on how to successful eradicate the weed *kaufiti*.

More emphasis on power structure in the communities

Community development initiatives rarely seek out who knows what, and who has access to what types of information. Understanding the social interactions in a community setting is necessary to understand how knowledge is generated, transmitted and transferred by different people. This will reduce social stratification and reduce the chance that minorities will be overlooked in village development projects. Ultimately this requires a greater time commitment on the part of government agencies and NGOs.

Need to include women in agricultural training programs

This research has shown that women are not as mobile as men and therefore have less access to both government extension messages, and farmer exchanges. Extension programs need to make greater efforts to overcome the bias that farmers are only generally male and thus, take account of women's knowledge. This means that women should be equally included in cross-farmer exchanges, field demonstrations, and in the generation of new technologies and practices.

Control of technological change must also be given to the farmers

Control of technology has traditionally been determined by colonial, and post-colonial, government research and extension in Malawi, although, farmers are not completely passive in receiving these technologies. Farmers should be given the right to direct the development process and actively take part in the creation of new practices and techniques at government forestry and agriculture research stations.

Recognize farming communities are made up of farmers

Using indigenous knowledge represents a challenge because of its relativism and the dynamic nature of farmers' knowledge. It is important to recognize differences between homogenous groups (e.g. poorer farmers may have different priorities for farming than wealthier farmers). A more successful approach to development would be to focus on these homogenous interest groups which would foster greater reciprocity of exchange between members rather than focusing on an entire village. It is important to also consider a wider application of agrarian changes (beyond the household and village) as regional factors also influence the household farm.

Use indigenous descriptions to foster better communication

There is merit in learning and using local language (e.g. common names of trees) and concepts (e.g. thirsty soils) as they will be familiar to farmers and therefore facilitate better communication between farmers and development practitioners. For example, I found that the agroecological zones used by government extension staff around Ngabu are too broad to take into account slight soil variations which the farmers use to their advantage. To dismiss this detailed and local way of knowing is to ignore a potential resource for sustainable land use development.

FUTURE RESEARCH NEEDS

I did not have time to investigate all possible dimensions of indigenous environmental knowledge while in Matengambiri village. Further areas of research or areas requiring greater emphasis which I feel would enhance building on indigenous knowledge systems towards sustainable agriculture and natural resource management include the following.

Women's knowledge regarding farm management practices is becoming particularly important in Africa as more men seek off-farm employment, leaving women the responsibility of all agricultural decisions. A greater emphasis on women's farming knowledge is essential. The decision-making systems of both men and women with regard to intercropping combinations are also needed to assess how macro-level changes affect farmers the local level. Learning about the different ways rural people cultivate and process indigenous plant species may provide insights to achieving greater food security. Similar to this research, IK research tends to address the positive aspects of what farmers know. Resource equity in traditional farming systems should also be examined to address local power imbalances in different socioeconomic groups. More difficult issues which need addressing are exactly how farmers' power and independence will increase by building on their knowledge. And furthermore, how to ensure that indigenous knowledge will not be expropriated by outside agencies (e.g. the current debate on intellectual property rights).

Closing Thoughts

I have found that indigenous knowledge is diverse, stretching from the technical (thirsty soils) to the spiritual (spirit hills). This diversity is also a reflection of the individual farmers who comprise a farming community. Social structure, spiritual beliefs, and ability to adapt to changes have allowed farmers to "do what they do" over the years while conserving and managing natural resources in a sustainable manner. In order to discover the wisdom held in their methods it is necessary to view knowledge-sharing as an essential part of community development.

APPENDIX 1

Contacts of Indigenous Knowledge Centers in Africa

CIKARD*

Center for Indigenous Knowledge for Agriculture and Rural Development
Dr. D. Michael Warren, Director
318 Curtiss Hall, Iowa State University
Ames, Iowa 50011, USA.
Tel: +1-515-2940938. Fax: +1-515-2946058.
E-mail: dmwarren@iastate.edu

ARCIK

African Resource Centre for Indegenous Knowledge / Prof. Adedotun Philips, Director
Dr. Tunji Titilola, Research Coordinator
Nigeria Institute of Social and Economic Research (NISER)
PMB 5 - UI Post Office Ibadan, Nigeria.
Tel: +234-22-400500. Fax: +234-22-416129
E-mail: niser.nigeria@lagosmail.sprint.com

BURCIK

Burkina Faso Resource Centre for Indigenous Knowledge
Dr. Basga E. Dialla (IRSSH), Director
B.P. 5154, Ouagadougou 02, Burkina Faso.
Tel: +226-362835. Fax: +226-315003.

CECIK

Centre for Cosmovisions and Indigenous Knowledge
Dr. David Millar, Director
c/o T.A.A.P.
P.O.Box 42, Tamale, Nothern Region, Ghana.
Tel: +233-71-22000.
E-mail: aispcg@ncs.com.gh

CIKFAB

Centre for Indigenous Knowledge Fourah Bay College / Dr. Dominic T. Ashley, Director
Department of Sociology
Fourah Bay College / University of Sierra Leone
Freetown, Sierra Leone.
Tel: +232-22-7387

CIKO

Cameroon Indigenous Knowledge Organisation
Prof. C.N. Ngwasiri, Director
P.O. Box 170, Buea, South West Province Cameroon
Tel: +237-322690. Fax: +237-322514/430813.
E-mail: ngwasiri@cyber.koki.net

CIKPREM

Centre for Indigenous Knowledge on Population Resource and Environmental Management
Prof. D.S. Obikeze
Dept. of Sociology and Anthropology
University of Nigeria, Knusu

GHARCIK

Ghana Resource Centre for Indigenous Knowledge
Dr. M. Bonsu, Interim Director
School for Agriculture
University of Cape Coast, Cape Coast, Ghana.
Tel: +233-42-2240-9/2480-9.
Telfax: +233-42-2552 UCC GH.

KENRIK

Kenya Resource Centre for Indigenous Knowledge
Dr. Mohamed Isahakia, Acting Director
The National Museums of Kenya
P.O. Box 40658, Nairobi, Kenya.
Tel: +254-2-742131. Fax: +254-2-741424
E-mail: kenrik@tt.gnapc.org

MARCIK

Madagascar Resource Centre for Indigenous Knowlege / Ms Juliette Ratsimandrava
B.P. 6224, Antananarivo 101, Madagascar.
Fax: +261-2-32123/20422

MARECIK

Maasai Resource Centre for Indigenous Knowledge / Dr. Nathan Ole Lengisugi
Simanjiro Animal Husbandry
Cocational Training Centre
P.O. Box 3084, Arusha, Tanzania
Fax: +255-57-8907.

