Sustainable Rural Livelihoods: A Case Study of Malawi

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Abstract

This thesis complements and extends understanding of the contribution of new approaches to development to the goal of achieving sustainable rural livelihoods. This is achieved by critically evaluating the concepts of agricultural sustainability and rural livelihoods. This study examines the use and management of natural resources by smallholder farmers in central Malawi. Development interventions by PROSCARP, a development project running nationally in Malawi and funded by the EU, within the case study area were evaluated This thesis has focused on land degradation and critically evaluates the new participatory or bottom up development paradigm in light of large-scale project interventions for land husbandry. A multidisciplinary approach, utilising a range of qualitative and quantitative methods provided a sound empirical basis for assessing the complexities of rural poverty and development interventions.

This thesis identified a wide range of interlinked rural problems and opportunities. This clearly indicates that a single issue, such as soil conservation, cannot be separated from other aspects of sustainable rural livelihoods. This thesis therefore argues, on the basis of empirical evidence, as well as a critical review of the literature, that agricultural sustainability must encompass all aspects of rural livelihoods. The response of farmers to development interventions is highest for technologies that directly cater to their needs or which are based on local knowledge and technologies. This thesis highlights the need to identify and target appropriate interventions for individual households.

Analysis of livelihood strategies also revealed a wide diversity of income sources within the case study area. The potential for increasing agricultural production is limited by landholding size and the potential for farmers to further diversify their income or food sources should be investigated in more detail.

The evidence from the literature shows that participatory development processes have achieved successes in small-scale projects. This research concludes that it is also possible incorporate and change the type of participation in a pre-existing large-scale project. The analyses in this thesis suggests that unless interactive participation or self-mobilisation is achieved there is a strong possibility that introduced technologies will not be sustained and the community may not feel the long-term benefits of the project. The main obstacle to achieving interactive participation in a large-scale project is the empowerment of the beneficiaries. Finally, in light of the results of this research a number of recommendations are discussed which include a suggested focus on individual households or marginalized groups within a community, and a clear strategy for passing control of the project to the beneficiaries to ensure long term benefits after project withdrawal.

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Table of Contents

List of Figures

List of Tables

List of Photographs

Acronyms

ADB	Asian Development Bank
ADD	Agricultural Development Division
ADDFOOD	ADD Food for Work Project
ADMARC	Agricultural Development and Marketing Corporation ().
AfDB	African Development Bank
AFSC	Agroforestry Steering Committee
DAR	Department of Agricultural Research
CADP	Catchment Area Development Plan
CADC	Catchment Area Development Committee
EU	European Union
FA	Field Assistant (of the ADD/PROSCARP)
FAO	Food and Agriculture Organisation (of the United Nations)
FRIM	Forestry Research Institute of Malawi
FSRP	Fertiliser Subsidy Removal Programme
GDP	Gross Domestic product
GNP	Gross national Product
GoM	Government of Malawi
ICRAF	International Center for Research in Agroforestry
IDB	Inter-American Development Bank
IDS	Institute of Development Studies
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
ITK	Indigenous Technical Knowledge
LHA	Land Husbandry Assistant (of the ADD)
LRCB	The Land Resources and Conservation Branch of the MoALD
MAFE	Malawi Agroforestry Extension Project
MRFC	Malawi Rural Finance Company
MoALD	Ministry of Agriculture and Livestock Development
MoHP	Ministry of Health and Population
MoIWD	Ministry of Irrigation and Water Development
NIEO	New International Economic Order

OAS	Organisation of American States
ODA	Official Development Assistance
PAPPPA	Poverty Alleviation Project Pilot Project Agroforestry
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
PROSCARP	Promotion of Soil Conservation and Rural Production
SACA	Smallholder Agricultural Credit Association
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

Chapter 1 Introduction

1.1. Introduction

The majority of Africa's citizens depend directly on agriculture for survival, especially smallholder farmers who make up the majority of rural dwellers in sub-Saharan Africa. Land degradation erodes the productive capacity of agriculture, therefore effective solutions to land degradation are required to safeguard their future. This thesis is placed squarely in the middle of the debate concerning the sustainable development of Africa. It explores the use and management of soil resources by small-scale agricultural producers in central Malawi to assess the potential to maintain or increase agricultural productivity. The research examines local agricultural systems and a range of social, economic, environmental and political factors that influence land use and natural resource conservation. Development interventions promoting land husbandry and soil conservation for agricultural production are then assessed to ascertain their potential to provide long term solutions to the problems of land degradation and sustainable rural livelihoods.

This thesis aims to complement and extend understanding of the contribution of new approaches to the development of sustainable rural livelihoods. The failures of the conventional, top down, approach to development has led to a significant shift in development theory and practice. This paradigm shift is based on a move to participatory or bottom up development. At the same time substantial changes have occurred in the discipline of soil conservation, where approaches have moved away from physical soil conservation measures to land husbandry, focusing on increased production through better management of soil resources. In the search for locally appropriate solutions to problems of land degradation, there has been considerable attention paid in the literature to the study of indigenous knowledge and technology, especially in the field of indigenous soil and water conservation. This thesis critically evaluates current theories and practices of development, evaluating problems of land degradation as part of the wider spectrum of rural livelihood issues, and assessing contemporary solutions to issues of land degradation and production.

The following discussion draws on a wide range of literature documenting the changing approaches to development and its implications for practical development initiatives, as well as factors affecting current and future agricultural production within Africa. From this review the following areas of particular concern to this research were identified, as they are restricted in the literature. Malawi in particular is not widely represented in the literature, particularly the smallholder farming sector and issues of land degradation.

- The first issue is the many ideas and definitions for what might constitute sustainable agriculture and potential conflicts in perceptions of sustainability (Pretty, 1995; IUCN, 1997). This thesis analyses farming systems and rural livelihoods of subsistence based communities to identify perceptions of sustainability and to identify elements of a farming system that can be manipulated to achieve sustainable production systems.
- This thesis focuses on land husbandry, therefore concentrating on increased production through better management of natural resources based on measures that are appropriate for the land users (Hudson, 1992; Shaxson, 1993). There is a need here to identify causes and perceptions of land degradation in rural areas, as well as solutions. This must take account of the complexities of rural issues (economic, cultural, political) that influence farmer decisions and to identify where interventions can most effectively be made.
- The previous two points raise the need for a critical evaluation of current development interventions in land husbandry, identifying production, as well as conservation components, in light of local priorities and needs.
- Participatory development has shown some successes in small-scale community projects under the banner of Participatory Rural Appraisal (PRA) (Chambers, 1994a). Therefore, this research concentrates on

the potential to incorporate participatory approaches to development in large-scale existing development projects, as well as assessing the potential for the project benefits to continue after the active life of the project.

- Despite the increasing recognition of the value of indigenous knowledge and technologies there is little evidence of development projects incorporating local knowledge systems (Critchley *et al*, 1994; Mathias, 1996). Local agricultural practices and knowledge are assessed in the case studies for the potential to develop initiatives based on more locally appropriate solutions.

Each of these points is discussed in more detail in the remainder of this chapter.

This thesis responds to the new approaches to agricultural development and examines soil conservation from a holistic perspective encompassing the concepts of sustainable rural livelihoods. This study has a broad base, focusing on the political, social, environmental and economic factors that are relevant to the rural population in the study. Pretty (1995) sees the promotion and attainment of sustainable agriculture as presenting a fundamental challenge, requiring more than just new technologies and practices. A positivist science approach would have perhaps focused on soil losses or the crop yields under certain agroforestry practices. As this research is responding to the new approaches to development it is necessary to adopt a more holistic approach. Chapter 2 discusses the methods used, many of which originate from PRA as an approach , and social anthropology. The political and economic context helps to place the farming community in the wider context of the society as a whole.

1.2. Development: Agriculture and the Environment

Poverty, malnourishment, food insecurity, population growth, health and environmental concerns are the focus of many of the development initiatives worldwide and in Africa in particular. The FAO (1999a) estimates that there are 180 million undernourished people in sub-Saharan Africa and almost half the population of Central, East and Southern Africa is undernourished. Per capita food production in Africa has fallen as population growth has overtaken agricultural production (FAO, 1994) and the World Bank (1999a) estimates that agricultural production in sub-Saharan Africa will need to increase by about 4 per cent annually over the thirty-year period to 2025 to meet the projected demands in food and fibre. This section, therefore, examines the constraints and potential to achieve the necessary growth in agricultural output, concentrating on the role of human intervention in land degradation and the impact of population growth.

1.2.1. Land Degradation

Agriculture is the production of food and fibre, through the growth of crops and the rearing of livestock. Agricultural production is a major feature of most rural landscapes. Soils are, therefore, the primary means of food production and the soil resources of landscapes vary widely in their suitability for use. Under natural or undisturbed conditions plant growth makes demands on the soil but also helps to renew and conserve the soils. Human attempts to modify the natural environment for the production of food alters the ecological balance of that area. In some cases this can result in soil degradation, where the soil base can be subjected to chemical or physical deterioration, for example salinisation or compaction. However, Brady and Weil (1999) estimate that the majority of soil degradation results from soil erosion. Accelerated erosion can occur when natural vegetation is disturbed for cultivation, grazing livestock or the cutting of forests. If rates of soil erosion are greater than the formation of new soils from parent material the soil depth suitable for plant growth is reduced. Loss of fertile topsoil can be partially overcome by the addition of fertilisers, however, loss of organic matter and waterholding capacity is more difficult to compensate. Long term accelerated soil erosion leads to declining productivity on most soils (Brady and Weil, 1999). The fertility of the soil is reduced both through loss of plant nutrients through erosion as well as through removal in a harvested crop.

The expanding human population and increased demand for higher living standards are putting an ever increasing pressure on the natural resource base on which agricultural production is dependent.

The majority of Africans are still primary producers, farmers, fishers, herders and hunters, that rely directly on the natural resource base for their survival (Stock, 1995). The belief that land degradation is a widespread and serious problem in many developing countries, particularly in sub-Saharan Africa, drives many agricultural development initiatives. The extent of land degradation is widely contested. The International Food Policy Research Institute, (1999) considers that as much as 80 per cent of crop and pasture land in Africa is degraded to varying degrees. Brady and Weil (1999) put their estimate of land degradation in sub-Saharan Africa at 65 per cent of agricultural land and 31 per cent of permanent pasture. However, there seems to be an overall agreement that the restoration and maintenance of the land resources base in general, and of soil fertility in particular, is essential to achieve a sustainable increase of agricultural production. Although the figures quoted above are all estimates and it is difficult to verify their accuracy, they point to an overriding concern within the development community about the overall impact of population growth, agricultural productive potential and land degradation on the future of sub-Saharan Africa. As early as 1939 Whyte and Jacks wrote about the problems of soil erosion and the *"advance of the desert"* (p61). They considered then that unless conservation works such as terracing, contour farming, vegetative cover and crop rotations were implemented, *"it may not be many years before the limit of possible food production is reached"* (p 70). Whyte and Jacks (1939) assertion that limits to food production will be reached have not been borne out as agricultural production is growing (Worldwatch Institute, 1990). However, sixty years later many development efforts are promoting similar technologies for the conservation of soil resources but the same problems are still around. Increasing malnourishment, poverty, disease and environmental deterioration, specifically land degradation, in sub-Saharan

Africa give a very negative picture of the results of sixty years of development in the region.

1.2.2. Population Growth and Food Production

According to Hudson (1995) the opening up of unexploited areas of the world and increases in agricultural land masked the growth rate of humans until early this century. However, the human population is increasing rapidly and the main area of increasing population is in developing countries. Figure 1.1 shows the increase in global population from 1960 to 1990 with the estimated increase until 2025.

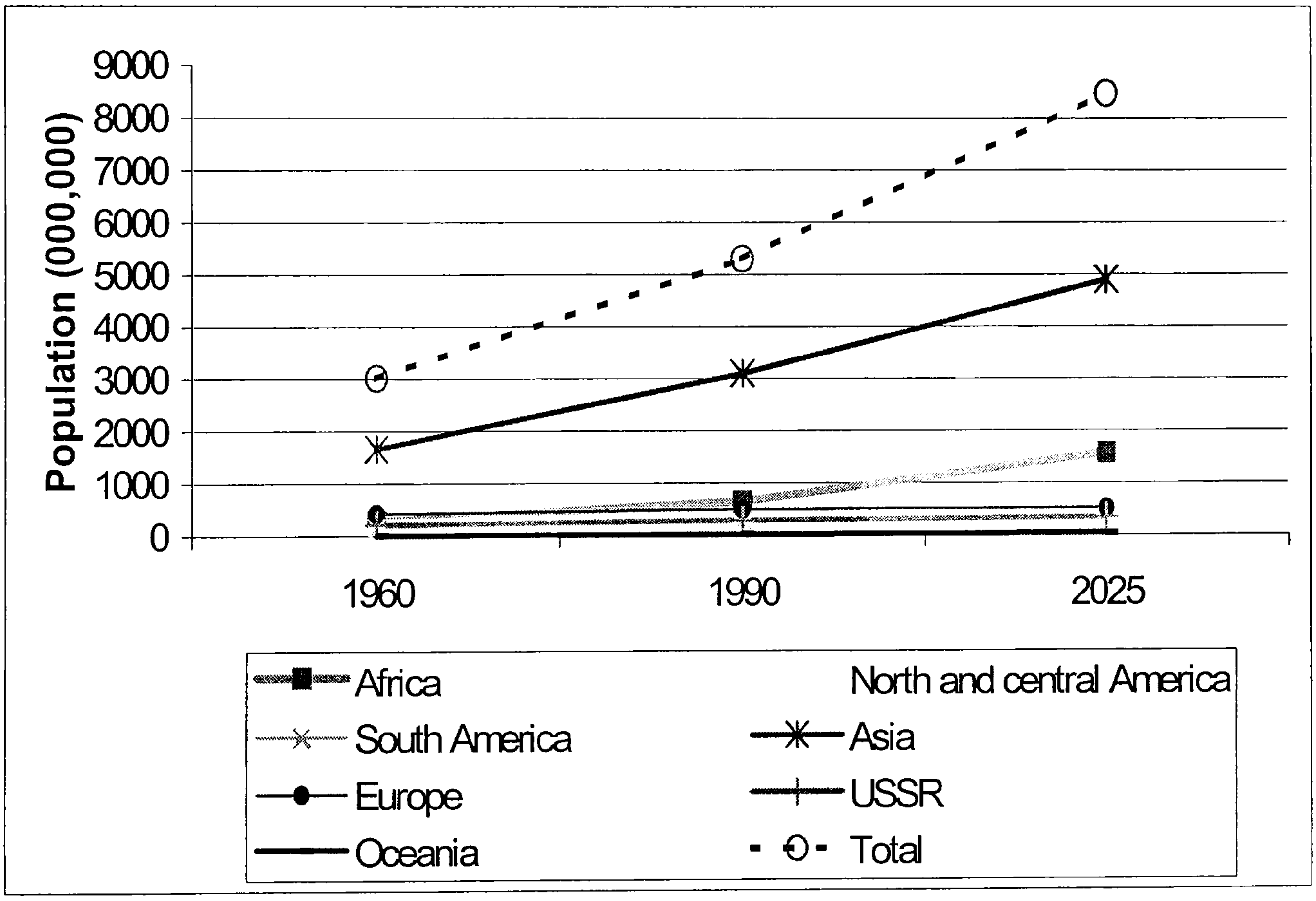


Figure 1.1: Actual and expected increase in the global population. (Source: Worldwatch Institute, 1990).

These figures show that the expected population in 2025 is approximately 8.5 billion persons but that most of the increase is to come from Asia and Africa. This has obvious consequences for the production of food in these regions. Food production will have to increase at least as fast as the population growth, and at a higher rate if the current food shortages of many developing countries are taken into account.

Agricultural production is generally growing and this is likely to continue to grow, but globally, the rate of growth is slowing (Worldwatch Institute, 1990). Despite increases in food production, sub-Saharan Africa failed to match increases in food production with population growth and per capita food production has fallen. Throughout Africa between 1971 and 1984 there was an average annual decline of 1.2 per cent in per capita food output (Binns, 1994). Grigg (1993) calculated that the per capita index of food production (1976-78 = 100) fell from 114 in 1960 to 90 in 1989.

Population density plays a major role in the availability of land for expansion of cultivation. Figure 1.2 shows the population densities of many African countries. However, regional differences can be extremely high.

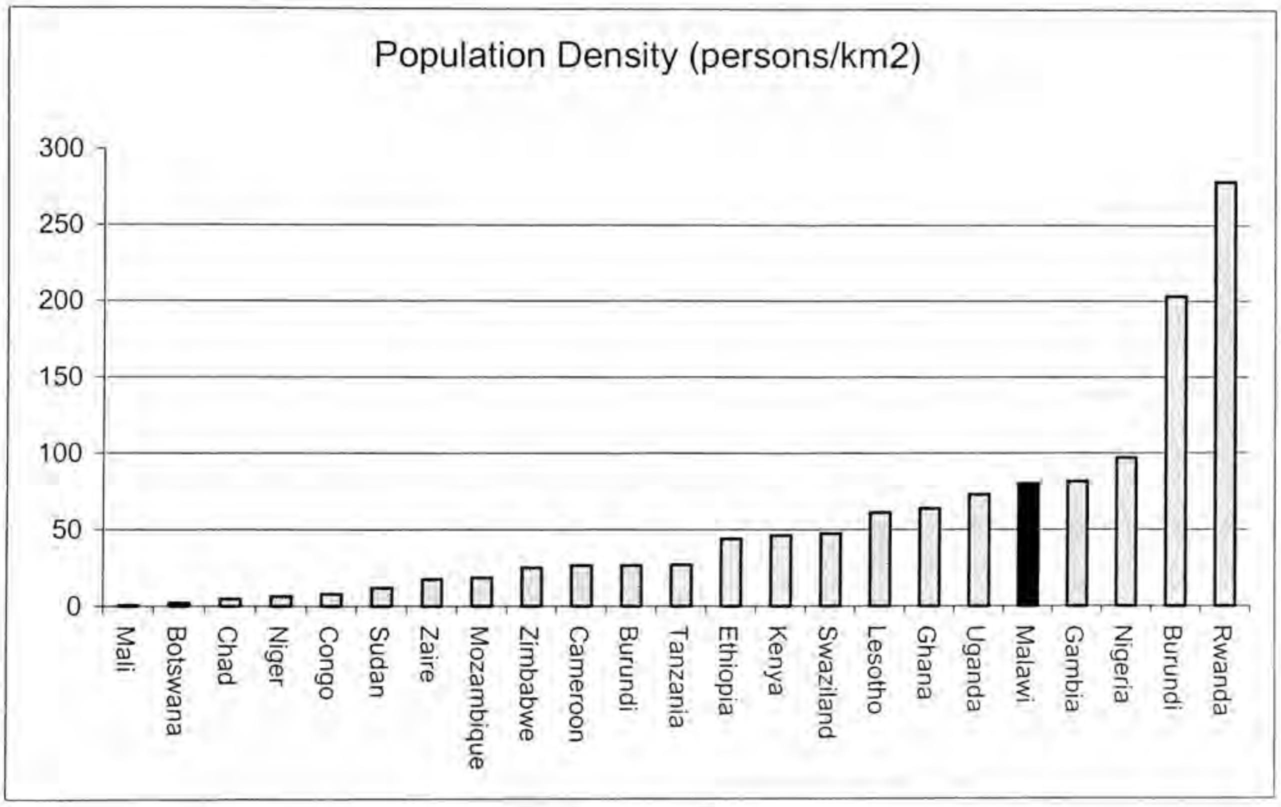


Figure 1.2:Population densities of selected African countries. (Source: Compiled from data in Arnold, 1989)

To meet the present and future food needs of a rapidly growing population the countries of sub-Saharan Africa must logically either increase food production accordingly, be in a position to import food, or rely (as now in many cases) on food aid and foreign support.

The growth in agricultural production worldwide is attributable to both an increase in the area cultivated and an increase in yields per hectare cultivated. Table 1.1 outlines the contribution to increased productivity globally of both of these factors.

Sub-Saharan Africa had the lowest increase in yields per hectare, relying on nearly half its increase in food production from the increase in the area cultivated. This expansion has often occurred on fragile land, resulting in land degradation and poor yields (Brady and Weil, 1999).

	Increases in Food Production Between 1961/63 and 1989/90 attributable to:	
Region	**Increased Area (%)**	**Increased Yields (%)**
Low Income Countries		
Sub-Saharan Africa	47	52
Latin America	30	71
Middle East/ North Africa	23	77
South Asia	14	86
East Asia	6	94
High Income Countries	2	98
World (Total)	8	92

Table 1.1: The contribution of increased area under production and yield increases per hectare to food production globally between 1961/63 and 1989/90 (Source: compiled by Brady and Weil, 1999 from FAO data)

An increase in the area cultivated exposes more land to the threat of land degradation. This is especially true in areas where, due to a lack of suitable alternatives, cultivation spreads to steeper or marginal lands more prone to degradation. In addition, increasing population pressures can alter indigenous farming techniques. In the case of shifting cultivation or fallowing systems the number of people dependent on the land has increased in some areas to the point where the soil resource has insufficient time to regenerate because the fallow time has had to be reduced or cut out completely (Hudson, 1995; Brady and Weil, 1999).

Africa as a whole has approximately 2.8 billion hectares of land. The FAO (1992) estimates that 789 million hectares (approx. 25 per cent) is potentially cultivable. Of this, 168 million hectares is estimated to be under cultivation, which is approximately 21 per cent of the land potentially cultivable (Food and Agriculture Organisation, 1992). However, much of this is under forestry, or requires irrigation and/or other measures to allow production. The FAO (Food and Agriculture Organisation, 1992) estimates that roughly half of the land that could be converted to crop production is currently under forest. The clearing of these areas and conversion to cropland represents a significant potential loss of carbon storage capacity and of biodiversity resources. The FAO also projects an expansion of 6 million hectares in dry land areas, which are mostly rangeland. This could increase grazing pressure on the remaining pastures or displace livestock to even more marginal lands (Alexandratos, 1995).

An increase in yields is the other main focus for increasing food security nationally and Africa-wide. Brady and Weil (1999) see the primary problem in the low yielding systems in Africa as being a lack of soil nutrients. Nutrients removed through harvesting of crops, or soil erosion, are not being replaced and the productivity of the soil is declining annually. The ability of a farmer to use inorganic fertiliser depends on a number of economic, social and institutional factors, which are also examined in this research. Alternatives to inorganic fertilisers are varied and include a number of management techniques, such as crop rotation. One technology promoted widely throughout Africa, as well as elsewhere, is the use of agroforestry systems. These can provide an alternative to inorganic fertilisers as well as wider benefits, such as timber, fuelwood, shelter, fruits and so on (Young, 1997; Brady and Weil, 1999).

Malawi was chosen as the country in which this research took place because of its extremely high population density (one of the most densely populated countries in Africa) and the resulting low potential for expansion of cultivable land. The development project at the centre of this research promotes agroforestry as the main component of interventions aimed at promoting soil conservation and increasing rural production in Malawi.

The growth of the human population is arguably the most important issue world-wide, both in terms of the requirements for food, and the impact of the human race on the planet's resources. As early as 1798 the Reverend Thomas Malthus was predicting that population growth would outstrip food production, leading to mass starvation, poverty and the collapse of social and economic systems (Malthus, 1798). The Club of Rome report (Meadows *et al*, 1972) is reminiscent of Malthus's arguments. It reached the conclusion that there are five basic factors that will ultimately limit demographic growth. These are population, food production, natural resources, industrial production and pollution. Meadows *et al* (1992) update the Limits to Growth debate, arguing that the world has already over-shot some of its limits and, if present trends continue, there is a virtually certain prospect of a global collapse. However, they argue that a sustainable society could still be attained by major controls on growth in population and material consumption, as well as a drastic increase in the efficiency of resource use.

This neo-Malthusian view is opposed by a number of critics who argue that population growth does not automatically lead to global catastrophe. One aspect of this argument is that technological developments can overcome environmental problems (Stock, 1995). However this requires access to technology, which is strongly constrained by poverty (United Nations and Government of Malawi, 1993). Boserup (1965) argues that population growth in low input agricultural systems can result in agricultural innovation and the adoption of improved farming methods. Tiffen *et al* (1993) give a recent example of the environmental improvement and increased productive capacity of a semi-arid district in Kenya, despite fivefold increase in population over a 60 year period. Tiffen *et al* (1993) argue that their research does not support the view that increasing population will lead to environmental degradation. The innovative capacities of the farmers in this study overcame the environmental stresses imposed on them by population growth. Despite Malawi's relatively high and increasing population density, there are no comparable adaptations in evidence in Malawi.

The following section examines approaches to development and the changes within development theory that are the subject of this research. The main way in which development is achieved is through the intervention in a rural area by a development agency. The focus of this research is, therefore an externally funded development project, PROSCARP, operating nationally for the promotion of soil conservation and rural production, mainly through the use of agroforestry.

1.3. Development Theories

In his inaugural speech in 1949 Harry S Truman declared parts of the Southern Hemisphere to be "underdeveloped areas". Truman established a new role for the United States, to bring development to these underdeveloped areas (Potter *et al*, 1999). This is seen by some as the beginning of the modern age of development (Escobar, 1992; Sachs, 1992a; Potter *et al* 1999). In the intervening years vast sums of cash have been invested by the developed nations in the name of development. This thesis is directly concerned with the strategies or practices utilised to achieve development. However, the changes in approaches and practices of development are underlain by a number of development theories. The new approaches to development under study have evolved from five decades of development theory and practice that has seen more failures than successes. The development theories outlined below do not replace each other. In many cases policies from several development theories are implemented alongside each other. This is the case in Malawi where structural adjustment programmes run at national level, with various development projects, using different policies and technologies, active throughout the country at the same time.

Many authors use two basic distinctions in an examination of theories of development, the left wing versus the right wing view of development (Larrain, 1989; Chambua, 1994; Corbridge, 1995; Leys, 1996; Morris, 1998). This division of the many authors and schools of thought within development theory is very simplistic. However, it highlights the fundamental difference between previous development thinking and the new approaches to development that are the focus of this thesis.

In essence the right wing view of development is based on the premise that regional inequalities arise through economic forces of capitalist development and are overcome through the same economic forces, moving through the stages of development in much the same fashion as Europe and North America. Morris (1998) provides a spatial representation of the right wing or capitalist view of development. In the early stages of development there is a core where development (measured in per capita income) through industrialisation occurs. There are regional inequalities at this stage, as the peripheries, for example subsistence agricultural areas, fail to develop. However, over time the trickle down benefits of development reduce the inequalities between the regions, as the periphery feels the benefit of the development process. Chambua (1994) equates the theoretical basis of this right wing view of development with the modernisation paradigm. The development strategies associated with modernisation are examined in section 1.5.

The left wing view of development rejects the notion that development can be achieved solely through economic growth or modernisation directly associated with the capitalist system (Chambua, 1994). Although the regional inequalities associated with underdevelopment are a result of the capitalist state, these inequalities are important for the maintenance of capitalism and are not overcome solely by economic growth or modernisation. The dependency school of thought, as a major force within the left wing school of thought, came into prominence in the 1970s. This can also be well represented spatially. There are core developed countries that depend on peripheral or dependent countries to achieve or maintain their development. The peripheral countries are prevented from developing due to economic or political control exerted by the developed or industrialised core. Morris (1998) sees the policies for development resulting from this leftwing view of development as "*improving consumption for the poorest, rather than worrying about production*" (p34). This translates to fiscal policies based on taxation of the wealthy and welfare provision. Corbridge (1995) sees a lack of plausible policy advice from the left wing view of development, as well as the collapse of many socialist states, as being responsible for a reduced role for these development theories in current literature.

Despite the differences in the left and right wing view of development, there are similarities in these views that separate them radically from bottom up or participatory development theory. Several authors, for example Morris (1998) and Potter *et al* (1999), highlight some of the major similarities in the left and right wing views on development. The first is the organisation of development from outside the area under consideration. Very little credence is given to self-reliance and internal or local motivators to change and develop. The second point is the focus on economic development. Both of these schools of thought use core-periphery models based on development mainly through industrialisation.

The focus of this thesis is an alternative to the development thinking outlined above. It refers to the new development paradigm, known among other names as, bottom up development, participatory development, and sustainable development. This has received increasing recognition since the late 1970s. The main tenet of this school of thinking is that self-reliance and internal forces of change are central to the development process. There is also a strong focus on multiple faces of development, including the basic needs of a population as well as the incorporation of ecological or environmental issues into the development process. This view of development argues that development and change should be focused on the needs of the poorest, mobilising the local natural and human resources (Potter *et al*, 1999). The poorest are at the periphery of the development process. But rather than relying on the core for development, or blaming the underdevelopment on the core, this development paradigm looks to the periphery to create development solutions for themselves. This encompasses the concept of individuals and communities as the authors of development, rather than the state or external forces. In many cases this can be seen to focus directly on rural populations. Escobar (1992) sees knowledge as power. Bottom up development could build the knowledge and capacity for development within a community and thus can be said to devolve power from the state. Stöhr (1981) points to the logical fact that as development strategies under this school of thought are strongly based on local conditions and realities, it is not possible to use a blueprint approach.

This thesis is directly concerned with the policies and practices of development that are motivated by this development paradigm, and these policies and various approaches to development arising from this school of thought are examined next.

1.4. New Approaches to Development

The failures of the conventional development paradigm have led to a demand for alternative approaches to development projects (Chambers, 1983; Chambers *et al*, 1989; Hudson, 1995). This research is concerned with the changes in development, leading to what some consider to be a new development paradigm.

The basis of the new paradigm is a holistic model of development that incorporates social, cultural and environmental concerns as well as economic factors. Central to this is the participation of the farmers in the development process; acknowledging local knowledge and local institutions;

and using a "bottom up" approach (Chambers *et al.* 1989; Pretty and Shah, 1994). This focuses on a people first approach, with empowerment of the local communities or individuals as a central tenet (Chambers *et al*, 1989; Chambers, 1993; Scoones and Thompson, 1994; Chambers, 1997). There is clearly some overlap between the bottom up approach to development and socialist principles. Stöhr (1981) emphasises that bottom up development needs to be closely related to specific socio-cultural, historical and institutional conditions and therefore there cannot be any single recipe for development as promoted in a top down approach. Table 1.2 highlights the fundamentally different processes involved in the top down or blueprint approach and the participatory learning approach to development (Chambers, 1993). This Table shows clear contrasts in the two approaches at a range of levels. The top down approach is very much a blueprint approach to the solving of problems as perceived by the "foreign" agencies involved in the development projects (Hudson, 1995). This translates to technologies designed by outsiders, introduced from other areas or other countries, which are often unsuited to local climatic or socio-economic conditions.

The "top down" implementation of these techniques involves decision-making by project managers and organisations, often with little or no input or feedback by the beneficiaries. In contrast, the participatory approach is a sharing and learning process, creating an enabling environment for change initiated and implemented by the people.

In terms of soil erosion, the new development paradigm is summed up by Hudson (1995) as a change of attitude from soil conservation to land husbandry. The conventional approach to the management and control of soil erosion was based on strategies designed for soil conservation in the USA (Young, 1997). This is the positivist science paradigm, or what Tiffen *et al* (1993) identify as the diagnosis-prescription-intervention model. Under this model the problem is identified by the scientists or policy makers and

	Blueprint process	Learning process
Idea Originates in	Capital city	Village
First Steps	Data collection and plan	Awareness and action
Design	Static, by experts	Evolving, people involved
Supporting organisation	Existing or built top down	Built bottom up with lateral spread
Main resources	Central funds and technicians	Local people and their assets
Staff training and development	Classroom, didactic	Field based learning through action
Implementation	Rapid, widespread	Gradual, local, at peoples pace
Management focus	Spending budgets, completing projects on time	Sustained improvement and performance
Content of action	Standardised	Diverse
Communication	Vertical, orders down, reports up	Lateral, mutual learning and shared experience
Leadership	Positional, changing	Personal, sustained
Evaluation	External, intermittent	Internal, continuous
Error	Buried	Embraced
Effects	Dependency creating	Empowering
Associated with	Normal professionalism	New professionalism

Table 1.2: The blueprint and learning process in rural development contrasted (Source: Chambers, 1993, adapted from David Korten)

thus the technologies, successful in other situations or research stations, are transferred. This focuses on the following factors:

- physical rates of soil loss and the reduction of this figure,
- mainly earth based structures to control or reduce runoff of rainfall,

- land use planning based on a land capability classification (all steeper land is allocated to grazing or forestry),
- conservation as a priority and a prerequisite for agricultural production, often based on a top down, legally enforced policy (Young, 1997).

This approach is quite removed from the abilities, knowledge or realities of the people farming the land under question. The new development paradigm changes this focus entirely by putting the people living on, and farming, the land at the centre of the development process.

During the colonial era in Africa many large-scale projects were put into action for the prevention of soil degradation. Soil erosion was recognised as a problem in Africa in the early 1920s. In British-ruled territories (including Malawi) soil conservation became a major issue in the 1930's when a number of schemes were started (Anderson, 1984). Throughout Africa and Asia large scale bunding and ridging was implemented, along with contour ploughing and planting for the purpose of soil and water conservation. However, despite considerable efforts with soil conservation projects during and since colonial times there is a documented analysis of failure (Stocking, 1985; Reij *et al*, 1986; Hudson, 1987; Pretty and Shah, 1994). Evaluation of soil conservation projects in sub-Saharan Africa has shown that little long term success has been achieved (IFAD, 1986; Food and Agriculture Organisation, 1991). Soil and water conservation measures were often implemented without the involvement of the people concerned, in some cases disrupting existing soil and water conservation measures, and without addressing some of the wider development problems of the so called beneficiaries (Scoones *et al*, 1996). The new approaches to development are attempting to overcome the failures of this approach to development, which is based on the scientific or modernisation paradigm, by adopting a much more holistic view of the development process.

Land husbandry incorporates better farming, which includes increased productivity and water management as well as soil conservation. Land husbandry also involves preventative as well as curative soil conservation measures (Hudson, 1995). There is a growing acknowledgement, based on research into indigenous technologies and knowledge, that local producers are well placed to develop innovations in agricultural and soil management techniques (Chambers *et al.* 1989; Reij, 1991; Tato and Hurni, 1992). The premise behind the current use of participatory development is that the full involvement of the beneficiary community is required to achieve lasting sustainable development (Scoones and Thompson, 1994; Pretty, 1995; Chambers, 1997).

The incorporation of the techniques and ideas developed by local people into development activities has the potential to provide more effective and locally acceptable solutions to sustainable resource management using appropriate technologies and policies (Reij, 1991; Millington, 1993; Warren *et al*, 1995). However, despite this growing recognition of the potential value of indigenous knowledge there is little evidence of development projects making use of local knowledge systems (Critchley *et al*, 1994; Mathias, 1996).

There is relatively little information produced on the practical aspects of the integration of this new paradigm into the planning and implementation of soil conservation projects and the benefits or otherwise to the farming communities involved in the project. This is especially true of larger scale projects such as the development project under evaluation in this research. As development projects cannot operate indefinitely it is necessary to assess the potential for the project benefits to continue after the active life of the project. This thesis aims to address precisely this point, analysing both the impacts of the interventions on the farmers to assess the potential long-term benefits of the project, and the potential for the project benefits to be felt outside the area of direct intervention.

1.4.1. Sustainability

Approaches to development have changed in response to failures of previous development projects. However, globally the growing concern with the interrelationship between the environment and development has also had an important impact on development ideas. Sustainability is now a term coined almost everywhere in the development debate. Sustainable development and sustainability have become features of most development literature. The notion of sustainability has gained shape through three decades of rising concern over the health of the biosphere added to the increasingly obvious interdependencies between human and natural systems (Dovers and Handmer, 1993). Development efforts should then theoretically be able to aim for sustainability or a sustainable state. This would suggest that the concept of sustainability is capable of being defined in absolute terms.

This, however, does not appear to be the case. Sustainability is originally an ecological concept, reflecting "prudent behaviour" by a predator that avoids overexploiting its prey to ensure an "optimum sustained yield" (Odum, 1971; cited by Bartelmus, 1994). Sustainability has evolved into a more complex concept that is applied to a range of processes such as environmental, social or economic sustainability with the overall goal of a sustainable society. It appears to be the broadening out of the concept that produces problems in agreeing a universally acceptable definition. Ascertaining sustainability can be a value laden judgement that will vary according to people's priorities and interests. Campbell (1994) argues that "*assessments of relative sustainability are socially constructed, which is why there are so many definitions.*" Pretty (1995) comes to the conclusion that for the concept of sustainability to have value or meaning it is necessary "*to clarify what is being sustained and for how long, for who's benefit and at what cost, over what area and measured by what criteria.*" (p. 11). In Pretty's (1995) view it is possible to ascertain trends in overall sustainability when specific parameters or criteria are chosen. This argues the case for the importance of appropriate indicators to assess the effectiveness of sustainable development or sustainable agricultural production.

The Limits to Growth reports (Meadows *et al*, 1972; Meadows *et al*, 1992) analysed the possibilities, limitations and consequences of conventional international development, raising questions of the durability of patterns of consumption and life style in developed countries and their commitment to unbridled growth. This highlighted the problem of how a society can persist over generations without undermining its physical or social support systems. The major concern is whether the changes contemplated in the sustainable development debate can lead to the goal of a sustainable society.

The Brundtland Commission's report (World Commission on Environment and Development, 1987) catapulted the concept of sustainable development into everyday language as an ideal to be achieved for the successful continuation of life on earth. One of the questions in this thesis is the relevance and applicability of these concepts to developing countries. The basis of these reports and other works on the subject is the inter-relationships between economics, socio-cultural and environmental aspects of the human condition.

Many authors of these works are from developed countries. Their ideas may therefore stem from a development process whereby levels of industrialisation have been achieved where the environment is threatened by levels of pollution, degradation of natural resources, and a host of other related factors. At a theoretical level, this is still directly related to developing countries. However, the priorities of sustainable development and the conditions to achieve this are very different. Maintaining or increasing standards of living while still ensuring the survival of the natural resource base as a priority can prove problematic when the majority of a country's population is below the poverty line and their priority is how to produce or obtain sufficient food supplies for his or her family for the year. This could lead to a situation whereby a people whose lives depend on a subsistence based production system might have a different perception of sustainable development. This research analyses farming systems and rural livelihoods of subsistence based communities to identify the perceptions of sustainability.

1.4.2. Sustainable Agriculture

Maintaining the soil base is a prerequisite for sustainable agricultural production. Until recently the promotion of soil conservation, like other areas of development, has been based on the modernisation paradigm discussed in a later section. The key role of the transfer of technology characterises this as a top down approach to development, in which the solving of problems is perceived by the "foreign" agencies as the purpose of development interventions (Hudson, 1995). This translates to technologies introduced from other areas or other countries that are often unsuited to local climatic or socio-economic conditions. The "top down" implementation of these techniques involves decision-making by project managers and organisations, often with little or no input or feedback by the beneficiaries. A specific example of this in Malawi is provided by the construction in 1968 of the World Bank financed Lilongwe Land Development Program, which constructed 288 000 kms of bunds, 2573 kms of crest roads, 7725 kms of diversion ditches and 933kms of artificial waterways using government machinery (Ngoleka Mlia, undated). None of these were maintained in the long term and little evidence remains today of their existence. This leads to the conclusion that the people living and farming in the area did not see these structures as beneficial and had no reason to invest time or effort to maintain them. Although the techniques themselves seem a logical and technically appropriate approach to protecting the soil resource, they were obviously not appropriate in terms of perceived benefit, available human resources or other local realities. This again strengthens the argument for locally appropriate solutions to natural resource management, which lies at the heart of the new development paradigm.

Sustainable agriculture is a term that is widely used to describe an alternative to modern agriculture. In Africa the latter form of agriculture is characterised by externally developed packages of technologies that rely on externally produced inputs (Pretty, 1995). This is contrasted with alternative systems as illustrated in the range of terms used to describe them, which include alternative, regenerative, low external input, resource conserving, organic, and biodynamic (Pretty, 1995).

Many ideas and definitions have been suggested for what might constitute sustainable agriculture. In terms of agriculture and land use it is seen by Young (1997) as a system that achieves production combined with conservation of the natural resources on which production depends. Specific focuses of various authors are obviously related to their specialised area. For example, Young (1997), working on agroforestry systems, sees soil fertility as the most direct and primary requirement for sustainability in arable land use.

The diversity of opinion about what sustainable agriculture could be is illustrated by Pretty (1995), who found over 70 definitions of sustainable agriculture varying in values, priorities or goals. In these terms it is easy to see how subjective the concept can be.

The FAO (1995) defines sustainable agriculture as;

"The management and conservation of the natural resource base, and the orientation of technological and institutional change, in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable."

However, this definition and others have significant overlap in the focus on producing sufficient agricultural output without damaging the resource base on which this output is dependent. This is underlain by the concepts of intergenerational equity inherent in the definition of sustainable development put forward by the World Commission on Environment and Development (1987) "*development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs*". (p.8).

A breakdown of the FAO's definition of sustainable agriculture gives the following broad conditions at farm level;

- Provision of adequate returns to maintain or increase living standards;
- Maintenance of the social fabric of the village or community;
- Protection and conservation of the natural resource base;
- Maintenance or increases in long term production potential.

If a comparison is made between these factors and the factors identified in the diagnosis – prescription – intervention model discussed in Section 1.4 the one thing that stands out is the focus on people. The conditions for sustainable agriculture presented above from the FAO are very people-focused whereas the conservation approach to agricultural development was totally science-focused with no mention of the farmers or beneficiaries involved.