NIRCIK

Nigeria Centre for Indigenous Knowledge
Dr. J. O. Olukosi, Coordinator
Institute for Agricultural Research
Ahmadu Bello University
PMB 1044, Zaria, Nigeria.
Tel: +234-69-50571-4 Ext. 4322
Fax: +234-69-50891/50563

SARCIK

South African Resource Centre for Indigenous Knowledge/ Alwyn Dippenaar, Executive Director
P.O.Box 2355, Somerset West, 7129 South Africa
Tel: +27-21-8543299. E-mail: alwyn@aztec.co.za

AZTREC

Association of Zimbabwean Traditional Environmental Conservationists
Office No. 2
Stand 97, Hellet Street Masvingo, Zimbabwe
Tel: 139-64889

SAFIRE

Southern Alliance for Indigenous Resources
Harare, Zimbabwe

*CIKARD is the global IK centre linking all regional centers.

APPENDIX 2

Contacts for Literature Review in Malawi

Blantyre Agricultural Development Division (BADD), Blantyre
Churches Action in Relief and Development (CARD), Blantyre
Centre for Social Research, University of Malawi, Zomba
Chancellor College, University of Malawi, Zomba
Chitedze Agricultural Research Station, Chitedze
Concern Universal (CU), Blantyre
Coordination Unit for the Rehabilitation of the Environment (CURE), Blantyre
Christian Services Committee (CSC), Limbe
Department of Forestry, Lilongwe
Department of National Parks and Wildlife, Lilongwe
Evangelical Alliance for Relief and Development (EVARD), Blantyre
Evangelical Lutheran Development Project (ELDP), Blantyre
Forestry Research Institute of Malawi (FRIM), Zomba
Ministry of Agriculture and Livestock Development, Lilongwe
Ministry of Research and Environmental Affairs (MOREA), Lilongwe
National Herbarium of Malawi, Zomba
Ngabu Agriculture Development Division (NADD), Ngabu
Natural Resource College, Chitedze
Society of Malawi, Limbe
Southern Alliance for Indigenous Resources (SAFIRE), Harare, Zimbabwe
United Nations Environment Program (UNEP), Lilongwe
Wildlife Society of Malawi, Limbe

APPENDIX 3

PRA Techniques Used in this Research

1) **Review of Secondary Data** included a literature review in Canada and Malawi of indigenous knowledge, sustainable agriculture, community-based resource management, PRA/RRA techniques, and history, culture, and natural resources management polices of Malawi.

2) **Self-correcting Notes.** By keeping regular field notes and continually re-reading them it allowed for more focus of where I was in my research, what had been accomplished so far, what else needed to be covered, areas which need emphasis, etc. At the end of the day Miriam and I would spend the evening discussing the days events, data, problems encountered, and note writing.

3) **Introductory Base-line Questionnaire (Appendix 4).** After pretesting in neighboring Njanje village and revising the questionnaire, Miriam and I visited each household, interviewing either the household head, spouse, or both in Chichewa. All households in the village participated. In standard PRAs, questionnaires are generally conducted late in the research stage. I chose to conduct mine early on for a number of reasons, primarily as a means of meeting people, and getting to know all the family names and layout of the village. Although the intent was also to collect baseline information, we also used the household visits to explain the purpose of the research, what types of activities we would be conducting in the future, and share information about ourselves. This approach was culturally appropriate as it gave each person a chance to ask questions about our presence in the village and it reduced their fear and suspicion of us. It also gave us an opportunity to observe the households and surrounding land and make notes for future interviews. This introductory process, combined with the support of the village headman, added to the fidelity of the research results. When carrying out other PRA activities, I often referred back to the questionnaires as a cross-check.

4) **Direct Observation.** Both participant and direct observation, although used throughout our village stay, were the starting tools for initiating data collection. Miriam and I spent the first month partaking in and watching village activities, asking question such as 'why are you doing this?', and generally walking around the village and meeting people. I wanted to feel comfortable with people and know the physical layout of the area before we started more specific research.

5) **Participatory Observation** involves a role reversal necessary to understand the situation from the villagers perspective. Salmen (1987) reinforces the notion of participant observation or 'learning-by-doing' as one of the most effective ways to gain an in-depth interpretation of the real situation. Participant observation was helpful in building friendships and good rapport with people in the village. I found that every

activity we took part in became an opportunity to collect more data. Although it was exhausting, and I sometimes became anxious to start other PRA activities, we persisted in working alongside people. In the end it paid off as we gained people's trust and respect. Participant observation also allowed us to verify things which were learned through other PRA activities. Some examples of activities we participated in are: daily water drawing, weeding and cultivating fields, pounding grains for flour, winnowing, collecting wild fruits, collecting firewood, picking cotton, collecting thatching grass, insect collecting, mice hunting, collecting medicinal plants, and ceremonies.

6) **Semi-structured interviewing** is used, as opposed to structured questionnaires, as an informal but guided interview which often results in more accurate responses. We used semi-structured interviewing both during the PRA activities and also to fill in gaps in the data or things which needed clarification.

7) **Historical Time Lines** are discussions with older villagers on changes that have occurred within the area over time.

8) **Transect walk** is a systematic walks with key informants through specific areas. We conducted the transect walk early on to introduce ourselves to the area. The transect walk was undertaken by two village elders, referred to us by the village headman, and took three hours to complete, covering approximately 2.5 Km. We started at the highest point near the village to determine the best possible route for a representative cross section of the village and surroundings.

9) **Wealth Ranking (Appendix 9).** As discussed in Chapter 1, indigenous knowledge is not uniform throughout communities, but a reflection of age, gender and wealth. Generally, farmers of different socio-economic status will have different needs, problems and varying abilities to solve them. I attempted to consider wealth, gender and age parameters during all PRA activities. This helped to ensure participation from the village was representative of farmers, thereby avoiding distorted sampling. I selected informants who were long-standing members of the community, anticipating they would be familiar with all families. Despite this, some informants did not know all the families well enough to rank them. We took this into consideration when calculating the final results. I used Feldstein and Jiggins' (1994) wealth ranking technique based on grouping family names, written on cards ahead of time, into a number of categories chosen by the participant. Prior to grouping names into the categories, we discussed the concept of wealth with each informant. Following the ranking we asked the informant to explain how each of the piles were different. When computing the average scores from the accumulated ranking data, Feldstein and Jiggins (1994) suggest grouping the families into three categories: rich, average, and poor. The number of strata should not exceed the mean of the number of piles used by participants (in this case 7), however, three are suggested as using more would represent a false degree of accuracy. Each ranking activity lasted approximately 2 hours. Measures of wealth, as perceived by villagers, are listed in Appendix 9.

10) Daily activity profiles explore and compares daily life patterns of both male and female villagers of all ages.

11) Participatory Diagrams included farm and resource maps drawn by participants which indicated farming techniques, areas of restricted access, and spiritual beliefs. The literature states that the maps do not need to be drawn on paper but could include the ground and the use of seeds, stones or sticks. I found most participants were comfortable using paper and markers. All maps were drawn on 80 x 60 cm sheets of flipchart paper. Resource mapping was usually conducted at the participants home and farm mapping was conducted directly in the map makers fields. A reconnaissance walk of the field with the map maker refreshed his or her memory and also raised questions. The mapping led to questions and discussions which we followed up with further semi-structured interviewing to fill in gaps. Examples of farm and resource maps are shown in Appendices 7 and 8.