This research does not attempt to produce yet another definition of sustainable agriculture. The concepts in the definitions above, rather than giving an absolute view of sustainable agriculture, point to a way of thinking or an approach to agricultural systems. This research approaches the subject with the view that sustainable agriculture is not a static definable absolute, but a changing process. The FAO definition above contains a holistic view of what sustainable agriculture should achieve. It encompasses more than just the production/conservation components but also the wider concept of "human needs". One of the problems is, however, that there does not appear to be any work that can point to an agricultural system, at local, regional or national level, that is truly sustainable, indicating a problem with the concept as a definable state.

It is from this point that the research in this thesis starts. It focuses on an approach that encompasses rural livelihoods rather than just agricultural production and consumption models. This recognises the integrated and holistic nature of rural people's lives, and links an understanding of people's assets and vulnerabilities, with their desired outcomes and the strategies they adopt to achieve these.

Development based on the concept of sustainable livelihoods has recently gained increasing recognition. The term sustainable livelihoods was used by the Brundtland Commission to encompass concerns of resource ownership and access, basic needs, and livelihood security (World Commission on Environment and Development, 1987). The concept of sustainable livelihoods was also recognised by the UN Conference on Environment and Development (UNCED) as linking socio-economic and ecological considerations (UNDP, 1999). The Institute of Development Studies (IDS) and the International Institute for Sustainable Development (IISD) were early advocates for a sustainable livelihoods approach. Their emphasis was on how households and members within households diversify their activities in order to increase income, reduce vulnerability and improve the quality of their lives (Chambers and Conway, 1992; IDS, 1999; IISD, 1999). The UNDP (UNDP, 1999) has defined livelihoods as the assets, activities and entitlements which people utilize in order to make a living. Utilising this concept of livelihoods, the UNDP defines the sustainability of livelihoods as " *a function of how men and women utilize asset portfolios on both a short and long-term basis. Sustainability should be defined in a broad manner and implies:*

- *The ability to cope with and recover from shocks and stresses;*

- *Economic effectiveness, or the use of minimal inputs to generate a given amount of outputs;*
- *Ecological integrity, ensuring that livelihood activities do not irreversibly degrade natural resources within a given ecosystem; and*
- *Social equity which suggests that promotion of livelihood opportunities for one group should not foreclose options for other groups, either now or in the future.*

In other words, SL is the capability of people to make a living and improve their quality of life without jeopardizing the livelihood options of others, either now or in the future." (UNDP, 1999 p1)

This definition is adapted from an early work by Chambers and Conway (1992) and is echoed by other organisations that are incorporating sustainable livelihoods into their development initiatives (DFID, 1999; IDS, 1999; IISD, 1999).

The debate on sustainability can be split into two component parts for the purposes of this thesis. The first part is the enabling conditions for sustainability to be achieved. This encompasses the participation of the farmers, empowerment, action at local group or community level, institutional support and strengthening local institutions, and the use of local knowledge among other factors (Chambers, 1983; Chambers *et al*, 1989; Scoones and Thompson, 1994; Pretty 1995; Holland and Blackburn, 1998). This can be seen as the new development paradigm, replacing the top down approach to development and these conditions can apply to a farmer's own development efforts or as policies within an external development organisation. The second part of this research (Chapters 7 – 9) deals exclusively with these aspects.

The second part of the sustainability debate is to identify the elements of a farming system that are integral to the goals or conditions for sustainability, or that can be manipulated towards a more sustainable use or output. This encompasses the resources of an area, both human and natural, the farming practices used, income sources, alternatives to farming and other factors that influence rural livelihoods. Chapters 5 and 6 analyse agricultural systems within the case study villages and the adoption of conservation and production technologies promoted by the project under review. The current livelihood strategies are analysed to assess what are the problems and opportunities within the area and what specific development efforts could be utilised to increase the living standards of the farming community while focusing on natural resource management as a vital component in the move towards sustainable agricultural development. The technologies and policies of the development project and the adoption of these practices by the farmers are then evaluated to determine how relevant these strategies are in light of the developmental needs within the villages.

The conditions for sustainable agriculture outlined above are quite broad goals and when these are applied to the smallholder farming systems within Malawi there are several points to observe. In many cases external resources are not available due to lack of funds or credit facilities. Therefore, instead of reducing these inputs, it is necessary to find an alternative or replacement. Also farm size plays an important role. If the area of land available for production is small then it becomes very important to maximise the productive potential of this area in order to provide food or cash for the farm household. Thirdly, if alternative ways of procuring food are not available then risk aversion strategies must be incorporated strongly into the farming systems, as loss of crops or very poor returns for any reason can be disastrous. All of these factors are investigated in detail later.

1.5. Rural Development and The Modernisation Paradigm

The previous discussions examined new approaches to development based on people-centred, participatory development. These have evolved from the failures encountered under conventional theories of development. However, the majority of development initiatives in Africa are still strongly influenced by capitalist development theories and the modernisation paradigm.

Rural development is seen by Shepherd (1998) as "*a set of activities and actions of diverse actors – individuals, organisations, groups - which taken together leads to progress in rural areas*" (p 1). Priorities of rural development vary dramatically between developed and developing countries. This research is concerned specifically with rural development in an African context. In Malawi, approximately 90 per cent of the population are smallholder farmers, struggling with problems of declining productivity, land degradation, poverty, malnourishment, illiteracy, access to clean water and sanitation, health and child mortality.

Shepherd (1998) equates the modernisation paradigm with four basic processes: capital investment; the application of science to production and services; the emergence of nation states; and large scale political and economic organisation. This reflects the history of Europe and North America, where many development projects originated. One of the first steps of this paradigm is the intensification of agriculture (Grove and Edwards, 1993). This conventional paradigm in rural development was based almost solely on economic growth (Esteva, 1992; Shepherd, 1998). This was to be achieved by the transfer of technology to developing countries to achieve the desired modernisation and potential for growth. Approaches to development within this modernisation paradigm have changed over time.

The United Nations (UN) is a major player in international aid and the approaches used by the UN provide a useful indicator of the development theories and policies to date. The First United Nations Development Decade in the 1960s had economic growth as a central theme, with a trickle down benefit to the low income segment of the populations (Esteva, 1992). The Second United Nations Development Decade aimed to improve the distribution of the results of economic growth, thus including a social objective. The goals and objectives of the Second Development Decade were not achieved due to inequities and imbalances in international economic relations (Esteva, 1992; Bartelmus, 1994). A key issue during the

1970s, and into the third development decade, was the concept of a New International Economic Order (NIEO). The bases of this were equity, sovereign equality, interdependence, common interest and co-operation among all states (Bartelmus, 1994). The Third Development Decade (1981 –1990) included targets such as increased Gross Domestic Product (GDP), expansion of exports, increases in domestic savings, expansion of agricultural production and manufacturing output, and also an increase in development aid from OECD countries from their existing contribution to 0.7 per cent of their Gross National Product (GNP). Most of these targets were not achieved (Arnold, 1989). The NIEO never materialised. Between 1980 and 1987 sub-Saharan African countries had zero economic growth and this, combined with reducing per capita income, left sub-Saharan Africa back at the level it had attained fifteen years earlier (Chambua, 1994). In fact the 1980s were known as the "*lost decade for development*" (Esteva, 1992, p16). This was due to a tendency for falling growth rates, declining living standards and increasing poverty, which widened the gap between rich and poor countries (Bartelmus, 1994). The Fourth Development Decade of the United Nations concentrated once more on the acceleration of economic growth as a prerequisite for the eradication of poverty and hunger, human resources development and the protection of the environment (Bartelmus, 1994).

Shepherd (1998) identifies two recent major changes within this modernisation paradigm. The first is the introduction of Structural Adjustment Programmes (SAPs). The second are moves to trade liberalisation, both of which are actively pursued in Malawi. Briefly, SAPs are a response to a "one world" view of development where global economic structures are based solely on the principles of a free market (Dixon *et al*, 1995). This calls for the developing world to adjust their economies accordingly. In 1980, the World Bank approved structural adjustment lending, policy-related lending tied to conditions stipulating policy and institutional changes. This approach was followed by the International Monetary Fund (IMF), the African Development Bank (AfDB), Asian

Development Bank (ADB), Inter-American Development Bank (IDB) and many bilateral lenders (Dixon *et al*, 1995). The policy and institutional changes take the form of deflationary measures to stabilise inflation prone economies, such as currency devaluation, reduction of money supply, reducing public expenditure, increasing privatisation, increasing exports and reducing imports (World Bank, 1994; Shepherd, 1998).

There are a wide variety of policies associated with structural adjustment in individual countries. However Dixon *et al* (1995) provide a general evaluation of SAPs. They conclude that SAPs may be able to generate a positive outcome in terms of economic growth and modernisation. However, the most disadvantaged members of society can suffer, especially the rural sector. This is due to reductions in subsidies (for example on fertilisers), changes in crop and input prices, reduction in social services expenditure, increases in taxation and the overall impact of currency devaluation (Barrett and Browne, 1995; Shepherd, 1998). Malawi is currently involved in a structural adjustment programme and the impact of this on the farmers in the case study area is briefly examined later as changes in input and product prices could be expected to have a severe impact on smallholder farmers. Structural adjustment, as an economic route to development is being promoted alongside sustainable development and the results of this research speculate on the problems or opportunities of combining both approaches.

1.5.1. Agricultural Development

Agricultural development has been strongly based on the modernisation paradigm. Pretty (1995) sees two guiding themes dominating this process of modernisation. The first is the need to increase food production. The second is the desire to prevent the degradation of the natural resource. The modernisation of agriculture and technological innovations in agriculture must be examined in light of what they are trying to achieve. The Brundtland Commission (World Commission on Environment and Development, 1987) identified three types of agriculture:

1. Industrialised agriculture - European or American agricultural systems
2. Green Revolution agriculture
3. Low-external input, traditional or unimproved agriculture

Industrialised agriculture, mostly found in the developed world, operates under a very different set of conditions and is not relevant to this discussion. One of the successes of the modernisation paradigm, and perhaps its greatest failure, is the so-called Green Revolution. The Green Revolution refers to the development of better plant and crop varieties that should result in increased yields. These crops in many cases required high cost inputs such as inorganic fertilisers, pesticides, machinery and irrigation. The development of these improved crop varieties started during the Second World War. As a result of this technology cereal yields doubled in 30 years, which is an improvement of approximately 7 per cent in the total food production per capita between the 1950s and the late 1980s (Pretty, 1995). Table 1.1 shows that increased yields were responsible for the majority of increase in agricultural production in all major areas of the world, except sub-Saharan Africa, which relied much more heavily on expansion of cultivated areas. The future expansion of cultivated areas is limited in certain areas of Africa, due to already high population densities or marginal land.

The focus of this thesis is on the third type of agriculture. These low external input or traditional agricultural systems operate under very different conditions, often characterised by small holdings, marginal land, little or no access to credit. The failures of the green revolution were felt by the last category of agriculture. Chambers *et al* (1989) characterises this "third agriculture" as "*complex in its farming systems, diverse in its environments, and risk prone*" (p. xvi). The poorest countries tend to have a high proportion of these agricultural systems. In the mid 1990s some 30-35 per cent of the world's population were directly supported by traditional agriculture (Pretty, 1995). In many cases, these farmers have little resources or access to credit, drastically reducing their ability to use fertilisers, pesticides or improved seed varieties for their crops. Crop production on poor or marginal land with limited inputs results in much lower yields as well as the potential for land degradation. Malawi has a large smallholder farming sector which is examined in Chapter 2. In the foreseeable future rapid modernisation of this smallholder farming sector is unlikely, as is any major reduction of alternatives to farming for these farmers. Therefore, realistic solutions to limitations in agricultural production, and rural livelihoods are necessary. The above discussion is concerned primarily with the technical fix approach to development. Despite four decades of development programmes and massive investments of time and money by the various donors, there has been little evidence of successful development projects. The new development paradigm has evolved in response to the failures encountered under the conventional development paradigm. This thesis assesses the potential for the new development paradigm to provide the success, in terms of agricultural sustainability and rural development, which has evaded the practitioners of the modernisation or top down approach to development.

1.6. Thesis Aims

The previous review of the literature critically evaluates the paradigm shift in development theories and practice. This has occurred alongside the continuing debate on sustainability. This thesis has developed in response to this paradigm shift and seeks to fulfil the following aims in the specific context of developing countries:

To contribute to the understanding of the relevance and applicability of the concepts of sustainability in rural populations through the development of a framework for analysing rural livelihoods, including farming systems as well as a wider range of social, economic, environmental and political opportunities and obstacles to development.

To add to the available knowledge on the incorporation of new approaches to development into development projects on the ground.

To relate the results of the previous two aims to the specific problems of land degradation, the promotion of land husbandry and agricultural productivity.

This research utilised a case study approach, explained in more detail in Chapter 3. The following chapter introduces Malawi, the country in which the case study is based.

Chapter 2 Malawi and the Study Site in Salima ADD

2.1. Introduction

Malawi is a small land-locked country in southern Africa. It is 855km from north to south. East to west varies between 10km to 250km. It covers a total area of 118,484sq km, of which over 20 per cent of the country (24000sq km) is fresh water - mainly Lake Malawi with minor lakes and rivers (Figure 2.1).

The topography of the country as a whole is varied, ranging from 37m above average sea level in the Lower Shire Valley to 3050m on Mulanje Mountain. The Rift Valley Escarpment runs parallel to the west of the lake (Figure 2.1). There are two study sites, one on the lakeshore plain and the second at the foot of the Rift Valley Escarpment (Figure 2.2) to provide comparisons due to geographical differences outlined below. The Rift Valley Escarpment rises from the lakeshore plain at 474m above sea level, to a plateau at a height of between 915m and 1220m (see Figure 2.1).

The climate in Malawi ranges from semi-arid to sub-humid. The rainy season runs from November to May, although it has been shorter and more erratic in recent years. Rainfall generally increases with altitude with annual amounts averaging under 800mm per annum in the Rift Valley area, 800 to 1000mm per annum in the medium altitude plateau and 1000 to 1500mm per annum in the high altitude plateau (Bunderson *et al*, 1995). This amount of moisture is sufficient for rainfed agriculture. However, erratic rainfall and several droughts in recent years have impacted on yields nationwide (Government of Malawi/ Ministry of Agriculture and Livestock Development, 1994).

Malawi is presently politically stable relative to other African countries. The current ruling party, the United Democratic Front, headed by Bakili Muluzi, came to power in the country's first democratic elections in 1994. From

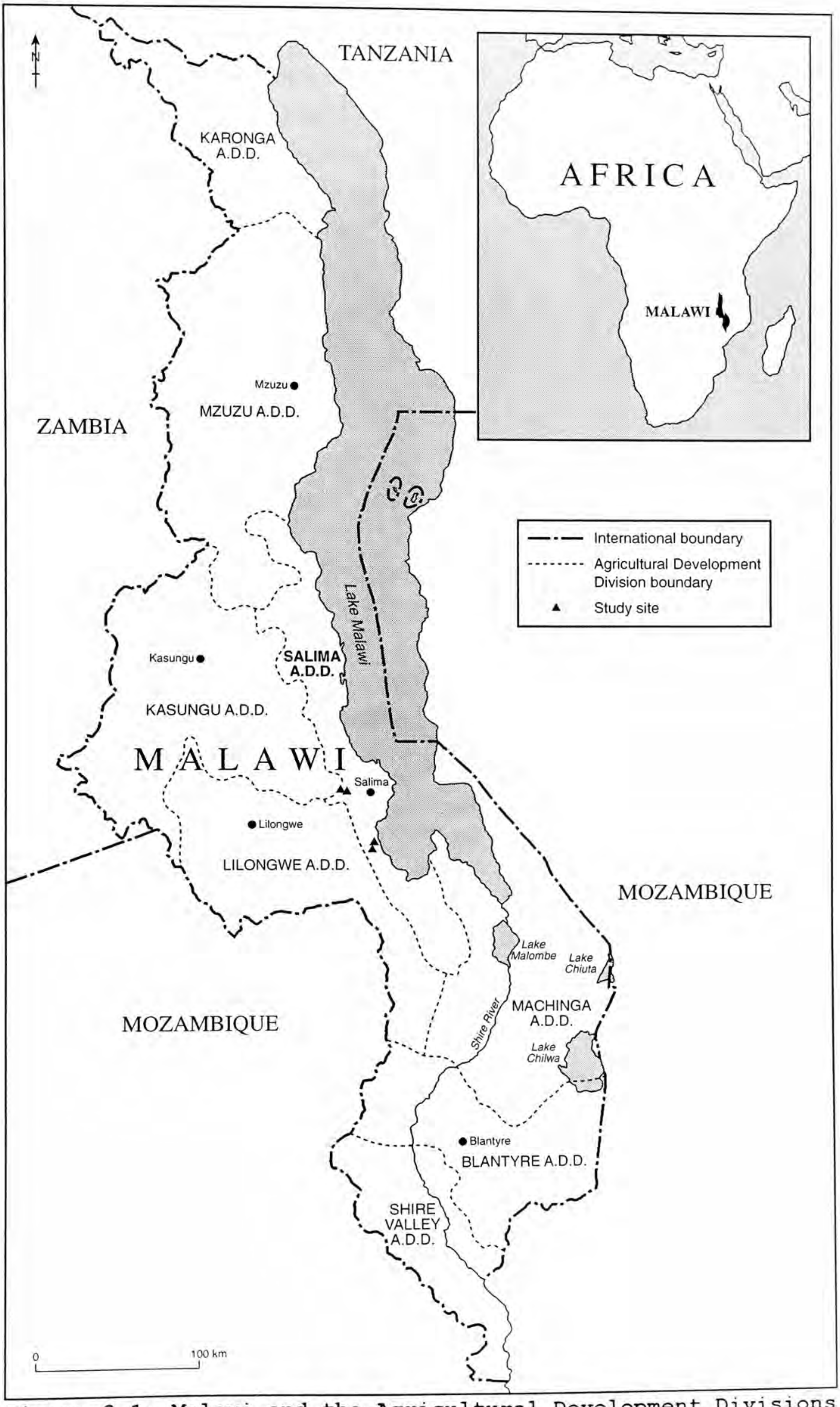


Figure 2.1: Malawi and the Agricultural Development Divisions

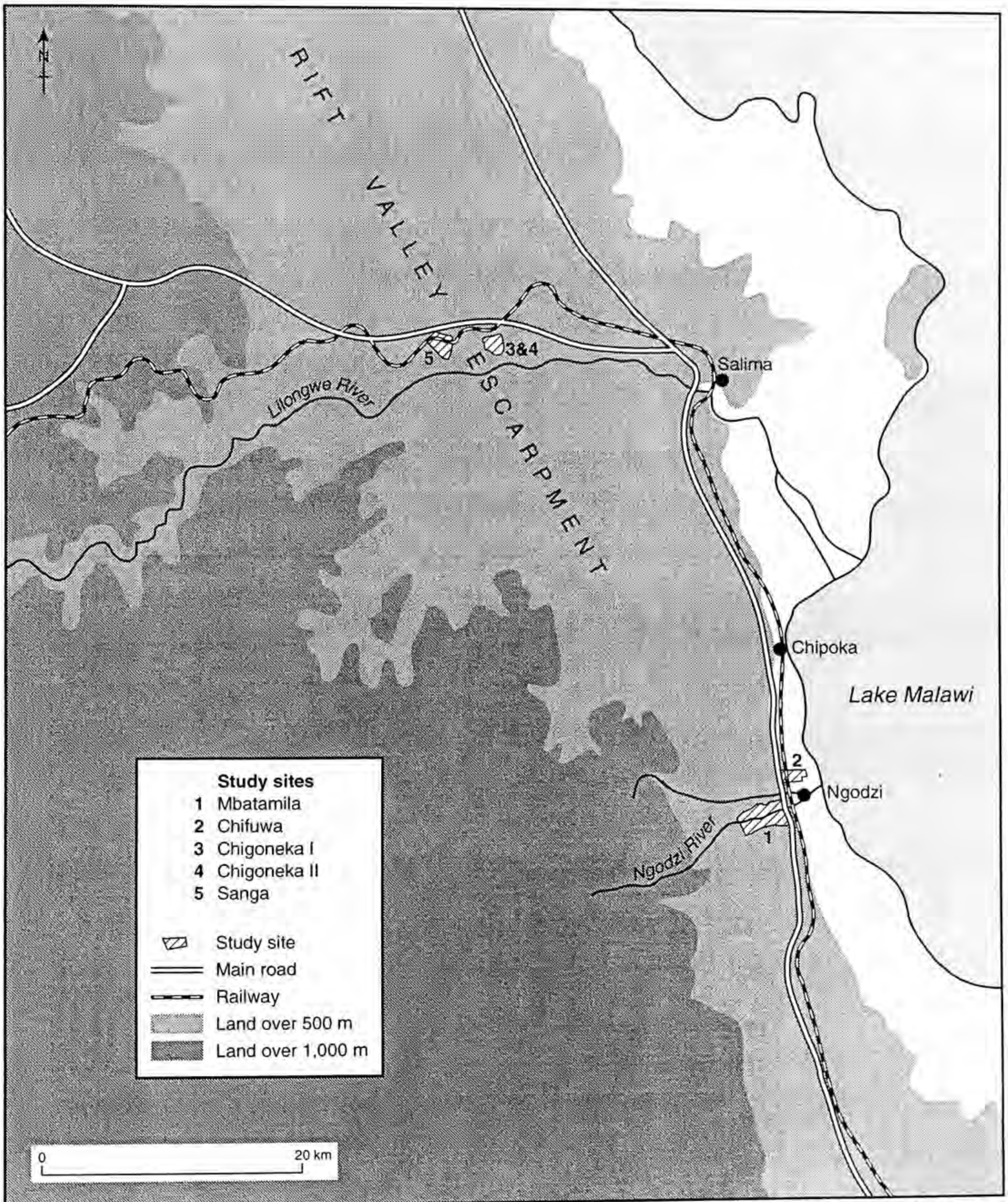


Figure 2.2: Location of five study sites within Salima A.D.D.

1964 until 1993 it was a one-party state under President Banda (who had declared himself president for life in 1971). Prior to that it was a British Colony. It has always maintained strong links with the UK and English is one of the two official languages. Chichewa is the other.

2.2. Socio-economic Factors

The population of Malawi was estimated to be 9 million persons in 1993 and 10.4 million in 1997 (United Nations and Government of Malawi, 1993). The intercensal growth rate is estimated by United Nations and Government of Malawi (1993) as 3.7 per cent and by the World Bank (1997) as 2.7 per cent. If population growth rates continue at the higher rate of 3.7 per cent this would give a population in 2025 as 28.5 million people. At the lower rate of 2.7 per cent the population in 2025 would be 21.7 million. Population growth is affected by factors such as health, mortality and family planning. Although these figures are estimates, which assume that population continues to grow at the same rate, and possibly wildly inaccurate, they indicate that problems related to population growth have the potential to be very strongly exacerbated. The fertility rate is 6.5 children born/woman and child mortality rate is 133 deaths/1,000 live births (World Bank, 1999). Figure 2.3 shows the age structure of Malawian population. Even if family planning measures reduced the reproductive rate significantly in the near future the high proportion of young Malawians would ensure that the total population would still increase significantly.

Malawi is currently one of the most densely populated countries in the African Continent (Figure 1.2). However, the population density varies considerably by region. The Northern Region averages 44 persons/km^2, the Central Region 113/km^2 and the Southern Region 162/km^2. Approximately 87 per cent of this population live in rural areas (World Bank, 1998).

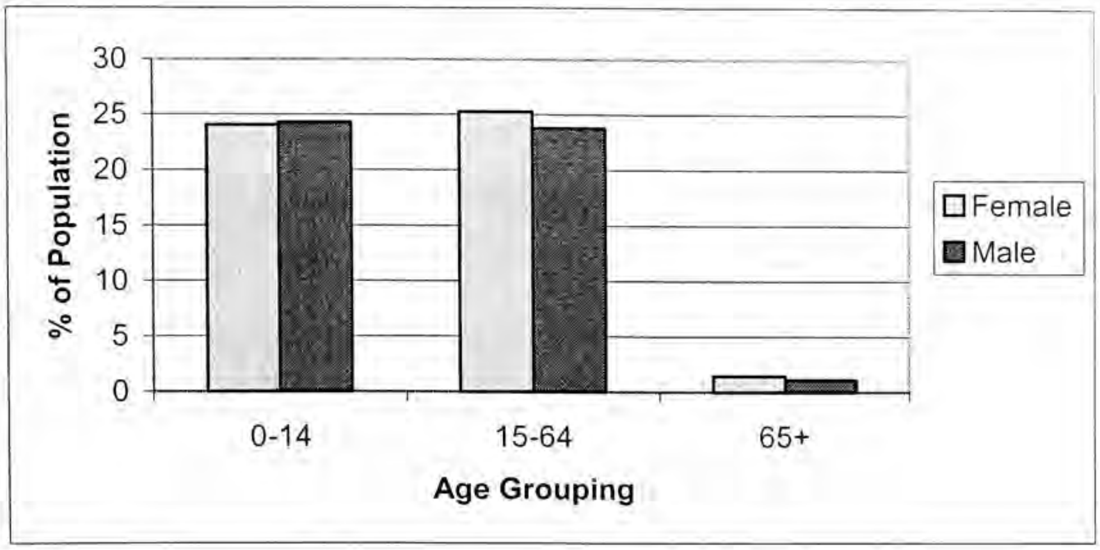


Figure 2.3: The relative age groupings of the Malawian population (Source: United Nations and Government of Malawi, 1993.)

Life expectancy at birth in 1997 was 44 years. The average life expectancy in Malawi is declining, manly due to HIV/AIDS (World Bank, 1997). The incidence of HIV/AIDS is among the highest in sub-Saharan Africa. Although there is little agreement on the exact numbers infected with HIV, the IMF (1999) estimate that thirteen per cent of 15 – 45 year olds were HIV positive in 1997. The impact of HIV/AIDS in Malawi could prove to be drastic, changing population structure as the mortality rates among infected working age adults increases.

The potential impact of HIV/AIDS is greater than just that on population numbers. The mortality rate will be highest amongst the working age, productive adults. The FAO (1994) estimated in 1994 that GDP growth rates in sub-Saharan African countries would be halved in the next five years as a consequence of HIV/AIDS on the labour supply, both through sickness and reduced capacity for work as well as mortality. Research in these countries indicates that farmers often cope with reduced labour supply by adopting farming practices that jeopardise immediate and future agricultural productivity, such as, delays, inadequate execution, and cessation of routine farming operations such as tilling, weeding, planting (FAO, 1994). HIV/AIDS education or health planning is not part of PROSCARP or directly covered by this research. However, the potential of this disease to dramatically change the future of Malawi must be appreciated.

Nyirenda *et al* (1995) estimates that approximately 60 per cent of the rural and 65 per cent of the urban population are now below the poverty level. Malawi ranks among the world's least developed countries. If measured in terms of Gross National Product (GNP) per capita, Malawi ranked in 1997 as the world's tenth poorest country at US$220 per person (World Bank, 1999). In terms of other indicators of a country's development, Malawi fares equally badly. Only 44 per cent of the rural population have access to clean water, 53 per cent have access to sanitation, 58 per cent of females and 28 per cent of males are illiterate, 28 per cent of children under 5 are malnourished (World Bank, 1999).

The Malawian economy is based on agriculture. Agriculture accounts for 36 per cent of Gross Domestic Product (GDP), approximately 90 per cent of its exports and 80 per cent of the labour force (World Bank, 1998: World Bank, 1999, United Nations and Government of Malawi, 1993). The economy depends on substantial inflows of economic assistance from the IMF, the World Bank, and individual donor nations. Official Development Assistance (ODA) to Malawi in 1996 was 23.2 per cent of GNP or US$50 per capita (World Bank, 1999). These figures are relatively high. In 1990 the ODA per capita in sub-Saharan Africa as a whole was US$33.9 and ODA as a percentage of GNP was 9.6 per cent (Cho, 1995).

This brief picture of Malawi shows a country with high levels of poverty and a strong reliance on agriculture. Increasing population pressure will add more strain to a currently stretched country. The next section examines resources available and environmental concerns. This incorporates an analysis of the agricultural sector that dominates the Malawian economy to ascertain the potential for social, economic and environmental development required for poverty alleviation at the current time and into the future.

2.3. Resources and the Environment

Lake Malawi provides a vast natural resource, providing fresh water, fishing and a draw for tourists. However, Malawi does not have major mineral resources to exploit. There are some deposits of uranium, coal, bauxite and limestone, (CIA Factbook, 1997). The major assets of the country are, therefore, people, agricultural land, forests, the lake and associated fisheries.

2.3.1. Land

The land area of Malawi has a wide variation in topography. There are substantial differences in agricultural potential nationwide as a result of this topographical variation. Malawi can be broadly divided into six relief units, each differing in some degree in altitude, soils, vegetation, rainfall, and agricultural potential (Saka *et al*, 1995). Table 2.1 outline these six major relief units, identifying the predominant soil types and the general agricultural potential of each of the units. The difference in agricultural potential between the units is influenced by soil type, but is also affected by rainfall and temperature between the agro-ecological zones. This influences the crops that can be successfully grown within an area. Also included in this table are dambos. Dambos are low-lying wet areas that are found around the country. Although these are not strictly a relief unit they can be of immense importance in local areas as crops can be grown here throughout the year, as moisture is retained or available in the soils.

The different agro-ecological zones outlined in Table 2.1, resulting in different crop types and varying problems of production, could have an important influence on agricultural development strategies and extension advice.

Five villages were investigated within this research. Two of the villages were within one catchment on the lakeshore plain. The other three villages were

Relief Unit	Predominant Soil Type	Agricultural Potential	Limitations
The High Plateaux	Lithosols (Inceptisols	Low	Potassium deficiency, soil acidity, soil erosion
High Altitude Hills	Lithosols (Inceptisols)	Low to moderate	soil erosion
Central African Plateaux	Ferrunginous and sandy ferallitic latosols	Moderate	Requires fertiliser applications and soil erosion control
The Rift Valley Escarpment	Litholsols, ferrisols, ferrelitic latosols	Low	Potential micronutrient deficiency, deep tillage, water management required.
The lakeshore Plain	Calcimorphic alluvials	Moderate to high	
The Shire Valley	Vertisols	Generally High but constrained by erratic rainfall	Good soil tillage practices required, water harvesting
[1]Dambos	Hydromorphic Soils (Inceptisols)	High	Poor drainage

[1]Low lying wetter areas found around the country, of special importance to farmers for production of horticultural and cereal crops throughout the year due to lack of water stress. Not strictly a relief unit.

Table 2.1: Division of Malawi into relief units (Source; adapted from Saka *et al*, 1995)

within the second catchment area at the base of the rift valley escarpment. This allowed comparisons to be made between higher (lakeshore plain) agricultural potential and lower (base of Rift Valley Escarpment) agricultural potential.

Green and Nanthambwe (1992) carried out an assessment of land resources within Malawi. Table 2.2 outlines the amount of land suitable for agricultural production under traditional and improved agricultural practices according to Green and Nanthambwe (1992). This is based on a land capability classification system. In the central area of Malawi, where this research is based, 45 per cent of the land area is suitable for agriculture at the time of this research. This figure could be increased to 72 per cent with improved agricultural practices. Improved traditional management would encompass aspects of natural resource management, soil conservation and water management (Green and Nanthambwe, 1992). This table demonstrates how increased food demand and population pressures have led to agricultural expansion into areas that are not considered suitable for agricultural production unless improved management practices are implemented. There is little evidence of improved practices (Saka *et al*, 1995).

	Northern Region	**Central region**	**Southern Region**	**Total for country**	**Land in agricultural production**	
					1967	1990
Area suitable for agriculture under traditional management	23%	45%	22%	**32%**	37%	**48%**
Area suitable for agriculture under improved traditional management	56%	72%	52%	**60%**		

Table 2.2: Agricultural potential in Malawi (Source; Green and Nanthambwe, 1992)

Of the remainder of the land suitable for agriculture under improved practices 10.5 per cent is in reserved areas such as forest reserves and National Parks. These areas are unlikely to become available for agricultural production. Apart from rapid expansion of the estate sector in the 1980s most of the land brought into new production is in the smallholder sector (Saka *et al*, 1995).

The difference between the area suitable for agriculture under traditional management practices and the area suitable for agriculture under improved traditional management practices is 28 per cent of the total land area. This illustrates sharply the need for introducing more conservation based agricultural management.

Increased population pressure has meant that land holdings are shrinking and becoming more fragmented. Traditional farming practices that maintained the soil base, such as fallowing, are decreasing rapidly and marginal land is being brought into production (Bunderson and Hayes, 1995). Even allowing for all farmers utilising improved traditional practices there is a severe scarcity of land for expansion. Land that is unsuitable for agricultural purposes has already been brought into production (Government of Malawi / Ministry of Agriculture and Livestock Development, 1994).

Overall land degradation is becoming a serious concern in Malawi (Government of Malawi / Ministry of Agriculture and Livestock Development, 1994; Saka *et al*, 1995; Bunderson and Hayes, 1995). The causes and effects of land degradation are examined in section 2.5. Due to population pressures and land shortages, increasing agricultural production to meet increasing demands on food and fibre within Malawi is strongly dependent on increasing production from the existing land area. Land degradation under current agricultural practices is degrading the soil resource. Therefore, increasing agricultural production must involve a change towards conservation-based farming. One of the questions this thesis addresses is can a move towards conservation based farming methods be achieved, and does PROSCARP provide the means to achieve this?

2.3.2. Forests

The total forest cover of Malawi was estimated by the FAO (1999) as 36.7 per cent. The forests provide 90 per cent of the country's fuel for both domestic and industrial purposes. Smallholder farmers and most rural dwellers rely entirely on fuelwood for cooking and heating.

Table 2.3 shows the decline in total forest cover. Malawi is losing forests at a high rate both in comparison to other southern African countries and the rest of the world. Agricultural expansion and a demand for wood for energy, construction, fish smoking, tobacco curing and so on cause deforestation.

	1995	1995	1990 - 1995
	'000 Hectares	%	% / Year
Malawi	3,339	35.5	-1.6
Tropical Southern Africa	141,311	25.6	-0.8
World	3,454,382	26.6	-0.3

Table 2.3: Total amount of forest cover and decline over a five-year period 1990 - 1995 (Source: FAO, 1999).

Again, pressures from the increasing population exacerbate this. Customary and private lands are the main areas of deforestation in Malawi due to the protected nature of parks and reserves (Bunderson and Hayes, 1995).

The impact of deforestation is high in the agricultural and rural sector. Removal of trees can exacerbate soil erosion problems. It also causes organic matter in the soil to mineralise, allowing the nutrients to leach out, reducing fertility. In terms of the impact on rural households, the requirement for woodfuel can mean longer journeys and more time spent on wood gathering. Wood is gathered mainly by women and children and the increased time and effort needed to gather fuel adds to their burden. Wood is also required as an input in the curing of tobacco, for smoking of fish and for making charcoal. The lack of wood can impact heavily on a household's ability to earn a cash income. The importance of income sources reliant on wood within the case study area is examined later. Non-timber forest products also can provide food, products and some income to rural households (Abbot, 1996).

Overall, from both an environmental, social and economic viewpoint, unless alternatives can be found for the high reliance on timber and forest products then a focus on sustainable forest management or tree utilisation is a strong requirement.

2.4. Agriculture

Almost 80 per cent of agricultural produce comes from smallholder farmers on customary land, which comprises of around 90 per cent of the population (Barbier, 1991). Maize is the main food crop grown on over 70 per cent of the cultivated area. Other food crops are cassava, millet, rice and sorghum. Tobacco is the main cash crop accounting for 71 per cent of the export trade. Other cash crops are cotton, sugar, tea and coffee (Government of Malawi / Ministry of Agriculture and Livestock Development, 1994). Legislation prevented smallholder farmers from growing tobacco until it was repealed in 1990 and smallholder farmers are now encouraged to grow tobacco as part of a state policy of crop diversification (Devereux, 1997). As a result of this, Malawi's production of Burley tobacco has trebled over the last decade, with most of this increase coming from the smallholder sector (Devereux, 1997).

Of the total agricultural land only 25 per cent is used for arable production. Figure 2.4 shows the breakdown of land usage. Malawian agriculture is predominantly rainfed with irrigated land estimated to occupy only 1.6 per cent of cropland (World Bank, 1999).

Crops are planted at the start of the rainy season (October/November). Most crops, including maize and tobacco are planted in ridges. Cassava can be planted in mounds. Agricultural production was traditionally based around a system of shifting cultivation where fallowing was used to allow the soils to recover their productive potential. Population pressures and land shortages have reduced this option and fallowing is now no longer practised in most areas of the country.

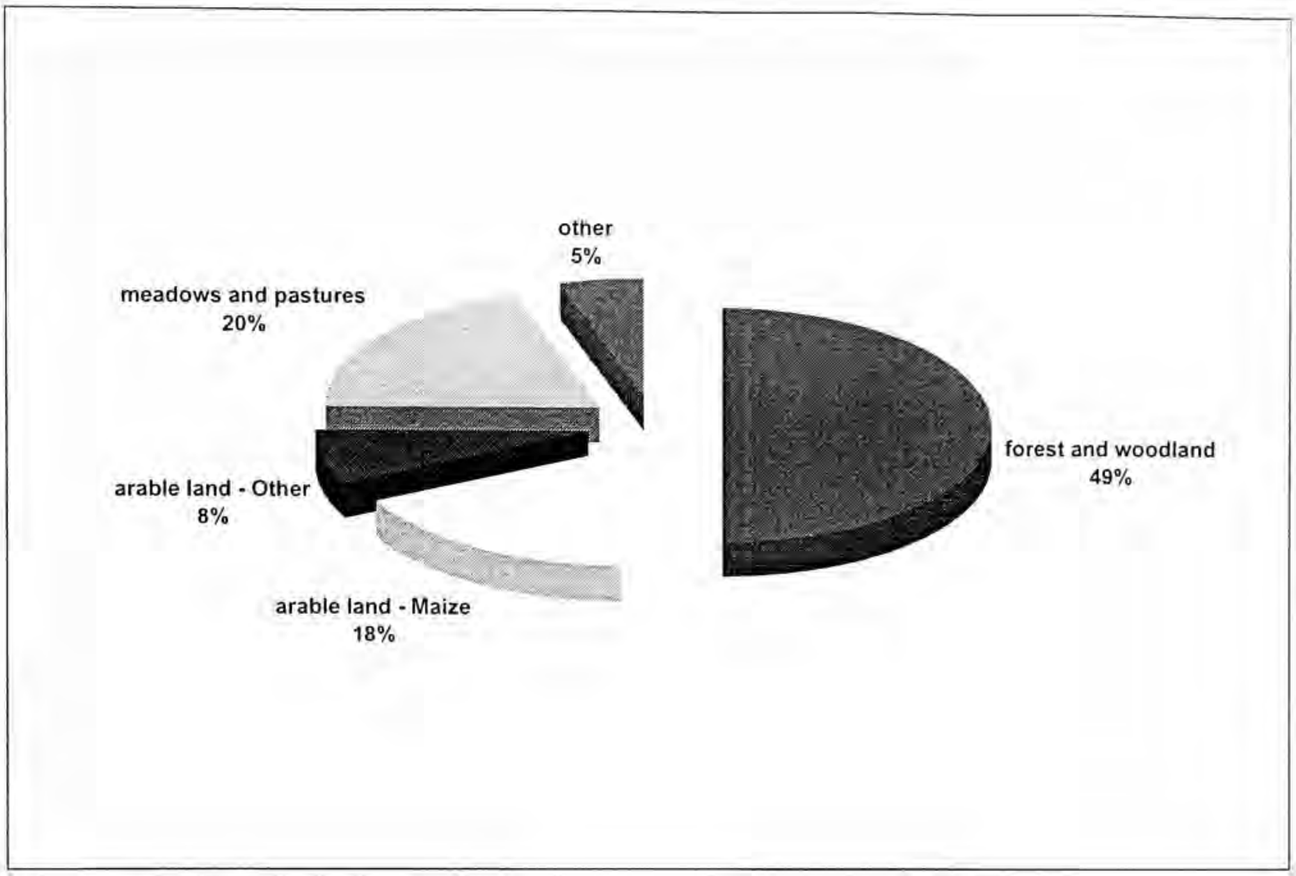


Figure 2.4: Division of agricultural land in Malawi.

2.4.1. Land Tenure

Security of land tenure has been identified as a potential problem to long-term land improvement (Millington *et al*, 1989; Stahl, 1993). This section briefly outlines the division of land among the different sectors and the tenure associated with them. Security of tenure and its implications for resource conservation is examined in the case study areas and the results presented later in the thesis.

The agricultural sector in Malawi is dualistic in nature. It is divided into the estate sub-sector and the smallholder sub-sector. The smallholder sector contributes 80 per cent of the total agricultural production while the estate sector contributes 90 per cent of the export trade (Bunderson and Hayes, 1995).

Land in Malawi can be divided into three categories;

1. Public land
2. Private Land
3. Land held under Customary Tenure.

Farmers that crop leased or freehold land (private land) are classified in the estate sub-sector. This accounts for 12,000km^2. Farmers cropping communal land under customary tenure are classified as smallholders (Saka *et al*, 1995). Figure 2.5 shows the division of land among the categories.