12) Local resource collection can provide insight into local taxonomic classification systems, uses and importance of plants in a community. I used this technique to gain information about tree and soil knowledge.

13) Direct Matrix Ranking. For this technique people chose their own categories and criteria for prioritizing items. I used this to gain participants knowledge of soils by rank the most and least useful soils, and to indicate their knowledge of the seasonality of wild fruits.

14) Seasonal Resource Calendars were used to explore constraints and opportunities by describing month to month changes throughout the year. Participants described all the resource-related activities they perform each month which was then combined onto one calendar.

15) Historical Resource Matrix was based on criteria obtained in the time line discussions. Four, ten year time periods (1964 - present) were used to discuss changes in 13 different resources which were indicated as being important to the community. I drew the matrix on flip chart paper with 4 x 13 boxes and asked participants to indicate the changes with each resource over time by placing a relative amount of dried beans in the boxes. Overall changes were then determined as either increasing or decreasing.

16) Case Studies and Stories. By exchanging details of daily life it can indicate how problems arise, how people cope with the problems and how they are solved. This was usually done in a more informal setting with a participant e.g. in a field while we were having a lunch break from cultivating. By openly sharing details of my own life, people were more receptive to discussion theirs.

17) Key Probes are key questions to obtain specific information. These were used especially during mapping, ranking and participant observation.

18) Folk-lore. The stories can reveal a great deal about traditional practices and beliefs.

19) Future possibles asks people their wishes and expectations for the future and what would happen if nothing is done or if something is done.

20) Night halts. Interactions between the villagers and ourselves were heightened by experience of staying in the village. It allowed for more confidence and respect building as people were generally impressed that our choice was to sleep in the village. It also allowed us to find out more about village life by participating in nightly events and discussions we would have otherwised missed by living outside the village. People often came to our home in the evenings after dinner to ask questions about ourselves.

APPENDIX 4

Household Base-line Questionnaire

Name_____ Position in household_____

Male / Female Age_____ Marital status_____Date_____

Family and Household

Note type of housing: thatched roof, tin roof, glass windows, doors
How long have you lived in this village?
How many children do you have?
How many people live with you?
Do your children attend school? (how many?)
Did you attend school?
If yes, to what level?
Did your spouse attend school?
If yes, to what level?
Does anyone in this family have a job outside of the village?
Do they help pay for things like school fees, or fertilizer?

Farming

What is the size of your farm in acres?
Do you own this land?
How did you acquire this land?
What type of farm implements do you own?
What type of food crops do you grow? Acreage for each?
What type of cash crops do you grow? Acreage?
Do you produce any surplus crops for sale? Which ones?
Where do you sell them?
How do you get your product to market?
Could you describe some of your farm practices (e.g. do you use organic manure, pesticides, chemicals, fertilizers?)
Do you do use practices which help to conserve the soil conservation (e.g. grass strips, ridges, gully erosion control,?)
Where did you learn these practices?
What are your problems related to the natural resources?
How do you try to solve these problems?
What do you think are the reasons for these problems?

Livestock Ownership

Do you own livestock?
What type?
How many of each?
How is your livestock used?

Water Use and Availability

Where do you get your water: dry season_____ distance _____km
wet season_____ distance_____km
What is the quality of the water like:
dry season location_____
wet season location_____
Who collects the water?
How long do they/you spend each day collecting water?
How many times each week do they/you collect water?
What water conservation methods have you practiced on your farm?
What problems have you encountered in water access?

Tree Planting and Use

How do you collect firewood? (purchase, free, limited?)
Where do you collect firewood? distance in Km_____
Who collects the firewood?
How long do they/you spend collecting firewood each day?
How many times each week do they/you collect firewood?
What problems do you have with firewood collection?
Have you planted trees in the last 3 years?
What species? For what use?
Where do you obtain your seedlings?
Where do you obtain your advice on tree planting?
Is it adequate?
What problems do you have with the advice?
Do you collect any wild plants?
What type?
What do you use them for?

Institutional Presence in the Village

What are the different institutions and groups in this area? (e.g. gov't extension workers, NGO extension workers)
Out of these which ones have helped you the most? Why?
What activities are carried out by these groups?

Do you take part in these activities? Why or Why not?
What activities would you like these groups to carry out?
What problems do you see with these institutions and different groups?
What changes would you like to see made in the village?

APPENDIX 5

Uses of Collected Trees Samples

Key:
B - building/fencing material; **C** - ceremonial/spiritual; **Ft** - fertilizer; **Fi** - fibre; **Fw** - firewood/charcoal; **Fr** - fruit/nuts; **L** - leaves eaten; **M** - medicinal; **Pe** - pesticide/insecticide; **Po** - poison; **R** - resin; **T** - tools/utensils; **W** - windbreak/shade

* exotic trees, most of which have naturalized

		Uses												
Chichewa Name	**Scientific Name**	**B**	**C**	**Ft**	**Fi**	**Fw**	**Fr**	**L**	**M**	**Pe**	**Po**	**R**	**T**	**W**
Bwazi	*Securidaca longipedunculata*				X			X					X	
Bwemba	*Tamarindus indica*	X			X		X							
Bwembakhole	*Senna singuena*								X					
Chalangalume/Chungalume	*Dialopis africana*					X			X					
Chidyagwape	*Albizia glaberrima*	X				X								
Chidyakamba	*Acridocarpus chloropterus*								X					
Chidyamatso/Ntemansato	*Maytenus senegalensis*	X												
Chiseo/Chisio/Chisiyo	*Acacia tortilis*								X					
Chitimbe/Nsekese/Ndaula	*Bauhinia thonningii*	X					X		X					
Chuchalanyere	*Maerua angloensis*					X								
Chymwanamwale	*Rhynchosia sublobata*		X						X					
Dowa	*Cardiogyne africana*	X			X	X	X							
Gonanibwino*	*Manihot glaziovii*							X						X
Kafupakapendae	*Premna senensis*								X					
Kagolo	*Combretum zeyheri*	X				X								X
Kamunakatsanya	*Lonchocarpus bussei*	X												

Chichewa Name	Scientific Name	Uses												
		B	C	Ft	Fi	Fw	Fr	L	M	Pe	Po	R	T	W
Kanjona	*Acacia sieberana*	X				X								
Kankhande	*Ziziphus mucronata*								X					
Kasikiribanda	*Deinbollia nyikensis*					X	X							
Kesha*	*Senna siamea*												X	
Khobo	*Commiphora pilosa*					X								X
Lungwe	*Dalbergia melanoxylon*	X												
Mangoe*	*Mangifera indica*						X							
Mdudunyanga	*Steganotaenia araliacea*								X					
Masawu*	*Ziziphus mauritiana*	X				X	X							
Matondobwinja	*Staphania abyssinica*	X				X	X							
Mbinimini	*Abrus precatorius*								X					
Mfula/Nfula	*Sclerocarya caffra*	X				X	X						X	
Mfuma	*Diospyros mespiliformis*	X				X	X		X				X	
Mgoza	*Sterculia africana*		X		X	X								
Mlambe	*Adansonia digitata*		X		X		X	X	X					
Mpakasa	*Lonchocarpus capassa*	X				X								X
Mpangala	*Dichrostachys glomerata*	X				X			X				X	
Mphimbi	*Garcinia livingstonei*		X				X						X	
Mphoza	*Annona senegalensis*				X				X					
Msikidzi/Nsikedze	*Trichilia emetica*	X							X					
Mtondo/Mitondo/Ntondo	*Cordyla africana*		X			X	X					X	X	X
Mtubyitubyi	*Paederia bojerana*								X					
Mvalalakalamba/dolulu	*Aristolochia petersiana*	X												
Mvunguti	*Kigelia africana*	X	X			X		X	X					
Mwanambewe	*Markhamia obtusifolia*	X												

Chichewa Name	Scientific Name	Uses												
		B	C	Ft	Fi	Fw	Fr	L	M	Pe	Po	R	T	W
Mwavi	*Erythrophleum suaveolens*		X								X			
Nangale/Mnangali	*Combretum imberbe*	X				X			X					
Napini	*Terminalia sericea*	X				X								
Mulumanyama/Mulukanya-	*Cassia abbreviata*								X					
Nchelenje	*Berchemia discolor*	X				X	X					X	X	
Nchovela	*Commiphora africana*								X					
Nchulosa/ Nchuluswa	*Lannea stuhlmannii*	X				X	X							
Ndalang'oma	*Erthyrina abyssinica*	X												
Ndama/Nfiti	*Combretum elaeagnoides*	X				X			X					
Ndudu	*Stereospermum kunthianum*	X				X			X					
Neemu/ Nimu*	*Azaderachta indica*	X				X			X					
Ngaga/Mgaga	*Holarrhena pubescens*	X							X					
Ng'ambo	*Dovyalis macrocalyx*								X					
Ngoliyondo	*Brachystegia spiciformis*	X				X								
Ngonganga	*Dichrostachys cinerea*					X								
Ngonono	*Terminalia stenostachya*	X				X								
Ngowe	*Acacia polyacantha*	X		X										
Njale	*Sterculia appendiculata*	X	X			X	X	X						X
Njenjete	*Albizia harveyi*	X		X		X								
Nkalati	*Burkea africana*					X								
Nkandankhuku	*Commiphora chorocarpa*								X					
Nkhotamu/Chipota	*Combretum collinum*								X					
Nkeena*	*Melia azadirach*					X			X	X				X
Nkhunku/Nkunku	*Acacia nigrescens*	X				X								
Nkohankhuku	*Capparis erythrocarpos*							X						

Chichewa Name	Scientific Name	Uses												
		B	C	Ft	Fi	Fw	Fr	L	M	Pe	Po	R	T	W
Nkuyu/Mkuyu	*Ficus sycomorus*	X				X	X		X					
Nkukugombe	*Anthodeista grandiflora*					X								
Nkundi/Mkundi	*Parkia filicoides*	X				X			X					
Nkwiniti	*Chenopodium ambrosioides*		X											
Nondae/Mnondae	*Xeroderris stuhlimannii*	X				X			X				X	
Nsangowa/Msangowa	*Moringa oleifera*		X			X		X						X
Nsatsi	*Ricinus communis*								X					
Nsetanyane	*Sterculia quinqueloba*	X			X							X		
Nsilisili/Msilisili	*Acacia niliotica*	X				X			X					
Nsokosa	*Drypetes natalensis*	X												
Nsolola/Msolola	*Pseudolachnostylis*	X	X			X			X					
Nsukwali	*Olax obtusefolia*								X					
Ntacha	*Pleurostylia africana*					X	X							
Ntalala	*Zahna africana*	X	X			X	X							
Ntangatanga/Mtangatanga	*Peddiea africana*	X		X					X					
Nteme/Mteme	*Strychnos spinosa*					X	X				X			
Ntengene	*Ximenia caffra*					X	X		X					
Ntete	*Acacia campylacantha*	X				X			X					X
Nthuthu	*Cordia abyssinica*												X	X
Ntudza	*Flacourtia indica*					X	X							X
Ntumbwi	*Kirkia acuminata*	X				X			X					X
Ntuthanyenere	*Boscia angustifolia*							X						
Nyamdima	*Euclea crispa*								X					
Nyangaga	*Tabernaemontana elegans*					X								
Nyenje/Nyenza	*Boscia salicifolia*					X								

		Uses												
Chichewa Name	**Scientific Name**	**B**	**C**	**Ft**	**Fi**	**Fw**	**Fr**	**L**	**M**	**Pe**	**Po**	**R**	**T**	**W**
Nyongolo	*Friesodielsia obovata*	X				X	X		X					X
Nyumwa	*Clerodendrum uncinatum*								X					
Ombwe	*Tephrosia nyasae*										X			
Phingo	*Dalbergia melanoxylon*	X				X							X	
Sese	*Lactuca capensis*							X						
Thembia	*Croton megalobotrys*	X						X	X					X
Theta	*Elephantorrhiza goetzei*					X			X					
Thombozi/Mtombozi	*Diplorynchus condylocarpon*	X				X			X			X		
Tsanya	*Colophospernum mopane*	X				X			X					X
Total uses		**50**	**12**	**3**	**7**	**53**	**22**	**10**	**45**	**1**	**3**	**4**	**11**	**13**