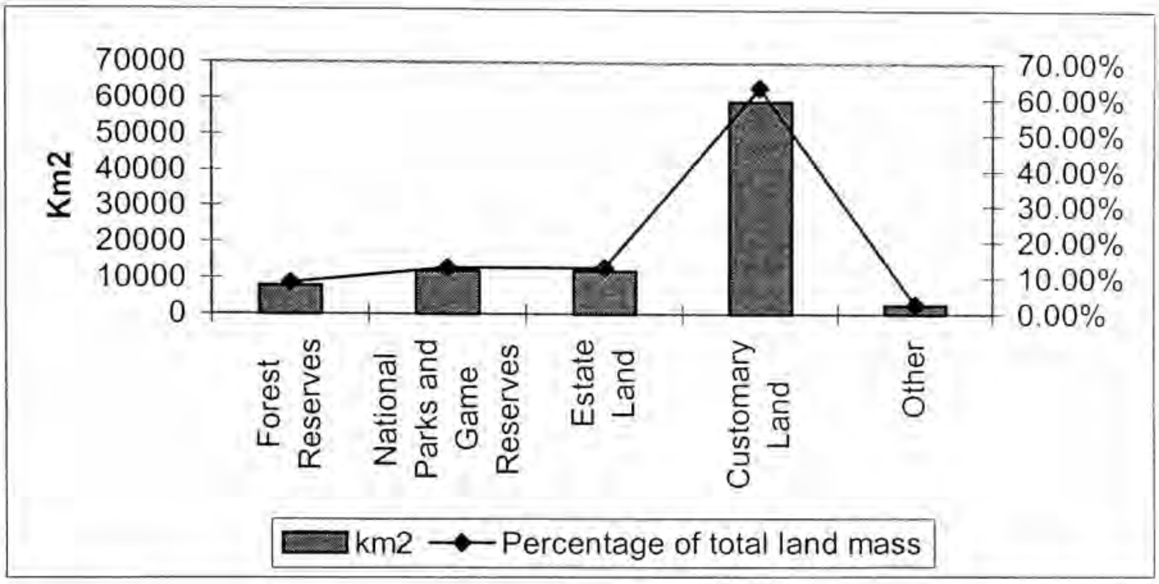


Figure 2.5: Main Classes of Land in Malawi (Source: Bunderson and Hayes, 1995).

This research is based on the smallholder farmers farming land under customary tenure, the majority of farmers in Malawi. The Traditional Authority (TA) allocates land under customary tenure to a community. A village chief or his headman can allocate unoccupied land to any person for his/her use. Land that is in use can be held indefinitely by a farmer and can be inherited. However, it is not a commodity and cannot be bought or sold.

The Minister of Land can declare customary land public or lease it to a private party. 1.1 million hectares was lost to the smallholders in this way between 1964 and 1988 (Saka *et al*, 1995). This increasingly marginalised the smallholder sector, increasing pressure on an already limited land supply.

Devereux (1997) suggested that one of the solutions to the problem of land shortages is the redistribution of unused or under-used estate land to smallholders. This is based on the findings of Mkandawire *et al* (1990) and Steele (1997) that estate lands are seriously under utilised.

Smallholders farm the majority of agricultural land under the customary tenure system. The main threats to smallholder farmers appear to be a reduction in the amount of land available due to reallocation of land into the estate sector, and a lack of land available for agricultural expansion, resulting in smaller farm sizes as land is passed down to future generations. The system of customary tenure, although not allowing the farmer direct ownership of his/her farm, does appear to give the farmers long term access to a piece of land and the ability to pass it on to his/her children.

2.4.2. Smallholder Farming Systems and Crop Production

Smallholder crop production is dominated by maize, the staple food. It accounts for 75 per cent of the area cultivated by smallholders (United Nations/ Government of Malawi, 1993). Despite an average increase in maize production nationally, per capita food production dropped overall by 25 per cent between in1979 and 1991. Maize yields for the period 1964 to 1998 are shown in figure 2.6.

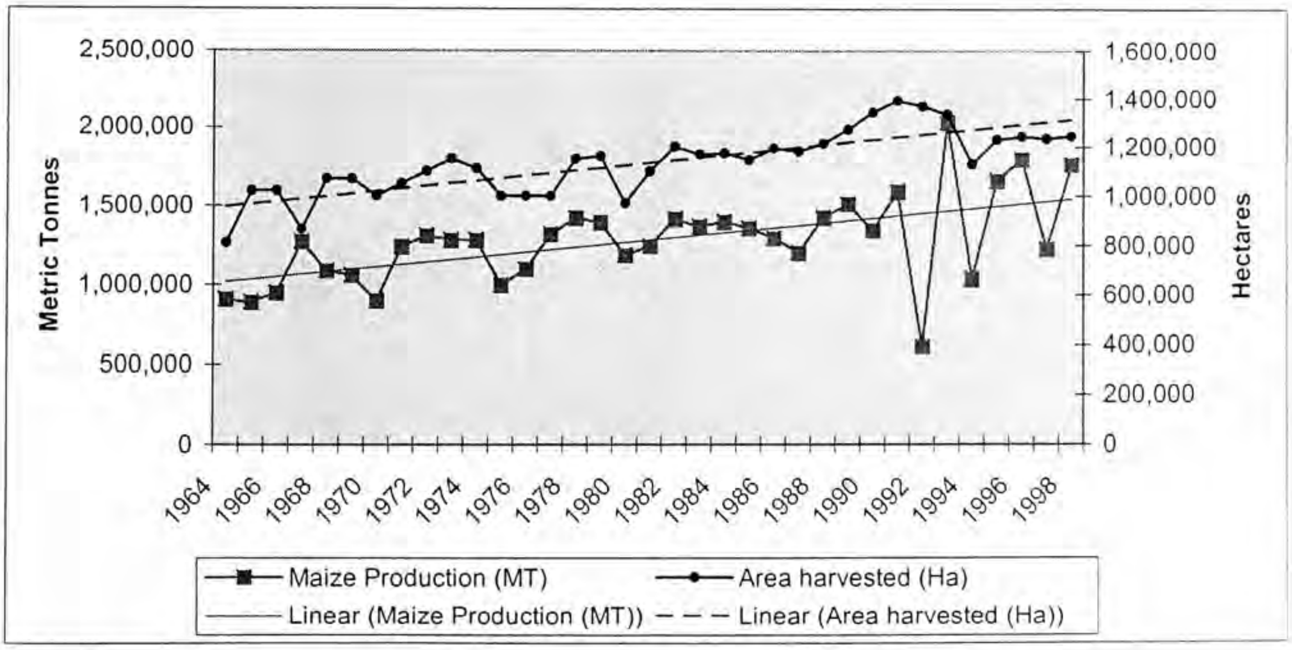


Figure 2.6: Total maize production in Malawi and area harvested from 1964 to 1998 (Source: calculated from FAO, 1998).

Malawi has experienced two serious droughts in the 1991/92 and the 1993/94 growing season followed by excessive rainfall in the 1996/97 growing season (Government of Malawi/ Ministry of Agriculture and Livestock Development, 1994). This drastically reduced maize yields as shown in figure 2.6.

The amount of maize produced has increased in line with a change in hectares harvested. Overall there is no appreciable increase in maize yields per hectare. In terms of yields per hectare for maize, Figure 2.7 shows current yields (high and low figures) on average and the potential increases in yield from using improved varieties of maize.

It can be seen from this that improving agricultural practices can increase even local maize varieties substantially. The use of improved varieties, particularly hybrid maize, has the potential to increase yields by several hundred per cent.

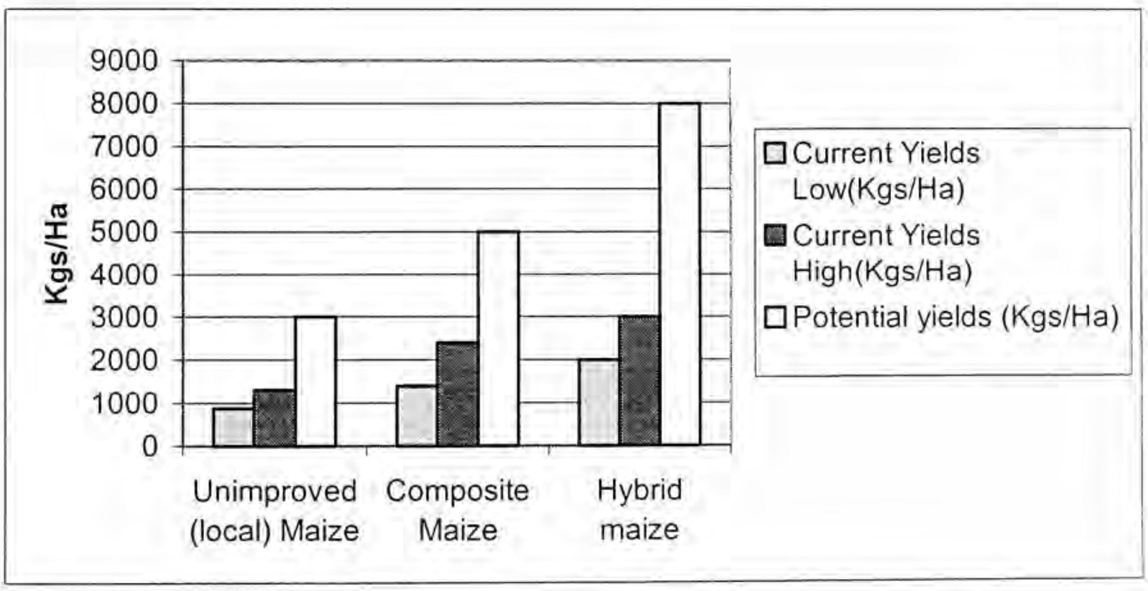


Figure 2.7: The current yield of local, Composite and Hybrid maize (low and high estimates) compared to potential yields of the same crops (Source: compiled from Government of Malawi and Ministry of Agriculture and Livestock Development, 1994).

One of the main limitations to increased maize yields other than the variety is soil fertility and additions of fertiliser. Figure 2.8 shows fertiliser use over the same period, 1964 – 1998. There is a dramatic drop in fertiliser use in 1994. There appears to be several causal factors. One of the major problems was the change in the availability of credit. The following section examines credit facilities for the smallholder farmers in detail but at this time many farmers were unable to obtain credit, reducing their ability to purchase inputs. The price of fertiliser at this time also escalated rapidly. Subsidies on fertilisers were to be removed completely by 1995 under the Fertiliser Subsidy Removal Programme (FSRP) (Devereux, 1997). This, combined with a currency devaluation (October 1994) and subsequent inflation, quadrupled the price of fertilisers between the 1993/94 and 1995/96 seasons (Devereux, 1997).

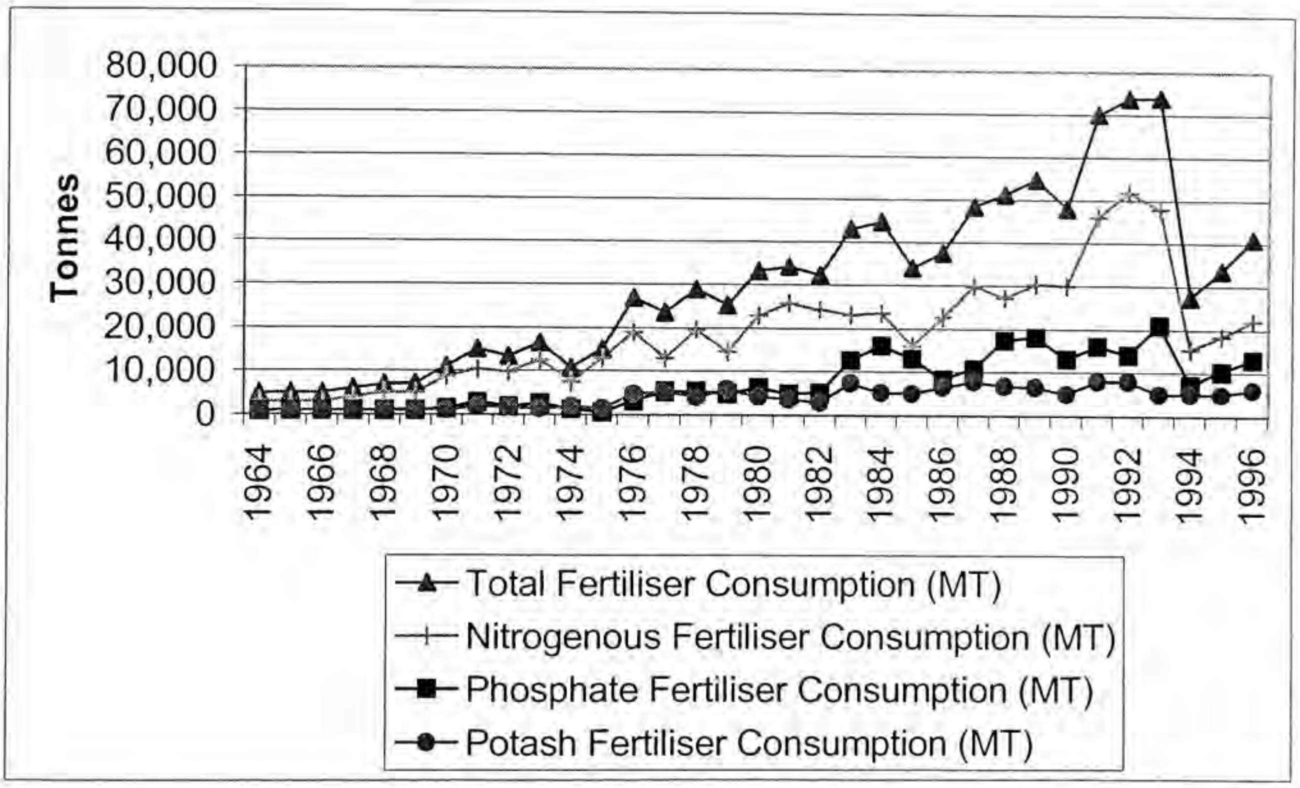


Figure 2.8: Fertiliser consumption in Malawi 1964 - 1996 (Source: compiled from FAO, 1998)

Although there has been some recovery in the use of fertilisers, it has not reached the 1993 levels. As fertiliser (or lack of soil fertility) is one of the main limitations on increasing yields it is obvious that the increasing price will be felt most strongly by the cash poor members of the community, the smallholder farmers.

2.4.3. Smallholder Credit Facilities

The information in this section (unless otherwise cited) is from interviews with the Malawi Rural Finance Corporation (MRFC) staff members in the Salima office and Lilongwe. The purchase of inputs for many smallholder farmers is reliant on the availability of credit. Until 1994 smallholder farmers were able to obtain credit from the Smallholder Agricultural Credit Association (SACA). Farmers formed clubs and acted as security for each other's loans. In the early 1990s over 30 per cent of smallholder farmers were using SACA (Devereux, 1997). During the 1990s the recovery rates on loans fell to levels that added to the collapse of SACA. The drought of 199/92 decimated the maize harvest causing widespread defaults. Also the political climate was in upheaval at the time and many farmers defaulted on loans at this time, perhaps due to unfulfilled promises of translating loans into grants (Mittochi, pers com).

A privatised company, the MRFC, replaced SACA. Credit is disbursed through farmers clubs. Loans are only given to people who have not defaulted (even on SACA). The total default must be paid before the farmer becomes eligible. Credit is also not available on an individual basis for smallholders. The farmer's club is responsible for the loan, therefore, if any member defaults the club is not eligible until the default has been paid.

There are two types of club. The first is the farmer's club that requires ten per cent collateral on any loan. The second is the Tikolore Scheme aimed at the rural poor. This does not require any up front collateral but farmers must have less than 1.5 hectares and assets of less than 90 kgs of maize (5 bags). In 1996/97 there were 128 farmer's clubs in Salima and 33 Tikolore centres. The MRFC wanted to expand this to 193 farmers clubs and 171 Tikolore centres in 1997/98. There are approximately 20 – 25 farmers per club, both for the farmers clubs and the Tikolore. Interest rates in August 1996 were 37 per cent, down from 55 per cent in 1995 and 40 per cent in 1994. The potential for the drop in interest rates to act as an incentive to join the MRFC was investigated during this research.

According to the MRFC it is difficult to reach the rural poor. Cash collateral can be a problem. Also there are time and staff constraints as well as problems with filling in forms. The demise of the block garden system of agricultural extension advice has lessened the opportunities to pass along messages about credit. Credit assistants now deal with district offices and it is the Ministry of Agriculture's Field Assistant that helps to pass along the messages and form farmer's clubs and Tikolore clubs. The uptake of credit by farmers in the study area is investigated later to determine whether it is a constraint to increased agricultural production.

Maize, as the staple food in Malawi, dominates the agricultural production of smallholder farmers. The yields of maize are strongly influenced by three main factors, the variety of maize, management factors such as the addition of fertiliser, and the availability of moisture.

It has been shown that hybrid maize varieties have much higher potential yields. Smallholder farmers are increasingly adopting hybrid maize varieties, with an increase from 7 per cent of the smallholder maize area planted in 1988 to 24 per cent of smallholder maize area planted in 1992 (Smale, 1995). However, the addition of fertilisers is an important feature to obtain high yields, even from hybrid maize varieties. A decrease in artificial fertilisers due to price increases and changes within the smallholder credit facilities must be seen as a major limitation to national maize production, but also at the household level if a farmer is unable to purchase either improved maize varieties and fertilisers, or is unable to obtain credit.

The final point that must be made in relation to the importance of maize to smallholder farmers is the susceptibility of the maize crop to drought. Figure 2.6 shows the results of two major drought seasons on the maize harvest. It must be questioned whether such a national dependence on maize is appropriate under the increasingly erratic rainfall patterns in the region. This issue is examined in a later analysis of Malawian Government Agricultural policies.

2.5. Soil Resources

Under natural vegetation soils are in an optimum physical, chemical and biological condition (Brady and Weil, 1996, Hudson, 1995, Saka *et al*, 1995). The ability of the soil to produce agricultural crops is dependent on a number of soil physical and physico-chemical properties including; soil structure, water holding capacity of the soil, availability of mineral nutrients and organic matter content. The overriding concern in Malawi for agricultural production is land degradation (Saka *et al*, 1995). This encompasses the problems of continuous cultivation without the benefit of added external inputs, deforestation and an expansion of the agricultural sector leading to increased soil erosion, soil nutrient depletion, increasing soil acidity and alkalinity.

The fertility of the soil in terms of its nutrient status, and the physical loss of soil through erosion are both major constraints to agricultural production and will be considered in more detail here.

2.5.1. Soil Fertility

The fertility of the soil refers to its ability to provide certain essential chemical elements in quantities and proportions for the growth of plants (Brady and Weil, 1996). The ability of the soil to supply nutrients is dependent on factors such as; parent material, climate, vegetation, soil type and soil management and crop husbandry practices. Under natural vegetation there is no overall loss of nutrients from the system. In agricultural production nutrients are removed from the soil by crops, which are subsequently harvested. The traditional practice of fallowing in Malawi allowed the soil to recover its productivity through the accumulation of nutrients. Continuous cultivation does not allow this natural recovery. Without returning lost nutrients to the soil, by means of organic or inorganic fertilisers, the fertility status of the soil will be reduced over time until crop production is reduced or not possible.

On-station research carried out in Malawi in the early 1950s indicated decreasing soil fertility status under continuous cultivation (Saka *et al*, 1995). This was followed by a series of on-farm research in the 1960s leading to the production of a soils map of Malawi that indicated the relationship of crop responses to fertiliser additions and soil type, parent material, natural vegetation and rainfall. Widespread nitrogen deficiencies were recorded (Saka *et al*, 1995). Vertisols and calcimorphic alluvials have an inherently high fertility status. Nutrient deficiencies are associated strongly with well-drained medium and coarse textured ferrunginous and ferrillatic latosols (see table 2.2).

More current research confirms the findings of this early research and micro and macro-nutrient deficiencies have increased substantially, mainly due to reduced fallowing and soil erosion / deforestation (Saka, 1987; Saka *et al*, 1995; Waddington, 1995).

Additions of organic or inorganic fertilisers can alleviate the problem. However, to provide optimum growing conditions for plant growth requires knowledge on the fertility status of the soils. This is achieved by soil testing to ascertain fertiliser requirements. Soil testing facilities are available in Malawi to both smallholder and estate farmers at a low cost but the uptake from smallholder farmers is very low (Saka, pers com). This was investigated in the villages. One farmer stated that he knew his fields were decreasing in fertility every year and did not need a soil test to tell him this. Other farmers said that they had enough to pay for without soil tests. Most of the farmers seemed to be aware of the facility but were either unable to pay for the test or unable to act on the recommendations (in terms of addition of fertilisers) and it was therefore irrelevant.