Total number of species = 100

APPENDIX 6

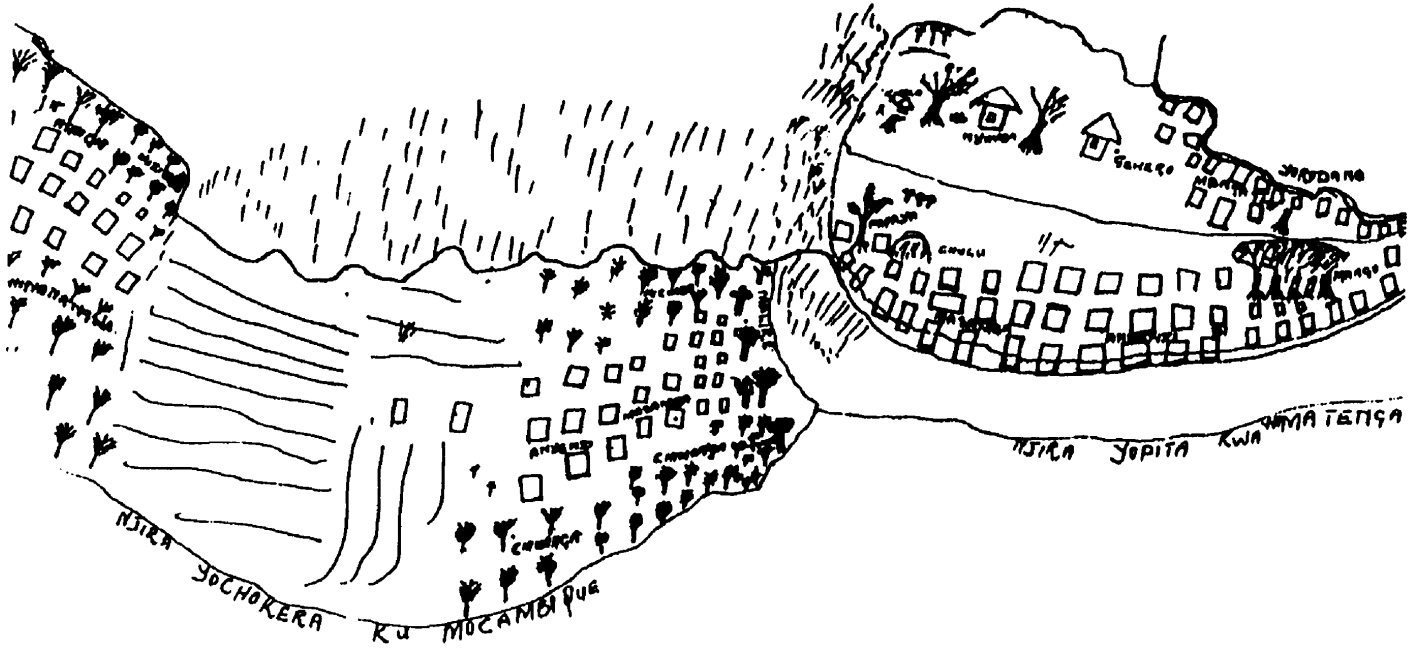
Medicinal Uses of Trees

Common Name	Part Used	Medicinal Use
Bwembakhole	leaves roots	stomach ache bladder infection, contraceptive
Changalume	bark roots	headache, backache muscle relaxant
Chidyakamba	roots	cleanse newly born babies
Chiseo	bark	painkiller during/after giving birth
Chitimbe	leaves bark	stomachache, coughs coughs
Chymwanamwale	leaves	given to a girl just after first menstruation
Kafupakapende	roots	depoisoning snake bites
Kankhande	bark	swollen legs
Mbinimini	seeds; leaves	bladder infections
Mkundi	leaves	madness
Mlambe	bark	stomach ache
Mpangala	roots	antidote for snake bite, aphrodisiac
Mphoza	stem fluid roots	wounds back ache
Mtubyitubyi	roots	venereal diseases (mwanamphepo)
Mulumanyama	bark	wounds, epilepsy, stomachache, sore throat
Mvunguti	pods leaves	wounds malaria
Nangale	roots leaves	stomach swelling stomachache
Nchovela	leaves	swollen scrotum
Ndama	leaves	stomachache, jaundice
Ndudu	leaves	stops vomiting
Nfula	bark	coughs
Ng'ambo	roots	backache
Ngaga	roots	bladder infection
Nimu	leaves	stomachache
Nkandankhuku	leaves roots	skin rash, sore throat stomachache
Nkeena	leaves	stomachache
Nkhotamu	leaves roots	pneumonia backache

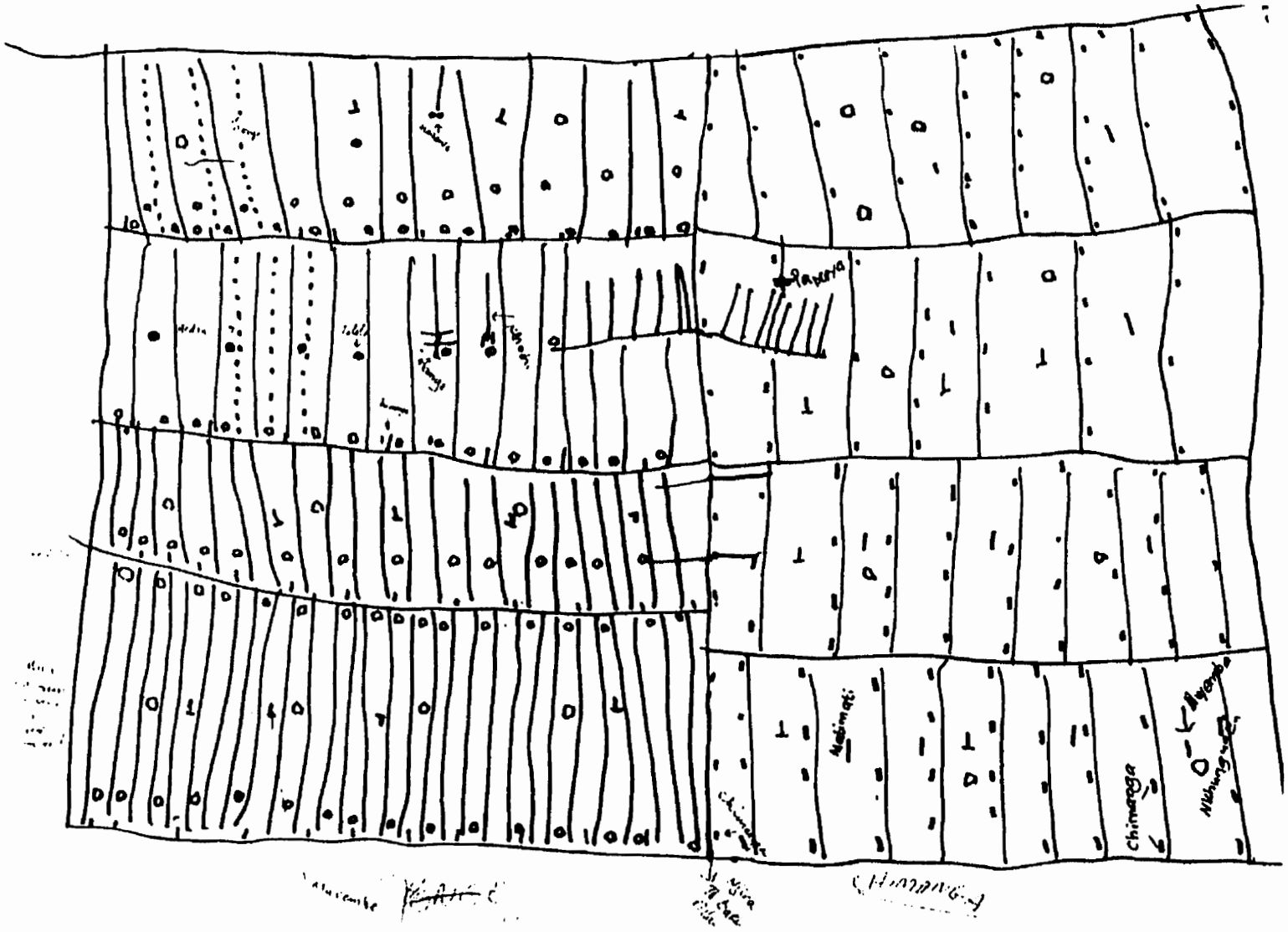
Common Name	Part Used	Medicinal Use
Nkuyu	leaves	bilharzia, treats infections in mother's milk
Nondae	stem fluid roots	anemia headache
Nsatsi	fruit	body oil
Nsikedze	leaves	bladder infection
Nsilisili	roots leaves	constipation abortion
Nsolola	leaves	ear infection; diarrhea
Nsukwali	leaves	used to induce vomiting
Ntangatanga	bark	ear infections
Ntemansato	leaves	sore throat
Ntengene	roots	stomachache
Ntete	bark	asthma
Ntumbwi	bark	coughs
Nyamdima	leaves	relieve pain during/after giving birth
Nyenje	leaves	contraceptive
Nyumwa	bark	bilharzia
Thembia	bark; roots	measles
Theta	roots	stomachache, measles, diarrhea
Thombozi	roots	venereal diseases
Tsanya	roots	asthma, migraine headaches

APPENDIX 7

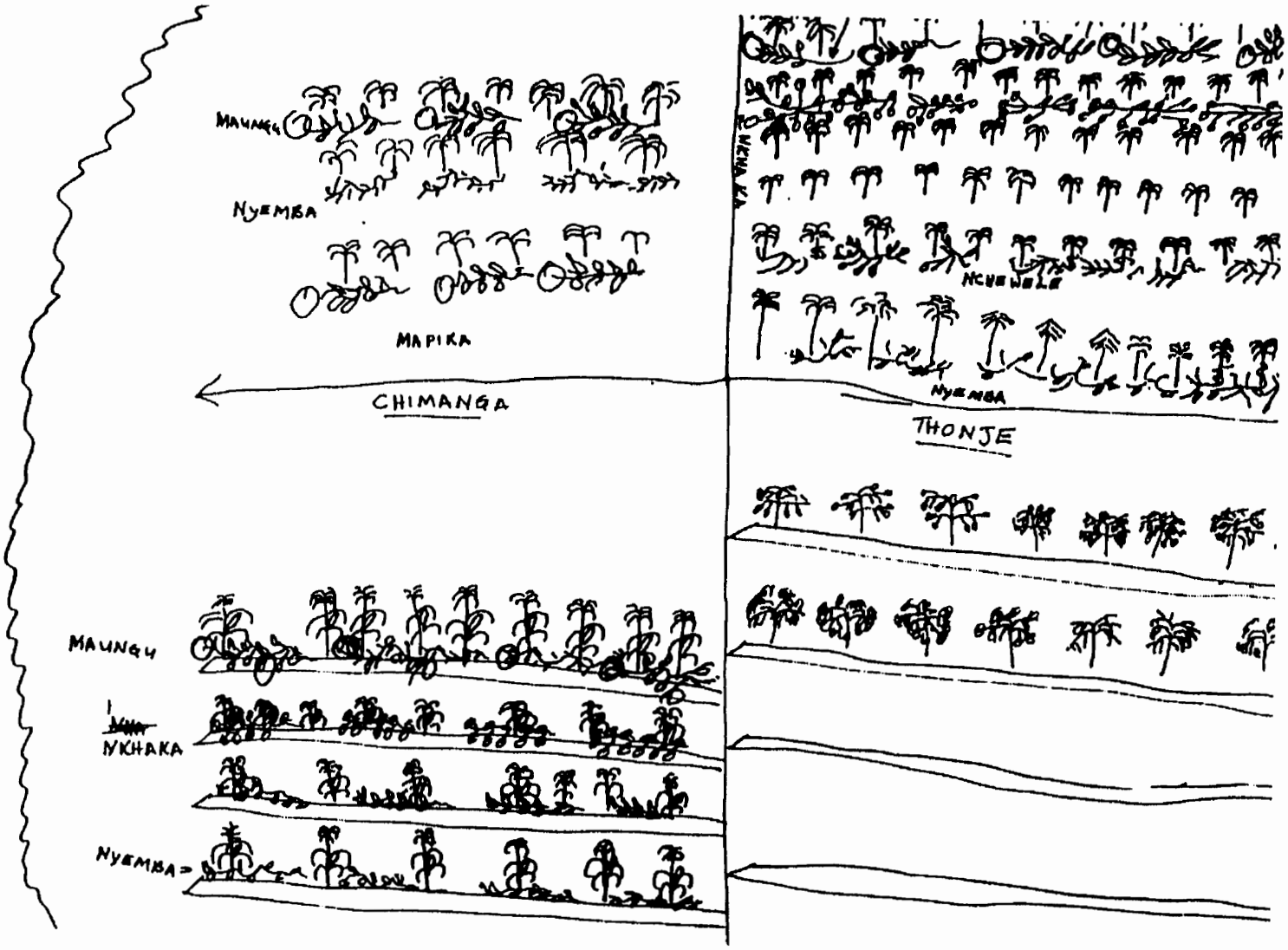
Examples of Farm Maps



Male map-maker. Age: >50 years.



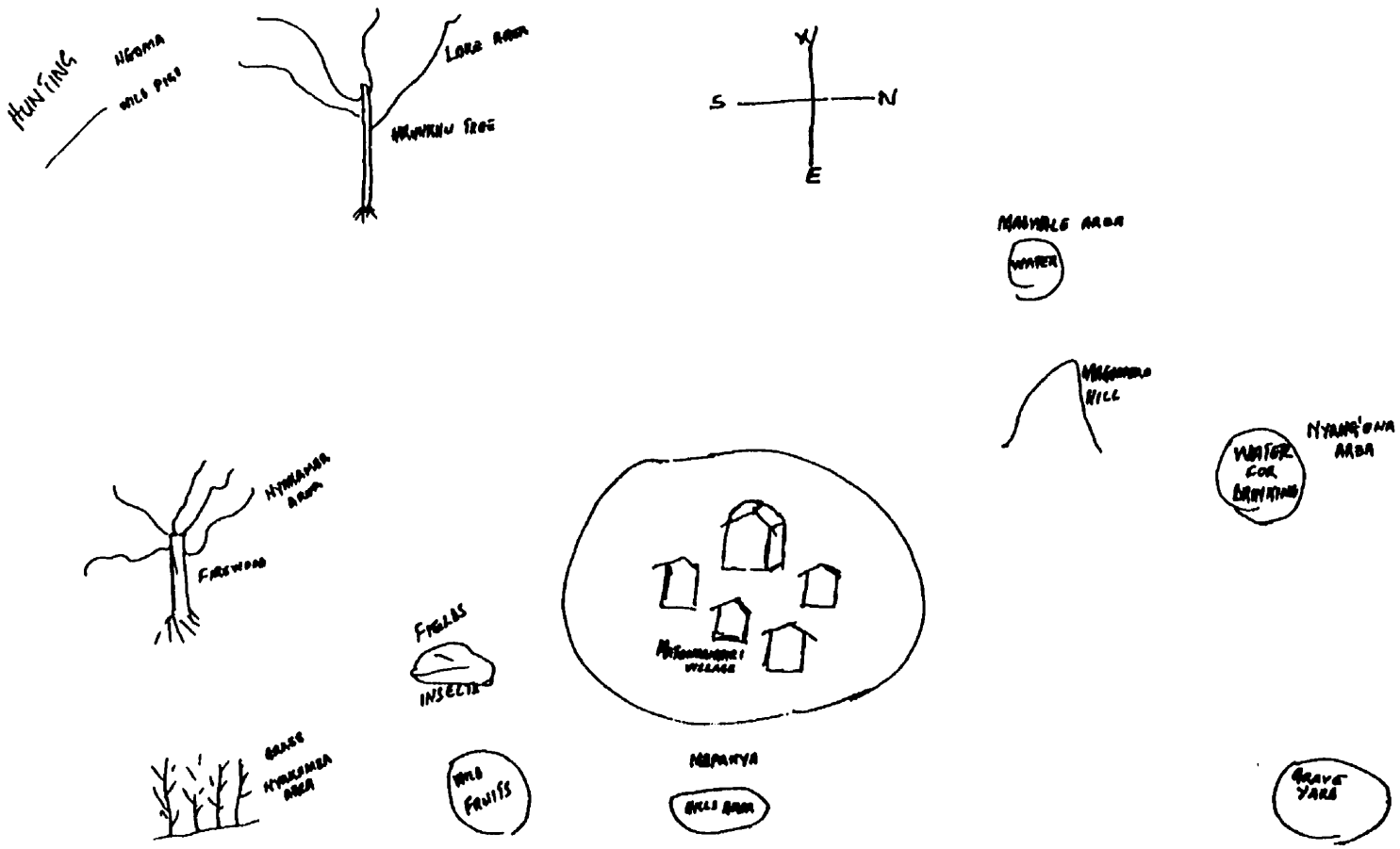
Female map-maker. Age: > 50 years.