2.5.2. Soil Erosion

The main agent of soil erosion in Malawi is water. The problems caused by soil erosion are varied. There are potential losses of productivity due to changes in soil characteristics. This can include reduced soil fertility, reduced soil nutrients and soil organic matter, reduced water holding capacity, and changes in soil structure. The consequences of soil erosion are the reduced soil productivity, the consequential negative impact on yields and increased production costs of crops (Ponzi, 1993). There are also off-site impacts such as sedimentation of reservoirs and rivers, agricultural pollutants entering water courses, and so on (Clarke and Harercamp, 1985).

The potential for water based soil erosion is based on five factors. These are;

1. Rainfall erosivity,
2. Soil erodibility,
3. Topographic factors,
4. Cover and management factors,
5. Support practice factors (Brady and Weil, 1996).

To effectively plan a soil conservation strategy to reduce loss of topsoil it is necessary to understand these factors.

1. The erosivity of the rainfall includes the total rainfall, as well as the intensity and seasonal distribution of the rain. Intense rains have a larger drop size, with more energy available to detach soil particles (Hudson, 1995). The higher the rate of rainfall the more run-off is generated which transports the detached particles (Brady and Weil, 1996).

Mean annual rainfall in Malawi varies throughout the country from 500mm to 3000mm. The intensity of the rainfall also varies throughout the country with the highest intensities found in the Southern Region and the lakeshore plain (Saka *et al*, 1995). These higher intensities mean that the potential for soil erosion (erosion hazard) is higher in these areas.

2. Soil erodibility is the soil's inherent susceptibility to erosion. The texture of the soil is a contributing factor in the erodibility of soil. Hudson (1995)

outlines these factors; sand and silt tend to increase erodibility, while clay decreases it. There are two soil characteristics that directly influence soil erodibility. These are the infiltration capacity of the soil and the structural stability. A high rate of infiltration of water will reduce run-off. Stable soil aggregates will be less susceptible to the disruptive and compactive forces of rain and more resistant to surface crusting. Properties of soils that tend to make soil more resistant to erosion are moderate organic matter content, a strong aggregate stability and a crumb or granular soil structure (Brady and Weil, 1996). Both structure and infiltration capacity of the soil can be altered through agricultural management practices, examined later.

3. Topographic factors that directly influence soil erosion are the length and steepness of the slope. On freshly ploughed or uncovered sites slope length has the greater influence. On rangelands or row cropped sites the steepness of the slope has more influence (Brady and Weil, 1996).

4. The management of vegetation, degree of cover, plant residues and soil tillage are the easiest control of soil erosion. Figure 2.9 shows the effects of crops and cover on soil erosion, indicating that vegetative covers provides protection from erosion. Natural forest provides the greatest protection under similar conditions in the West African Humid Zone.

5. The construction of physical structures or other measures to control run-off is the final factor in the potential for erosion on a site. These can take the form of contour planting, contour strip cropping, terrace systems and grassed waterways (Brady and Weil, 1996).

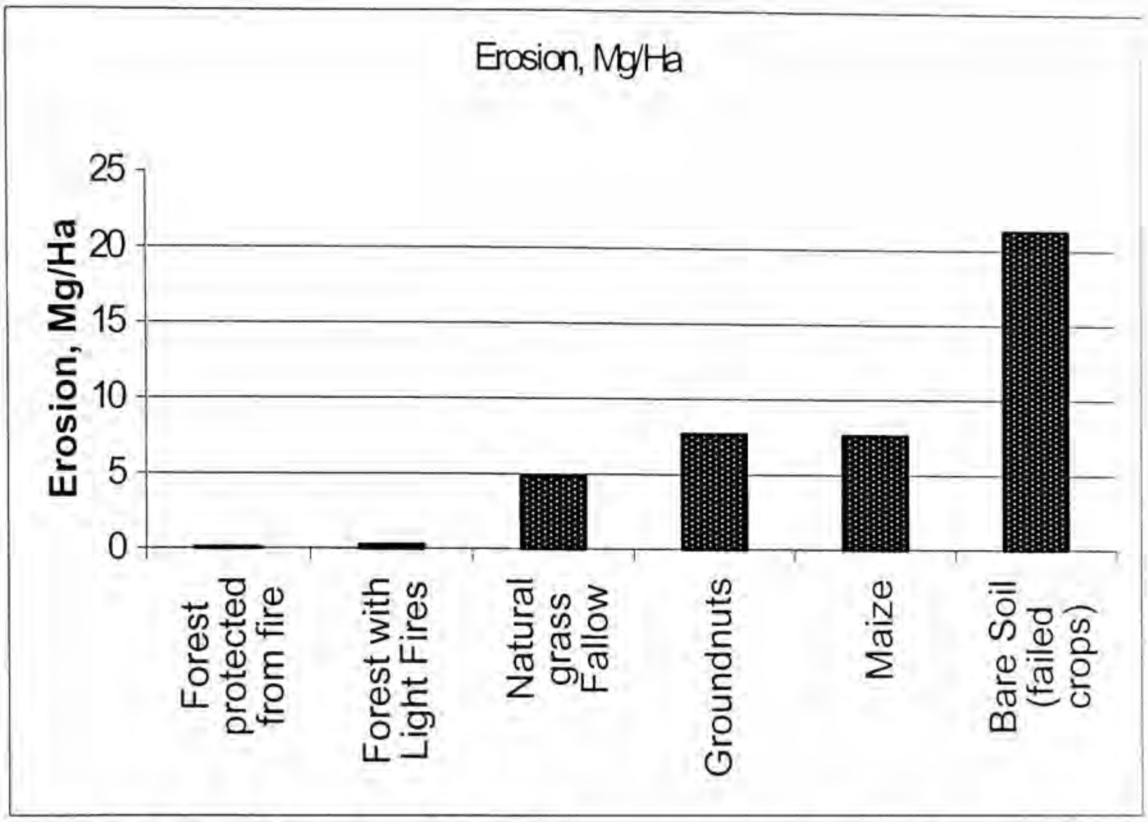


Figure 2.9: Effects of plant cover on soil erosion in West African Humid Zone (Source, Brady and Weil, 1996)

These factors are very much the basis of the "diagnosis, prescription, intervention" model discussed in section 1.4 and are presented here solely to indicate potential areas of intervention to decrease the likelihood of land degradation through soil erosion.

Table 2.2 shows the amount of land available for cultivation under traditional and improved traditional practices. A study by Green and Nanthambwe (1992) found that although 48 per cent of the land was either currently cultivated or in recent fallow, only 32 per cent of land was suitable for cultivation under traditional practices. They also found that the majority of farmers were not using improved traditional practices and some of the land suitable for cultivation was held as forest reserves. They concluded that land that is not suitable for cultivation is already being cultivated and that this will result in a much higher erosion hazard and higher overall degradation of the soil resource.

Unfortunately it was not possible to find research results that quantified on-farm losses of soil through erosion in Malawi. The lack of accurate data makes remedial measures difficult or impossible to implement efficiently. Measures for the control of soil erosion appear to be based more on a visual assessment at farm level or on a countrywide basis on the assumption that it is a serious problem throughout the country.

Hudson (1995) suggests that there is a movement towards minimising the effects on productivity from soil erosion rather than applying soil conservation on a blanket cover basis. More could be gained from applying soil conservation techniques to affected but recoverable land rather than costly remedial work on badly degraded land. There is also the problem of who is responsible for the cost of soil conservation. Ponzi (1993) found that improved plant breeding, additional fertilisers and other technology or management practices can hide falling land productivity. However, this can happen despite decreases in the long-term soil productivity. The situation for smallholder farmers in Malawi means that cash inputs or other costs related specifically to the control of soil erosion seem unlikely to be invested in unless there is some other more immediate benefit.

The control of soil erosion and loss of soil fertility is vital to the long-term production potential of an area. It is upon this aspect of resource management that both PROSCARP and this research is focussed.

2.6. Policy Approaches to Resource Management

Agriculture is vital to the Malawian economy. In 1987 the objectives of the agricultural development policies of the Government of Malawi were: 1) improving and maintaining food self-sufficiency; 2) expanding and diversifying agricultural exports, while conserving natural resources; 3) raising farm incomes and promoting economic growth and improving social welfare (Government of Malawi, 1987). In 1994 a strategy workshop was held to assess national policies for poverty alleviation. This redirected government policy towards poverty alleviation through crop diversification and resource conservation (Government of Malawi/ European Union, 1995). As part of the poverty alleviation and agricultural development programmes the National Agricultural Objectives were expanded in the 1994/95 season as follows (Government of Malawi / Ministry of Agriculture and Livestock Development, 1994):

1. To achieve and maintain self-sufficiency in food production at both national and household levels,
2. To expand and diversify cash crop production for export and import substitution,
3. To improve opportunities to all smallholder farmers for the growing of cash crops in addition to maize and other food crops,
4. To achieve self sufficiency in all livestock products and export any available surplus,
5. To conserve natural resources, especially soil, water and trees in order to improve and maintain the productivity of the land, and
6. To raise the economic and social welfare of the rural population through increased farm income.

Some of the critical policy changes in this period were the deregulation of burley tobacco production (1990), phasing out subsidies on fertilisers (1996), privatisation of SACA (1994), and investment in high yielding maize varieties (1990 onwards) (Ng'ong'ola, 1996).

Advice on ways to achieve these aims is disseminated to the farmers through two main methods, agricultural extension and radio broadcasts. Agricultural extension workers from the Ministry of Agriculture visit each village on a regular basis. There is no evidence of these objectives being met through the agricultural extension services. Lack of funding, lack of inputs, problems of transport and so on all contribute to practical problems of information dissemination. If all of these objectives had been achieved there would be no need for PROSCARP.

These objectives are very strongly oriented towards increased agricultural production, both to achieve food self-security and to increase cash incomes.

The problems of agricultural production examined earlier, especially the reliance on rainfed agriculture, have meant that national self-sufficiency in major food crops was only achieved in three out of eight years from 1988 to 1995 (Devereux, 1997). In the drought years of 1991/92 and 1993/94 the food gap was extremely large. Production was 42 per cent of national requirements in 1991/92 and 59 per cent in 1993/94 (Devereux, 1997). The other focus of these objectives is the protection of natural resources to maintain the productive potential of the land. The population density of the country, and subsequent land scarcity has already changed agricultural practices. Fallowing is reduced or non-existent. According to Saka *et al* (1995) marginal land is already being cultivated. The protection of the natural resource base would require a reversal of current trends. The population of Malawi is set to increase for the foreseeable future. If erratic rainfall and droughts continue, the shortage of land for agricultural expansion coupled with the current problems of meeting national food requirements do not lead to confidence in the National Agricultural Objectives of the Government being fulfilled.

2.7. Structure of the Thesis

The first chapter outlined the changing approaches to agricultural development and natural resource management, and identified the aims of this thesis. Within these broad aims, this research focussed more specifically on a development project in the case study area. The purpose of the case study was to analyse the contribution, in terms of both appropriate technologies and appropriate policies, of an externally funded development project to the sustainability of local agricultural systems in Malawi, with specific reference to soil conservation techniques.

This chapter has evaluated the political and social climate of Malawi and the development issues it faces. This places the research in the broader context within which the agricultural system and the producer operate. Malawi has high levels of poverty and a high proportion of smallholder farmers comprising the majority of the rural population. The economy is heavily reliant on agricultural production and the high density of the population leaves little room for expansion of the area cultivated. Land degradation is one of the major problems facing the nation and is the focus of government attention as well as NGOs working within the country. The main purpose of this chapter has been to introduce Malawi as a country and prepare the reader for a full understanding of the context in which this research takes place. The PROSCARP project and the current research not only take place within a specific agricultural setting but also are influenced by political, social, cultural and economic conditions. This is reflected both in the success and failures of PROSCARP. However, it also influences the findings of the research and any ability to draw comparisons with other areas. The following chapters address the issues raised in this discussion.

Chapter 3 discusses the methods used in the research while Chapter 4 is an in-depth assessment of PROSCARP, the development project in Malawi. The relationship between development paradigms, outlined in this chapter, and the field project, PROSCARP, forms the basis of this research. The project is funded and managed by outsiders and initially had a very top down approach to development. However, the project has matured considerably bringing major changes, some of which incorporate aspects of the new development paradigm discussed earlier. This case study addresses a number of fundamental issues. The project runs on a nation-wide basis in selected areas. The size of the project is deliberately chosen to allow analysis of the problems and opportunities of a larger scale project. This is particularly relevant to the concepts of participatory development and the potential for incorporation of other aspects of the new development paradigm as highlighted in Chapter 1.

Chapter 5 examines farming livelihoods within the case study area. This allows the priorities of the villagers and the problems and opportunities within the village to be understood within the context of sustainable development. Development priorities within the villages are assessed. This chapter aims to understand the role of agricultural production and natural resource management within rural communities by the development of a framework to represent the complexities of rural livelihoods.

Chapter 6 analyses farmer adoption of techniques introduced by the development project, including the relevance and acceptability of the strategies promoted to the farmers. This builds on the previous chapter by investigating decision making strategies as well as the role and acceptability of the PROSCARP project in light of the rural livelihood strategies of the communities under study. This Chapter evaluates project technologies. The following two chapters are an assessment of project policies, which, in conjunction with the results of the research discussed earlier, are used to critically comment on the new approaches to development.

Chapter 7 examines the concepts behind farmer participation in development and analyses the current and potential contribution of participatory approaches to development to the success or failures of PROSCARP.

Chapter 8 evaluates indigenous or local knowledge by an analysis of local farming techniques and ethnobotanical knowledge. This chapter also examines the role of local innovation as a response to environmental stress.

The final Chapter summarises and discusses the findings of this research and the implications of this research in the context of the literature.

Chapter 3 Methodology

3.1. Introduction

As outlined in chapter 1, this research studies the contribution of an externally funded development project to the sustainability of local agricultural systems in Malawi, with specific reference to soil conservation techniques. There are two underlying hypotheses under examination. The first is that PROSCARP, as an example of a large scale externally funded development project, can promote sustainable agricultural development within the villages, reacting to the needs and priorities of the community. The second is that this can best be achieved through a bottom up or participatory approach to the development process.

This research focuses on the new development paradigm. In Chapter 1, two fundamental aspects of this development paradigm are identified. The first is the participation of the beneficiaries of the development process. The second is the role of local knowledge systems within local development strategies. The nature of the new development paradigm, in terms of its focus on bottom-up, locally appropriate development requires an understanding of the local environmental, social and economic factors within which both the farming community and the development project must operate. This research responds to the paradigm shift in agricultural development and examines soil conservation from a holistic perspective encompassing the concepts of sustainable rural livelihoods. This places the problems of soil erosion and conservation within the wider setting of the village or community and assesses the potential for natural resource management to be achieved within the wider development needs and priorities of the local communities. This approach requires a diverse set of research tools.

The historical basis of participatory development is evaluated in Chapter 7 but, in brief, appears to be a convergence of complimentary methods and ideals that have lead today to a strong subject area based around Participatory Rural Appraisal (PRA) or Participatory Learning and Action (PLA). This is a process whereby outsiders act only as facilitators, providing, through a range of techniques, a backdrop to which beneficiaries can analyse their own problems and procure solutions through group discussions with all interested parties within an area utilising a range of visual and verbal techniques (Pretty *et al*, 1995). This has evolved a new range of methods and tools. The data collection techniques used in this research are drawn from the "PRA toolbox". This chapter presents and critically evaluates the methods used to understand and analyse the system under study.

This research was based on a case study of the Promotion of Soil Conservation and Rural Production (PROSCARP) project in Malawi. The case study is used to provide a practical example of a development project operating under field conditions. It allows comparisons to be drawn between the project goals and the needs and priorities of the farmers. It also allows the approaches promoted in the development literature to be tested under field conditions. The role of participation, local knowledge and appropriate technology are examined. The focus of the research is subsistence farming communities, due to the failures experienced in these communities with little resources or access to credit. This drastically reduces their ability to use fertilisers, pesticides or improved seed varieties for their crops. Priorities of subsistence farmers can be very different leading to risk aversion farming strategies rather than increased production. In addition, the focus is on arable farming, as including pastoral communities would be beyond the scope of this research.

To accurately reflect the research aims set out in Chapter 1 the following criteria for the selection of an area to base the case study were chosen,

- a project that is already established and has soil conservation as a major part of its intervention;

- must be based on subsistence farming systems on poorer or agriculturally marginal land;
- be mainly involved with cropping systems; and
- the project must incorporate at least some of the new ideas on design and implementation of development projects, taking account of the participatory approaches to development.

Development organisations active in soil conservation projects for sustainable development were approached with the proposal (VSO, Oxfam UK, Concern UK and Ireland, Action Aid, and UNAIS). A shortlist of four projects was drawn up of which the PROSCARP project was chosen as it most closely matched the criteria set out above.

3.2. Site Selection

PROSCARP operates in what are termed sites or catchments. Some of the catchments correspond to the actual watershed but most do not. Each catchment can consist of one or several villages and vary immensely in size. The term site and catchment are used interchangeably to denote the geographical area of intervention of the PROSCARP project. The Ministry of Agriculture has divided the country into nine Agricultural Development Divisions (ADD). The location and boundaries of each of these is shown in figure 2.1. Salima ADD has the longest intervention by the PROSCARP project and the research was based in this region for this reason.

Site selection for this research was carried out with the help of Mr Julius Nkomaula of Salima Agricultural Development Division (ADD), Acting Senior Land Husbandry Officer, who is familiar with all of the sites in Salima ADD. Salima ADD is further divided into Rural Development Projects (RDPs) and Extension Planning Areas (EPAs). These divisions and their relevance to PROSCARP are examined in the next chapter, however it is noted here that all villages studied were within Salima RDP.

Two catchments were identified within Salima ADD. The first is Mbatamila within Chipoka Extension Planning Area (EPA). This site is one of the first sites to receive intervention from the PROSCARP project in 1989. Mbatamila lies on the lakeshore plain (See Figure 2.2). In the 1993 Nutrition Ranking carried out by ADDFOOD Mbatamila ranked 23rd out of 42 sites surveyed (1 = best nutritional status) (ADDFOOD Monitoring and Evaluation, 1993). The second site is Naluva within Tembwe EPA that consists of two villages, Chigoneka I and Chigoneka II (Figure 2.2). These two villages are more recent entrants to the PROSCARP project, in 1995, and are sited on more sloping land on the edge of the Rift Valley escarpment. The length of time that PROSCARP has been active in each village allowed comparisons of adoption rates and progress within the three villages researched.

Two villages that do not receive PROSCARP interventions were also included in the research. Sanga village is the neighbouring village in Naluva and Chifuwa village is next to Mbatamila (Figure 2.2). The purpose of the inclusion of these non-project villages is twofold. Firstly, this allowed the effect of the PROSCARP project to be identified clearly within the project villages by comparison to the non-project villages. Secondly, it identified the potential for the activities of PROSCARP to spread to farmers outside the direct area of intervention.

A pilot study was carried out at Kabululu site in Linga EPA (Salima ADD) to test the methods examined later. Several issues were highlighted and resolved during this pilot phase. These issues are discussed in the appropriate sections on the techniques used.

3.3. Research Issues

To carry out research in developing countries as a foreigner has attracted a number of concerns regarding problems of the role of the researcher, issues of language, and other ethical and practical problems. The following section presents the concerns highlighted in the literature and the way in which this research has sought to overcome them.

3.3.1. The Role of the Researcher

Many authors highlight the importance of determining the role of the researcher within the villages, specifically in terms of how the researcher is perceived in the village (Dixon and Leach, 1984; Sidaway; 1992; Mazzucato and Niemeijer, 1996). There are several aspects to this. Madge (1993) calls for consideration of the researcher's positionality (race, nationality, age, gender, affiliations and so on) as an influence on the data collected. As a result of the discussions in the literature a female research assistant / interpreter was employed as it appeared that this could also allow better contact with the female members of the community who might not be as open or relaxed with a male assistant.

There are also ethical considerations of research to respect the rights of the people studied. This includes the right of people to clearly understand the purpose of the research and how the results will be used. Based on this understanding people must consent to their inclusion in the research (Lockwood, 1992; Wilson, 1992; Erikson, 1995).

This research sought to respond to these concerns in a number of ways. Although this research was supported by the PROSCARP project, it was not undertaken for PROSCARP. This separation was intentional, as it was possible that the responses from the villagers in the study might have been influenced by any connection between the research and a development organisation or government organisation. There was no benefit in terms of monetary gain or influence with the project to the villagers from this research. At the end of the fieldwork a visit was made to each village to present the results of the data collection, both to verify its accuracy and to return the data collection and analysis to the villages.