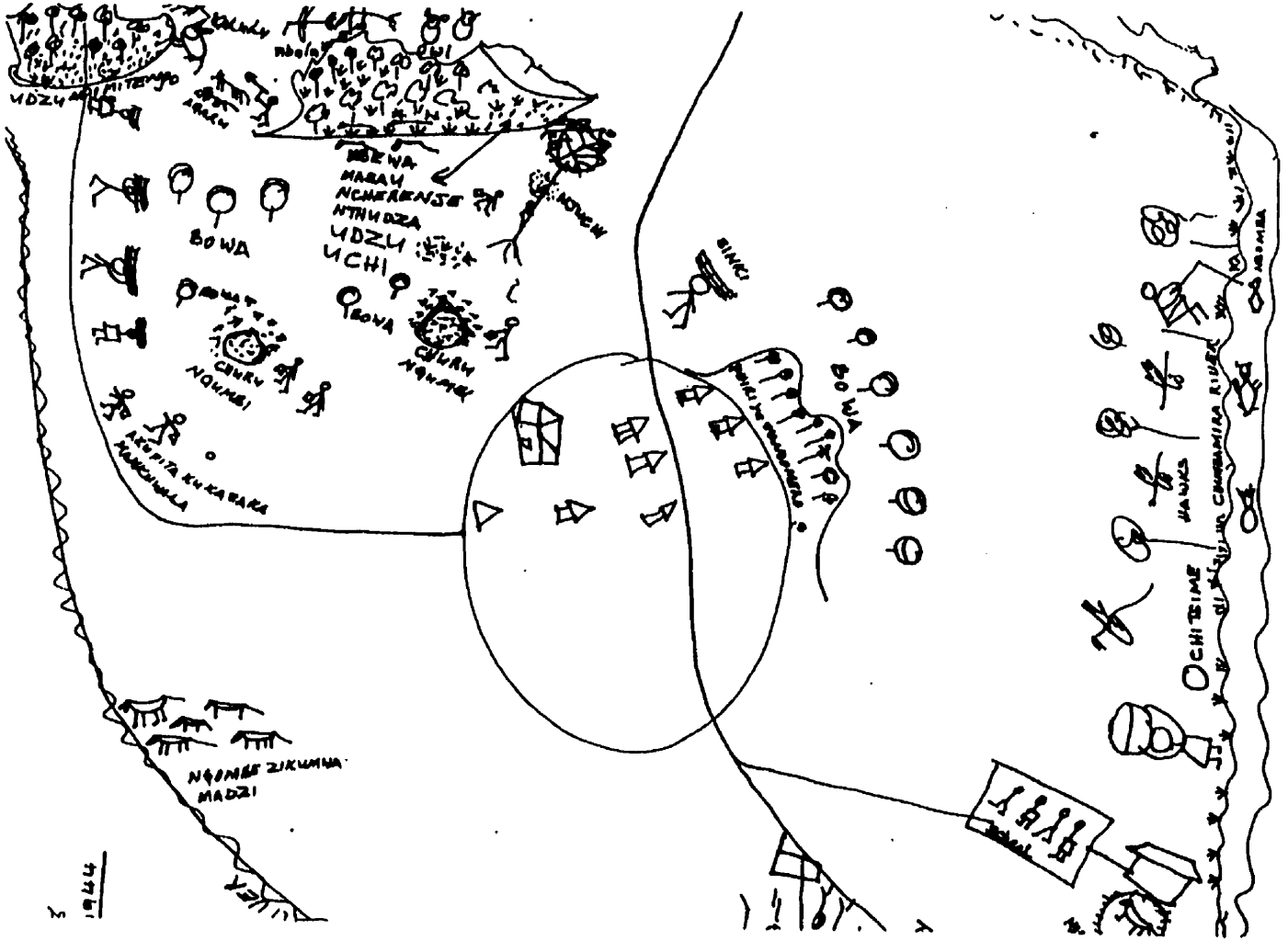
Male map-maker. Age: < 50 years.

APPENDIX 8

Examples of Resource Maps



Male map-maker. Age: 26 years



Male map-maker. Age: 48 years.

APPENDIX 9

Measures of Wealth in Matengambiri Village

	Prosperity Level		
Indicator	**Rich**	**Average**	**Poor**
House	large mud houses; grass thatched roof	medium sized mud houses; grass thatched roof	medium - small mud or grass houses; grass thatched roof
Windows	glass or cloth covered	none	none
Furniture	table, chairs, sometimes matresses on wooden bed frames	sometimes chairs and tables, sleep on bamboo mats	bamboo mats for sleeping
Livestock	goats, ducks, chickens, pigs, doves, some cattle	goats, chickens, pigs, maybe 1 cow	chickens and maybe goats
Transportation	bicycles, ox cart	bicycles	none
Hired farm labour	yes	no	no
Land holdings	more than 2 hectares	1 - 2 hectares	less than 1 hectare
Farming implements	hoes, panga knives, axes, sickles, sometimes ploughs	hoes, panga knives, sickles	hoes, sometimes panga knives
Handicapped household heads	none	a few	many
When food stocks generally run out	usually never	February	December
Purchased processed foods	tea, sugar, milk, bread, rice, some tinned goods	tea, sugar, rice, sometimes bread	tea, sugar, or nothing

APPENDIX 10

Seasonal Resource Calendar for Matengambiri Village

Period of time	Approximate number of days/year spent on activity	Resource related activity*
April - May	21 - 30	harvesting maize, sorghum, millet, planting cotton
June- July and August-September	37 - 90	harvesting cotton (two harvests)
May	7	planting vegetables
April	60 - 90	start cultivating a cotton field
July, September	30	grading cotton
July, September	7	packing and selling cotton
September - October	60 - 90	building a house
October	30	uprooting cotton plants
June	2 - 3	building a bath house
September - October	30	building a kitchen
July, September	30	sell cotton, buy new things
August - October	60 - 120	cultivating and mulching
May - February	20 - 37	collecting wild fruits
January	2 - 21	collecting mushrooms
July - September	14 - 30	collecting grass
October	21	thatching roof
June - July	5 - 7	redoing mud walls,floors of house
August - October	14 - 30	making ridges for maize
September - November	7	making gulleys
November	21	planting maize, millet, sorghum, groundnuts, beans, pigeon peas
December - January	30 - 60	weeding
most of the year, especially February - April	30	controlling pests (mabobo - 30 days; kaufiti weed - 14 d)
February	21	eating green maize and cucumbers
February	30	weeding cotton
March	14 - 30	building grainary
August - October	30	cutting building poles
October	2	castration of pigs
September - October	1 hour	burn cotton stalks

Period of time	Approximate number of days/year spent on activity	Resource related activity*
December	2 - 8	collecting termites
February - March	30	collecting grasshoppers
June - August	120	collecting mice
November	2 - 7	rain ceremony
September - October	14 - 30	Thokozani Mzimu ceremony
February - March	40 nights	Njole (women and girl's dancing for happiness)
December	1 - 7	tree planting
October - November	4 - 11	digging/protecting shallow well
anytime	40	collecting wild medicines
anytime	7 - 24	visiting a traditional healer
anytime	20 - 24	attending funerals
anytime	30 - 240	teaching children
anytime	30	making wooden tools (mortars, pestels, hoes, etc.)
anytime	24	attending village meetings
anytime	12	taking a course
anytime	7	making a grass mat
anytime	1 - 7	building a kraal
anytime	1 - 6	building a fence
anytime	30	making repairs on buildings and fencing
anytime	3 - 5	making rope
anytime	3	building a toilet
anytime	2 - 7	Chikwangale ceremony
anytime	7 - 14	Malombo ceremony

* note: the activities overlap eachother. A person is not usually occupied with any one activity for a full day. Some of the activities, such as building a bath house, would not be undertaken every year.

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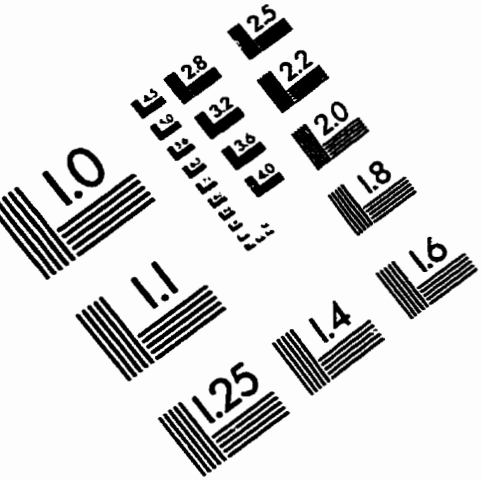
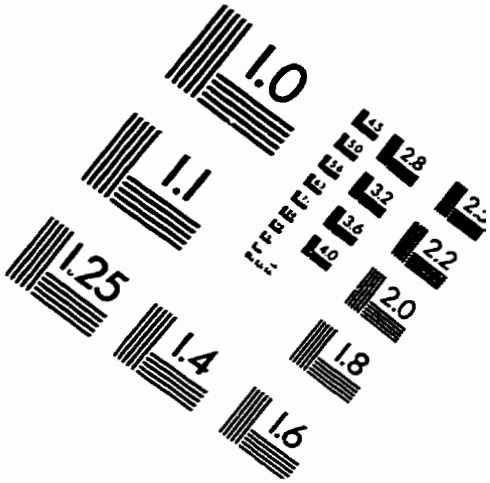
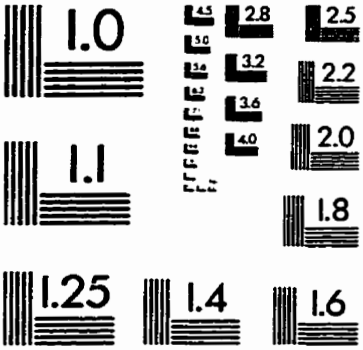
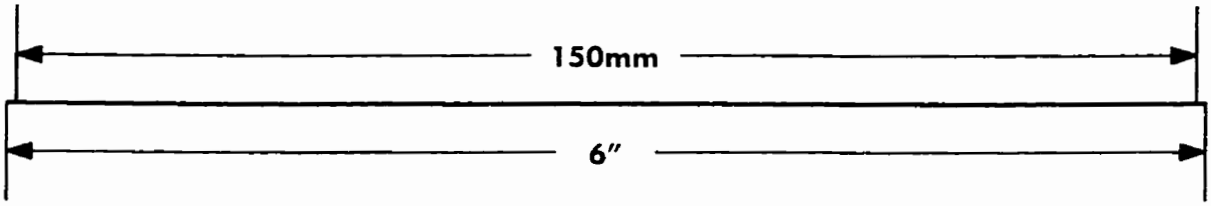
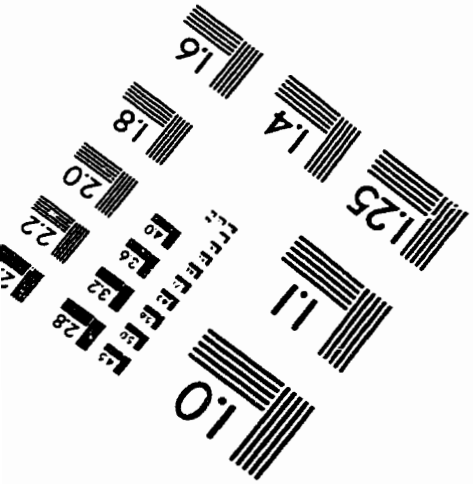
IMAGE EVALUATION TEST TARGET (QA-3)

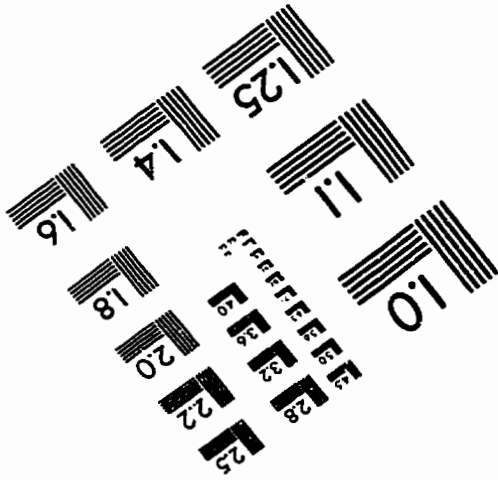












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