The same approach was used in all the villages in the study. Initially the chief of the village was contacted and asked for permission to work in the village. Then a village meeting was arranged (through the chief). At this meeting, our presence and the purpose of the research were explained and the researcher and assistant were introduced to the village. The meeting then took the form of a question and answer session. Lessons were learned from the pilot village. The motorbike that was used for transport was easily identified with the PROSCARP project and it proved difficult to convince people that the research was independent of PROSCARP. In addition, the presence of an agricultural extension agent in the village during the meeting seemed to confuse the origins of the research. In each of the other villages alternative transport was arranged for the initial meeting as well as making sure that no other groups or organisations were represented in the village at the same time. Time was always taken after any meeting to allow people to ask any questions they might have. Informal walks around the village also proved a good place for people to come up and chat. At the end of each introductory meeting the villagers were asked whether they would be happy to be included in the study. In all of the villages consent was given. Permission was sought for each stage of the research especially for the questionnaire survey that happened towards the end of the research period. No problems were encountered at any point. The villagers seemed happy to ask about any part of the research that was not clear to them. In fact, there was a 100% response rate from the questionnaire survey.

3.3.2. Language and Interpretation

Although English is the official language it is rarely spoken outside the cities or tourist areas. The Chewa tribe is the largest in central and southern Malawi and Chichewa was the common language spoken by all the residents of the study area. Consequently, all of the fieldwork was conducted through an interpreter.

Initially a female interpreter was employed. After the pilot study several problems became apparent. The interpreter was from the capital city. Despite an excellent knowledge of English, she did not come from a farming community. Neither the men nor the women responded well to her. There were obviously issues of gender with the men. Also, due to her urban background there appeared to be issues with her clothing and behaviour. Apart from urban centres, it is still normal for women to wear long skirts (chitengies). Due to the mode of transport (motorbike) it was necessary to wear trousers and then wrap a skirt on top on arrival in the villages.

A local man, Mr Moses Likutche, with a good knowledge of agriculture and local conditions, and a very high standard of English was employed for the rest of the fieldwork. His knowledge of agriculture and excellent communication skills resulted in high levels of response and interaction from both the men and the women.

The potential for errors in interpretation and translation are well documented (Dixon and Leach, 1984: Devereux and Hoddinitt, 1992: Kapila and Lyon, 1994). To ensure maximum accuracy notes were taken during the meetings. The sessions were also recorded and each evening would be checked over for accuracy. Some of the recordings were checked for accuracy of translation by another Malawian. The questionnaire surveys were carried out by a small team of three. This was composed of the interpreter, a local schoolteacher and a local businessman. The first ten questionnaires were filled in with all three members of the team present to ensure the questions were understood and explained in the same fashion to each of the respondents. .

3.4. Data Collection

The integrated nature of natural resource problems is addressed by using a combination of methodologies. Data collection was split into two major areas, qualitative data and data collected through questionnaire surveys (quantitative).

3.4.1. Qualitative Data Collection

The methods used for the collection of qualitative data were based on methods developed through Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA). There has been a lot of debate in the literature about the use of the tools of PRA and RRA and use of the term PRA. One of the problems identified is the misuse of the term participatory (Chambers, 1994a; Chambers, 1994c; Backhaus and Wagachchi, 1995; Lane, 1995). Chapter 7 analyses the concepts and uses of people's participation in development, specifically in relation to the PROSCARP project. However, in terms of the methods used in this research it is necessary to understand the use of participatory methods in relation to PRA. PRA has been distinguished as an approach rather than a method (Chambers, 1997). PRA should enable local people to conduct their own analysis and often to plan and take action (Chambers, 1994a). This can mean radical personal and institutional change and shifts in power (Chambers, 1994a; Nelson and Wright, 1995). Again, each of these issues is raised in chapter 7.

This research was by nature extractive and therefore, despite the use of methods from the PRA toolbox cannot be considered PRA. The first phase of the research was based on the collection of qualitative data using methods that were chosen to allow the local realities and priorities to be understood. Participatory research tools have evolved from a variety of sources (Pretty *et al*, 1995). One of the most important aspects is the flexibility of methods, and the investigation and analysis of local conditions by the local people themselves using visual and verbal methods (Chambers, 1994a; Pretty *et al*, 1995). The methods sought to learn directly from the local people, thus offsetting any bias from pre-conceived notions of local livelihoods (Chambers, 1983; Chambers, 1994c). The role of the outsider is that of a facilitator. The methods developed as part of the PRA approach were, therefore, selected as they met the needs of this research. Each of the methods used is discussed here and the benefits and problems of each is presented.

The fieldwork was based on the need not just to identify levels of adoption or reason for adoption of PROSCARP interventions but also to provide information on the diversity and complexities of rural livelihoods.

A series of visits was held in each village. Most of the qualitative data were collected through group meetings. Large group meetings were held where anybody who came along was included. Turnout could be anywhere from 10 to 100 people. Smaller focus groups were organised for more specific requirements (men, women, the catchment committee (in project villages), female headed households and older members of the community). Semi-structured interviews were held with individuals that did not turn up at the village meetings to try to get as wide a representation as possible.

Information is grouped into:

- qualitative data collection within the villages;
  -collected using various different techniques from the PRA toolbox, and
  -collected more informally in semi-structured interviews and discussions during the meetings and with individuals,
- semi-structured interviews with relevant people outside the village setting.

The following section describes the data collection methods. The sources of information on each of these techniques came from the following authors, (Beebe, 1987; National Environmental Secretariat (Kenya) *et al* ,1990; Theis and Grady, 1991; Chambers, 1994a; Kapila and Lyon, 1994; Chambers, 1995; Gosling and Edwards,1995; Pretty, 1995; Pretty *et al*, 1995). Other sources, specific to a particular technique are cited in the appropriate places. The same techniques were used in each of the villages.

1. Mapping.

Village mapping was used to view the community from a spatial perspective. Village maps were prepared after an informal introductory session in the first group meeting in each village. Maps were constructed on the ground by village members using locally available materials. This method of mapping was preferred by the villagers who were not at ease with pencils and paper. The map was then photographed and transcribed onto paper. The map showed physical features of the village (slope, drainage and soils), environmental features (areas of soil erosion, vegetation), and infrastructure (roads, paths, buildings). The maps also identified areas with specific problems or potential for improved production (National Environmental Secretariat (Kenya) *et al*, 1990; Theis and Grady, 1991; Leach and Marsland, 1994).

The mapping exercise was of immense benefit within the villages. It provided a good overview of the each of the villages that helped reveal the physical opportunities and limitations. However perhaps the greatest benefit of the mapping exercise was that it was fun for both the villagers and the researchers and acted as an excellent icebreaker. It attracted the attention of all of the villagers and engendered a high level of participation of the villagers at each of the meetings. The maps themselves did not provide a high level of detail and were used as a reference point for the villagers and researchers, as well as allowing triangulation of other data collected, such as the transect walks.

2. Transect walks

A transect walk shows a cross section of the community and provides more detailed mapping information as well as verifying information collected in the mapping exercise (National Environmental Secretariat (Kenya) *et al*, 1990; Leach and Marsland, 1994). The numbers of transect walks carried out in each village varied depending on the number of production and ecological zones within the village. Mbatamila had a fairly uniform soil type and vegetation type with a 5% to 15% slope. Therefore two transect walks were carried out. Chigoneka villages had a much wider diversity with slopes up to 25% and four transect walks were carried out in each village to reflect this diversity.

The transect walks also attracted a lot of interest within the village and in most cases took a considerable amount of time as the problems and opportunities of the different areas passed through were discussed eagerly by the farmers along the route.

3. Seasonal Calendars

Seasonal calendars were constructed to show timing of cropping operations during the year and times when off-farm work was carried out. This allows peak periods for labour to be identified and indicates when labour shortfalls are likely to occur. The incidence of disease as a factor related to labour availability was also examined.

The construction of the seasonal calendar was quite a lengthy exercise. The results of this exercise were general results, not specific from each year. This was due to the fact that the timing of many of the operations was dependent on factors such as the arrival of the rains and the availability of labour, seeds and so on.

4. Trend lines

This exercise was attempted for trends in rainfall, population, land productivity and crop and input prices. It was carried out with smaller groups of 6 - 10 people, mostly older people to get a longer time frame. However, it proved very difficult to get a concept of time past four or five years. Hence, the information collected was more general in nature.

5. Wealth ranking / well being analysis.

The purpose of the wealth ranking was to identify what would be the priorities of a community, for example, what would be considered an improvement in standard of living. The focus groups were small groups of both male and female villagers. However, people were reluctant to discuss individuals or families so the results were again more limited to general ideas than specifics. The results were still useful in gathering an overall picture of the villages.

5. Identification and Ranking of Institutions

This exercise was specifically aimed at institutions that would be active in the village. This pointed to sources of information, information flows, and how the villagers perceive the usefulness of the institutions. This exercise was carried out at the larger group meetings to get as much input as possible from different groups within the villages. The resulting information highlighted some major differences between villages in terms of the numbers of institutions and the levels of interaction.

The people in the villages were very willing to talk about any outsiders coming into their village and the efforts they (or the institutions that they represent) make in terms of benefits to the villagers. Most villages also suggested institutions that they would like to see represented in their villages.

6. Venn diagrams

Venn diagrams were also used to identify the mobility of the villagers and their contact with other groups such as farmers. Again, this exercise was carried out in larger group meetings. One of the benefits of this exercise was to gain some understanding of the potential for transfer of techniques between villages.

7. Problem Identification and Ranking.

This was one of the most successful exercises. It was used to identify priorities of the villagers. It was carried out with large groups. This worked very well with all the people participating. As well as the discussions that took place about the ranking of the problems it also provided a forum where people discussed possible solutions to their problems as a group.

Concerns have been raised in the literature about the methodological soundness of these data collection methods. Chambers (1994c) and Pretty (1993) proposed several methods of verification and trustworthiness of the data. In order to address these concerns the data were verified as far as possible by the use of a number of checks. Results from different methods were compared as well as from different sources allowing triangulation of data collected. A number of group sessions were recorded and a person not directly involved in the research process checked the accuracy of translation and interpretation. At the end of each session the findings were outlined back to the participants who were then asked to verify the accuracy of the report. In addition, in each village a final meeting was held where an overview of the main findings and conclusions from the village was presented to the villagers. This final checking and correcting of the data by participants is seen by Pretty (1993) as a strong test. The data were discussed to ensure that they represented accurately the original views of the participants. In each village the results of each of the exercises were shown and discussed in turn. In each village some results from other villages were also presented if there was a difference. In each case the differences were explained by the participants. For example, there were differences in planting and harvesting dates in seasonal calendars constructed in the villages. This was due to the arrival of the rains that were intermittent for several weeks on the lakeshore plain while much heavier in Naluva catchment. Therefore, the crops were planted earlier in Naluva. The villagers were quite vocal in the final meetings. In Mbatamila one man asked to keep a copy of all the exercises. He felt they might be of use when talking to PROSCARP staff. In each village copies were made of the results from that village. They were given to members of the catchment committee. In Mbatamila village and Chigoneka II the farmers asked if a copy of this research could be given to PROSCARP. The questionnaire survey was also used to verify any information that could be verified using quantitative methods.

3.4.2. Quantitative Data Collection

The questionnaire surveys were carried out after the participatory data collection. The aims of the questionnaire survey were:

- Provision of more detailed information on farming systems;
- Triangulation of findings from the participatory data collection;
- Measurements of baseline socio-economic conditions;
- Understanding of differences within the village at household level; and
- Provision of details of adoption of PROSACRP interventions.

Table 3.1 gives an overview of the research sites and the number of questionnaires completed.

Village Name	Project Member	Population (Households)	Number of questionnaires	Percentage of Households surveyed
Mbatamila	yes	385	53	13.8
Chigoneka I	yes	96	39	40
Chigoneka II	yes	75	32	42.6
Sanga	no	250	55	22
Chifuwa	no	400	52	13
			total 231	

Table 3.1 Details of the five villages studied and the questionnaire surveys.

Preliminary analysis of the qualitative data was carried out in the field. The questionnaire was used to build on the qualitative information as well as providing some baseline socio-economic data that was not otherwise available.

Sampling strategy used for the selection of respondents was linear transect sampling, a tool of Participatory Rural Appraisal (Gosling and

Edwards,1995). The surveyors would start at the central point of the village (the chief's house) and walk to the village boundary. The head of household of each parcel of land that was crossed was interviewed. There are issues of choosing the most suitable respondents for a survey (Dixon and Leach, 1984; Kapila and Lyon, 1994). As each family or household is allocated land by the chief of the village, it was appropriate to use the household as the element about which the data was collected. The person mainly responsible for decisions about agricultural production was identified as the respondent within that unit. This was to take account of the fact that some men work away from home. In this situation the spouse was chosen as the respondent. If sons or daughters had a separate household within the same plot of land they were only interviewed if the land had been divided to take account of this. The same approach was successfully taken by Kanyama Phiri *et al* (1994) using similar methods. A sample questionnaire is provided in Appendix 1.

3.4.3. Information Collected From Other Sources

Information was collected from a wide variety of sources to provide specific information. Table 3.2 outlines the individuals and organisations interviewed.

These interviews provided information about the project itself as well as research into the specific techniques that the project is promoting. Also, issues external to PROSCARP, such as the availability of credit for smallholder farmers, prices of inputs, farmgate prices of cash crops, and other information that was considered relevant to the research was gathered.

3.5. Data Analysis and Presentation

Information collected through each of the participatory methods was collated. Comparisons were made between results obtained in each of the villages

Semi-structures interviews held with:	Subjects covered:
PROSCARP project staff	All aspects of project management and implementation
Government agricultural extension service employees	Extension services provided by Ministry of Agriculture
Malawi Rural Finance Company	Availability of and eligibility for credit
Agricultural Development and Marketing Corporation (ADMARC)	Prices of inputs (fertilisers, pesticides) and buying price of cash crops purchased by ADMARC
Chitedze Research Station	Current on station research into agroforestry and cash/food crops
Bunda College of Agriculture	Academic research carried out within Malawi
Malawi Agroforestry Extension Project (MAFE)	Agroforestry species used, problems and opportunities
Ministry of Agriculture and Livestock Development (MoALD)	Government policy on natural resource management and soil conservation
Land Resources and Conservation Branch (LRCB) of the Ministry of Agriculture	Government policy on natural resource management and soil conservation

Table 3.2: Semi structured interviews held outside the villages

and between different focus groups within the villages. This enabled evaluation of the priorities and needs of the villagers as well as identifying the major obstacles to sustainable production. Discussion with the farmers about the project also allowed analysis of the problems and successes of the project as felt by the beneficiaries.

The questionnaire survey generated general socio-economic data as well as more specific information about project uptake and techniques adopted. Comparisons were made based on an analysis of correlations and cross tabulations of data. This information is used both for triangulation of findings from participatory data collection and to provide more in-depth analysis of key areas identified from the group meetings. Statistical analysis of data from the questionnaire survey was carried out using SPSS 9.0 for Windows. Analysis of food security factors was carried out to determine whether geographical location or PROSCARP intervention caused a significant difference. The characteristics of the head of household and the farm were analysed to identify possible correlations between these characteristics and adoption of PROSCARP technologies.

Overall the methods used for the qualitative data collection provided in-depth information about all aspects of rural livelihoods within the village. The farmers involved in the research responded very well to these methods and were both interested and very capable of analysing the problems within the village.

This chapter has outlined the various methods used for this research. Where appropriate the methods are more fully explained where the results are used. The fieldwork component of the research was carried out between September 1996 and June 1997 in Malawi.

Chapter 4 The PROSCARP Project

4.1. Introduction

PROSCARP is the "Promotion of Soil Conservation and Rural Production programme". It is funded by the European Union (EU) and operates in conjunction with the Ministry of Agriculture and Livestock Development (MoALD) of the Government of Malawi. This chapter presents the background, aims, objectives and implementation strategies of the PROSCARP project. This allows the response of the PROSCARP programme to the many development problems faced by Malawi, discussed in Chapter 2, to be understood. This evaluation of PROSCARP is based on information from project reports as well as interviews with PROSCARP staff at all levels. Farmer evaluation of the PROSCARP project is presented in the following Chapter. Evaluations of PROSCARP have been carried out within the project and by EU consultants and are also examined. .

4.2. Background to PROSCARP

The EU has been funding a rural development programme in Malawi since 1989 (Government of Malawi/ European Union, 1995). Since the beginning of the programme it has changed in both name and focus several times. This section investigates both the impetus for change and the changes themselves. A later analysis of the priorities of the project beneficiaries identifies whether the change in project focus and techniques responds to the concerns of the beneficiaries.

4.2.1. ADDFOOD

The European Development Fund (EDF) funded rural development projects in Salima ADD up to 1989. At this time a review of the support given to Salima ADD raised concerns about the effectiveness of the current strategies for smallholder farmers (Government of Malawi/ European Union, 1995). A review of the problems of the nation's smallholders identified chronic food deficiency as a major concern. An important issue in this problem was the need for smallholders to undertake "ganyu" work (Ministry of Agriculture, 1993). Ganyu is employment for cash, food or other payment in kind. It often takes the form of farm work, such as weeding and planting for larger farmers. Due to the agricultural nature of ganyu work it takes the farmers away from their own land at the time they need to till, plant, and weed. They are unable to produce enough from their own land to see them through the following season without again seeking ganyu work. A project was initiated in 1989 funded by the EU to address these concerns. It was known as the ADD "food for work" programme (ADDFOOD).

ADDFOOD began as a food and inputs for work programme, providing a basic package of food maize, improved hybrid maize seed and fertiliser to the farmers.

The emphasis of ADDFOOD changed in the 1990/91 season towards land husbandry, soil conservation and agroforestry with the goal of sustainable farming systems (Ministry of Agriculture, 1993). Initially the project objective was to target the poorest households in each site, for example female-headed households. Targeting of specific households was abandoned due to conflicts caused within the villages because of this (Ministry of Agriculture, 1993).

Sites were selected through factors of soil degradation, farmer interest and the general level of poverty, with all farmers within a site involved (Ministry of Agriculture, 1993). A public health component was added in 1991.

The strategies used were:

- Increased use and profitability, overall, of hybrid maize, hybrid sorghum and fertilizer through the adoption of alleycropping associated with soil and water conservation;
- Provision of inputs and technical assistance for agroforestry technologies and for land husbandry and soil conservation measures;
- Provision of free food maize in selected sites to allow farmers to stay on their land for critical farming operations, especially to carry out

project promoted land husbandry and agroforestry operations (23 kg of maize per person for four months in pre harvest season). New sites in 1993/94 do not receive this and sites with well-established hedgerows received a reduced amount;

- Construction of protected shallow wells and sanitary platforms for latrines to improve health conditions in the ADDFOOD sites;
- Establishment of committees to organize project activities within each village.

4.2.2. PAPPPA

The next phase of the programme was known as PAPPPA, the Poverty Alleviation Programme Pilot Project Agroforestry. This was an intermediate phase between ADDFOOD and PROSCARP. During this phase project activities continued on from ADDFOOD with main changes being:

- Removal of food maize and fertiliser as incentives (this component was phased out during the ADDFOOD phase);
- Introduction of Vetiver Grass *Vetivera zizanoides* for marker ridge stabilisation;
- Introduction of minimum tillage trials on farm.

4.2.3. PROSCARP

The Promotion of Soil Conservation and Rural Production (PROSCARP) is the current phase of the project.

The aim of the project up to and during the PROSCARP phase was to "*develop strategies for use by resource poor farmers to tackle problems of poor food security caused by declining soil fertility*" (Government of Malawi/ European Union, 1995). The project goals are now stated to be;

- the wide scale implementation of agricultural extension strategies for the promotion of smallholder farming systems that can sustain food production;

- increased use and profitability, overall, of hybrid maize, hybrid sorghum and fertiliser through the adoption of alley cropping associated with soil and water conservation;
- proven technical strategies and packages for increased food production and security;
- improved nutrition and public health.

(Government of Malawi/ European Union, 1995).

These goals reflect both the wider problems of natural resource management combined with the national need to increase crop production in the smallholder farming sector. They are directly in line with the national agricultural objectives of the Ministry of Agriculture (Government of Malawi / Ministry of Agriculture and Livestock Development, 1994) outlined in chapter 2. The success of PROSCARP in achieving these goals in the study area is examined later. The current strategies used to achieve these goals are examined in detail in the next section.

The expansion of the programme since the initial 4 sites in Salima ADD in the 1989/90 season has been quite rapid. It has spread to all ADDs within the country. The planned expansion until 2001 is of a much greater magnitude as shown in figure 4.1.

This expansion is the result of a decision to turn the project into a nation-wide programme to combine poverty alleviation and natural resource conservation (Government of Malawi/European Union, 1995). This research attempts to answer, in following chapters, whether this expansion is appropriate in terms of the perspective of farmers already involved in the project, as well as the more practical issues of resources available for project activities. The adoption by farmers of the project techniques and the potential for project benefits to be continued after the active life of the project are of great importance when considering this rapid expansion. Expansion can be seen as a result of two outcomes. The first is that the project expands to the point where all smallholder farmers have access to the information and technologies promoted by the project. The second outcome would rely on

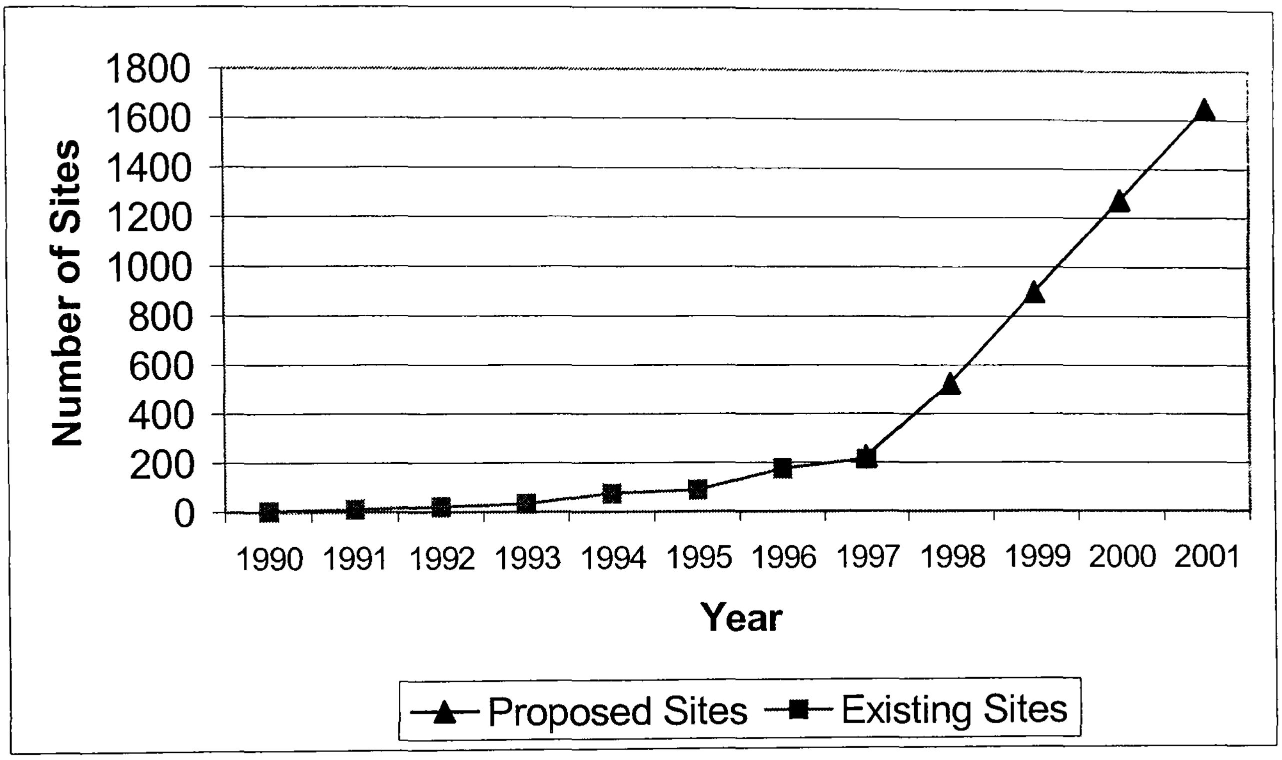


Figure 4.1; Expansion of PROSCARP by Number of Sites to Date and Proposed New Sites (Source; adapted from; Government of Malawi/ European Union, 1995; Government of Malawi/ European Union, 1998).

the project acting as an example and relying on diffusion of project benefits outside direct project intervention. Neither of these outcomes is specified in project documentation and the relevance of either or both is examined in later chapters. In either case the success of the project techniques and benefits is assumed. The response of the smallholder farmers in this research is used to assess both the opportunities and problems felt by the beneficiaries, as well as the effect of the project in non-project neighbouring villages.

4.3. Soil Conservation

The benefits from the PROSCARP project are recognised as dealing with two operational timescales. The soil and water conservation component of the project, if successful, will only really provide benefits in the medium to long term, whilst sanitary measures, improved planting materials and the provision of safe drinking water will have more immediately obvious benefits (Government of Malawi/ European Union, 1995).

Soil conservation activities promoted by PROSCARP can be divided into physical and biological conservation measures.

4.3.1. Physical Conservation Measures

The first line of defence against soil erosion is contour planting. This involves the marking out of contour ridges with an A-frame, followed by construction of the marker ridge and re-alignment of the ridges in between. Full details of the A-frame are provided in Appendix 2. Construction of tied cultivation ridges is a once off operation with the same marker ridges kept in place from season to season. Vetiver grass *Vetivera zizanoides* is planted on marker ridges and on the edges of gullies to stabilise the soil.

4.3.2. Biological Conservation

4.3.2.1. Alleycropping

In the ADDFOOD and PAPPPA phases of the programme alleycropping was strongly promoted. This involved planting the marker ridges with agroforestry species, mainly *Leuceana leucocephela* and *Senna spectablis. Sesbania sesban, Glyricidia sepium* and *Tephrosia vogelii* are also used depending on the availability of the seeds. These species should provide both direct (nitrogen fixing) and indirect (production and application of biomass) benefits to soil fertility. They also help to stabilise the marker ridges.

However, major problems were reported with establishing and maintaining the high densities of trees required for alleycropping. *Leuceana leucocephela* is prone to termite damage, browsing by livestock and has problems of non-germination of direct seeded seeds (Leach and Marsland, 1994). Establishment rates for *Senna spectablis* were very low. In a study of Namwini Village (Machinga ADD, See Figure 2.1) Leach and Marsland (1994) found that this was attributed to a combination of factors including failed germination, poor seed preparation, incorrect planting depth, drought, and potentially some vulnerability of the species to soil type and run-off (Leach and Marsland, 1994).

As most of the small farmers were unable to establish viable numbers of these species on their land PROSCARP is moving away from a strong focus on alleycropping. Although they still support sites where alleycropping has been established, PROSCARP is now promoting an approach called "trees on farms" (Government of Malawi/ European Union, 1997).

4.3.2.2. Trees on Farms

This is the establishment of multipurpose trees at much lower densities (1200 trees / ha as opposed to the 5000 – 7000 trees per ha required for alleycropping hedges). Trees or shrubs that are currently receiving attention are:

- *Glyricidia sepium*
- *Jatropha curcas Linne*
- *Moringa oleifera*
- *Acacia polyacantha*
- *Tephrosia vogelii*
- *Sesbania sesban*

(Government of Malawi/ European Union, 1997).
More details on each of the species is given in Table 6.2 (Chapter 6).

Jatropha curcas Linne is of particular interest to the project as a potential source of alternative income for smallholder farmers. It is a small shrub that produces an oil seed with 25% extractable vegetable oil. It grows in marginal conditions of rainfall and low soil fertility and has become naturalised in Malawi (Wegmershaus and Oliver, 1997). The oil has several potential uses. The first is as a replacement for animal tallow used in soap manufacture. The second use is not yet commercially viable. The oil can be used as an alternative fuel for motorised vehicles adapted to use a "multifuel" engine. Although this engine has been patented in Germany, it is not yet commercially manufactured (Wegmershaus and Oliver, 1997). Other uses include pesticides, fertiliser and a replacement for paraffin oil. PROSCARP is focused on *Jatropha curcas Linne* in the hope that *"remote communities could produce their own cooking and engine fuel by simple extraction of Jatropha curcas Linne"* (Government of Malawi/ European Union, 1997, p18). PROSCARP is promoting the growth of *Jatropha curcas Linne* in all project sites and will buy any seeds produced (Government of Malawi/ European Union, 1997).

Moringa oleifera is a multipurpose tree from which high quality cooking oil can be extracted from the seed. The leaves, pods and flowers of this tree can be used as a vegetable food source. It is leguminous, thereby increasing soil fertility. Moringa grows well below 1500 metres throughout Malawi (Bunderson *et al*, 1995; Government of Malawi/ European Union, 1997). Again PROSCARP purchased seed produced by farmers in the 1997/98 season and will be promoting this tree in project sites.

Acacia polyacantha can be direct sown and is a fast growing species. It is leguminous and provides good fuelwood and fodder as well as hard wood useful for building and tool making (Bunderson *et al*, 1995). PROSCARP is mainly promoting this species for live fencing (Government of Malawi/ European Union, 1997).

Tephrosia vogelii is promoted by PROSCARP for improved fallows of 21 months. This involves undersowing the maize crop with Tephrosia in February of a growing season and in October of the following year this species is cut at ground level and the residue left on the ground (Government of Malawi/ European Union, 1997). This will increase soil fertility both through nitrogen fixing by the (leguminous) shrub and by the residue after the crop is cut. PROSCARP is also investigating the potential to extract Tephrosin from the seeds as a marketable insecticide (Government of Malawi/ European Union, 1997).

Although *Sesbania sesban* is noted by Bunderson *et al* (1995) as being easy to establish, PROSCARP has had problems of establishment and are not currently promoting *Sesbania sesban* but are working on the problem (Government of Malawi/ European Union, 1997).

The above tree species, which will be strongly promoted by PROSCARP, have a variety of uses. There is some potential here for cash income from the sale of *Jatropha* products. There are very limited alternatives for smallholder farmers to obtain cash other than through the sale of crops. Therefore, alternative cash crops may be of great benefit to the farmers. However, it would be necessary for a market for such products to be in place and a demand for the product established. This is not the case now. The potential for the project to provide an alternative source of income to the farmers could provide an alternative to the need to show project benefits through increased yield of crops from biomass.

4.3.2.3. Systematic Interplanting with *Faidherbia albida*

Faidherbia albida is an indigenous tree that loses its nitrogen-rich leaves during the rainy season, improving soil fertility and allowing crops to grow beneath the canopy with increased yields (Bunderson *et al*, 1995). Planting of this tree has been promoted by PROSCARP since 1990. The demand for *Faidherbia albida* is high from the farmers despite problems of seedling establishment and the relatively slow growth rate (7 – 10 years)(Leach and Kamangira, 1996).

4.3.2.4. Vetiver Grass

Vetiver Grass (*Vetivera zizanoides*) has become a principal component of the PROSCARP soil conservation strategy (Leach and Kamangira, 1996). The final goal of the vetiver program is the establishment of vetiver hedges along the marker ridges in all catchments. Vetiver should be planted in the furrows on the topside of the marker ridge to form a thick hedge. This stabilises the marker ridge and provides a barrier to prevent soil loss through runoff (Bundeson *et al*, 1995). To achieve this PROSCARP needs sufficient planting materials. In 1995/96 PROSCARP started the process of setting up a network of vetiver nurseries contracted out to estate farms, commercial farms and at catchment area levels (Government of Malawi/ European Union, 1995). The farmers in the PROSCARP sites are paid to establish and maintain Vetiver nurseries for the multiplication of Vetiver.

4.3.2.5. Minimum Tillage

Minimum tillage trials were introduced by PROSCARP in conjunction with the Malawi Agroforestry Extension Project (MAFE) in the 1996/97 season in 195 demonstration sites. Minimum tillage is an alternative to the ridge planting that is used throughout Malawi. The main component of minimum tillage is the crop residues that are never removed. This provides continuous soil cover that is a major component in the reduction of soil erosion as demonstrated in Chapter 2. The goals of minimum or reduced tillage promoted by PROSCARP are:

- Maintaining ridges in the same position every year;
- Sowing of successive crops on exactly the same planting lines as the preceding crop;
- Careful placement of crop and weed residues as a vegetative blanket on the soil surface to protect it from raindrop action and desiccation by the sun while reducing the effect of wind erosion;
- Elimination of the practice of burning crop residues;
- Punctual manual control of small weeds to ensure that they do not seed (Government of Malawi/ European Union, 1997).

The minimum tillage trials are based on the successes and lessons learned from this technique in Zimbabwe (Oldrieve, 1993). The origins of the success of minimum tillage in Zimbabwe appear to be commercial or estate farmers (Oldrieve, 1993). Planting crops on ridges is the common cultural practice in Malawi. A move to minimum tillage would require a major change in local farming practices. One of the concerns of minimum or zero tillage is the control of weeds. Under this trial the control of weeds is based on manual removal of weeds before they seed. One of the study villages in this research had a minimum tillage trial set up by PROSCARP. The

understanding, potential relevance, and acceptability of this technique to the farmers in the village was examined in depth and the results presented later.

Evaluations of these physical and biological conservation techniques carried out within or on behalf of PROSCARP are detailed in section 4.6. The relevance and acceptability of these techniques to the farmers in the study sites for this research are detailed in later chapters.

4.3.3. Crop Diversification

During the ADDFOOD phase of the project, food maize, improved hybrid maize seed and fertiliser were distributed to the farmers. This was intended to allow the farmers to remain on their farms rather than have to undertake ganyu labour. It was also conditional on the implementation of the technologies promoted by the project. This was abandoned for new sites in 1992. This was due to concerns about the long-term impact of incentives on the sustainability of the project. The 1994 Beneficiary Assessment Study (Leach and Marsland, 1994) found that there was a problematic relationship between the success rate of the farmers in implementing PROSCARP technologies and the level of maize dependency. Less successful farmers would withdraw from the project entirely if the free maize was withdrawn. This study concluded that the long-term success and sustainability of the project was likely to be greatly enhanced by the more active participation of the farmers in the project rather than by the use of incentives (Leach and Marsland, 1994).

In 1995/96 there was a large-scale issue of composite maize seed and other planting materials (sorghum, legumes, cassava cuttings and sweet potato vines) as part of a crop diversification scheme. The rationale behind this is a response to the local shortage of promoted seeds and planting materials (Government of Malawi/ European Union, 1995). This seed distribution was to assist farmers with composite maize so that a cheap source of better seed would be available for several years as well as increasing the range of crops grown for improved nutrition and soil improvement. The farmers have to repay either in cash or in kind, plus 20% interest (Government of Malawi/ European Union, 1995). PROSCARP will encourage local multiplication of seeds as an income generating activity. The eventual aim is for all the households to have access to promoted planting materials through local growing and storage of seed.

Leach and Kamangira (1996) found that the seed repayment policy was confused for the 1995/96 season and that repayment of seeds did not appear to be very high (Table 4.1).

	Maize	Pigeonpea	Sorghum	Soya	Groundnut	Cowpea
% of farmers able to repay seeds	53 %	15 %	16 %	17 %	9 %	38 %

Table 4.1: The percentage of farmers able to repay seeds distributed by PROSCARP in the 1995/96 season (Source; Leach and Kamangira, 1996).

In the Annual Work Programme for 1997/98, the purchase and distribution of crop seeds of composite maize, improved sorghum, groundnuts, pigeon pea, soybean, cowpea and short season root and tuber crops were planned. However, this is stated to be to "*retain the interest of the farmers in the soil conservation and agroforestry interventions which are slow to provide tangible benefits*" (Government of Malawi/ European Union, 1997). There is no mention of the repayment options or interest. This pointed to the need to investigate the attitude of the farmers towards this aspect of the project. The results of this are presented in later chapters.

4.3.4. Water, Sanitation, Health and Hygiene

This component of the project consists of the following;

- Provision of protected drinking water points;

- Sanitation in the form of the digging of pit latrines and the construction of sanitary platforms (sanplats) to cover them;
- Help and training on nutrition and household hygiene.

This water component of the project is implemented by the Ministry of Health and Population (MoHP) and the Ministry of Irrigation and Water Development (MoIWD) with funds allocated by the PROSCARP project. A limited food and nutrition component is implemented by the Farm Home Assistants (FHAs) of the ADD Women's Programme (Government of Malawi/ European Union, 1995).

These components of PROSCARP were included to increase labour supply. Labour was diverted away from agricultural production due to ill health and time demands of water collection. The provision of a safe water supply had other less predictable benefits. It was highly appreciated by the beneficiaries and thereby increased the credibility of the project (Government of Malawi/ European Union, 1995).

The water and sanitation component of the project is based on the active involvement of the communities. They contribute resources of time, labour and materials such as sand, gravel, and bricks. However, there are other resources that a community might find difficult or impossible to provide. Pumps installed on protected wells are provided by PROSCARP but pump maintenance can be a problem. The project has attempted to train two community members to maintain each pump. Some repairs are beyond the capacity of communities to undertake and a supply of spares is necessary. The casting of sanplats needs cement and reinforcing wire that the project feels that individuals would not be able or willing to pay for (Government of Malawi/ European Union, 1995). Both of these issues have long-term consequences. If PROSCARP stops its activities in a community (or the project finishes entirely) then there must be a way to get spares for pumps and other resources. As these aspects of the project are implemented by the MoIWD and the MoHP, they must be able to continue to support communities with technical and resource inputs.

Again, further examination of this component in the study villages is presented in later chapters.

4.4. Research

Research carried out both within Malawi and outside is of great importance to the PROSCARP project given the often trial basis of species introduced. Research on agroforestry species, their uses and limitations is used by PROSCARP to determine the most appropriate species for the farmers in the project.

Research on agroforestry can be divided into three main sections.

1 Research carried out informally by smallholder farmers on an on-going basis,

2 Formal agroforestry research conducted by the Government Department of Agricultural Research, The Forestry Research Institute of Malawi (FRIM), the University of Malawi (UNIMA) and by the SADC/ICRAF team;

3 On farm research is carried out by the Malawi Agroforestry Extension Project (MAFE) and PROSCARP within the extension system of the MoALD. NGOs such as Action Aid and the Christian Service Committee also carry out smaller on farm research.

Research carried out by farmers themselves does not appear to receive any formal recognition by the project. Many authors recognise that innovation and experimentation by smallholder farmers can provide intelligent and locally relevant solutions to farming problems (Richards, 1985; Chambers *et al*, 1989; Scoones and Thompson, 1994; Reij *et al*, 1996). Indigenous knowledge and practices in the study area are investigated in Chapter 8 to determine the extent or significance of locally developed solutions to problems of agricultural production and conservation of natural resources.

A review of formal agroforestry research carried out in Malawi was undertaken in 1995 (Hoekstra *et al*, 1995). Banda (undated) found that the use of *Leucaena leucocephela* and *Glyricidia sepium* for biomass may not produce optimal yields. The use of inorganic fertilisers, although no rates of application are specified, will still be required to produce the optimum yield. The use of biomass may be sufficient to sustain soil fertility but only if yields of biomass are at the levels produced on station trials. The yields have not yet been replicated on farm.

Research on *Faidherbia albida* (formerly known as *Acacia albida*) under traditional management practices in Malawi showed significant positive effects of local and hybrid maize yields under the tree canopy (Saka *et al*, 1994). There were limitations to this study due to its on-farm nature. The results of this back up research on *Faidherbia albida* in other countries in Africa, which suggest that observations of increased crop yields are consistent (Young, 1997). *Faidherbia albida* is valued by farmers in the semi arid zone of West Africa, Senegal and Ethiopia among others (Young, 1989).

The on-farm minimum tillage trials carried out by MAFE and PROSCARP are designed by these organisations and implemented by the farmers under the instruction of project staff. The objectives of the research are to carry out on-farm trials of reduced tillage to compare with annual ridging practices. Also, these trials will act as a demonstration on soil conservation, grain legumes and agroforestry practices. The trials include agroforestry and soil conservation practices with legume rotations. One of the major benefits aside from the expected result of higher yields and better soil and moisture conservation is the lower labour demands made by not ridging the land each season. Results from these trials are not yet available as ridging was carried out in the first year and reduced tillage did not begin until the 1997/98 growing season (MAFE / PROSCARP, 1998).

Chapters 7 and 8 analyse farmer participation and indigenous knowledge. Issues of research carried out on-farm and farmer research are discussed in detail in these Chapters.

4.5. Implementation

The project is implemented on a catchment basis. Therefore, the first beneficiaries are supposedly the participating families in these areas. The project anticipates secondary beneficiaries being the local community in the selected catchment areas, and in some cases members of neighbouring communities (Government of Malawi/European Union, 1995).

The selection of the project's operational areas and beneficiaries is "based on a combination of socio-economic criteria and land suitability criteria" (Government of Malawi/European Union, 1995). These criteria do not appear to be recorded anywhere and project staff were unable to state what they were.

PROSCARP operates within the extension system of the MoALD. The staff of the MoALD are funded by PROSCARP to carry out the extension work of the project. Figure 4.2 outlines the basic structure of the MoALD in relation to the two project sites involved in this research. It can be seen from this figure that the system has a very top down structure.

This external funding of MoALD extension agents to carry out PROSCARP work can be positive on the basis that the extension agents are fully briefed on agroforestry and soil conservation measures which can be passed on to non-project villages. However, logically there would seem to be a negative side associated with the amount of time spent by an extension agent within PROSCARP sites. PROSCARP has more funding and resources available for agricultural development within their sites. Therefore, the same extension agent would have less time left for other non-project villages within his or her area, which obviously leaves these villages at a disadvantage.

The project funds Ministry of Agriculture field workers (extension agents) for the actual extension work but directly employs staff (Malawians, VSO's and some expats) at management level for the running of the programme.

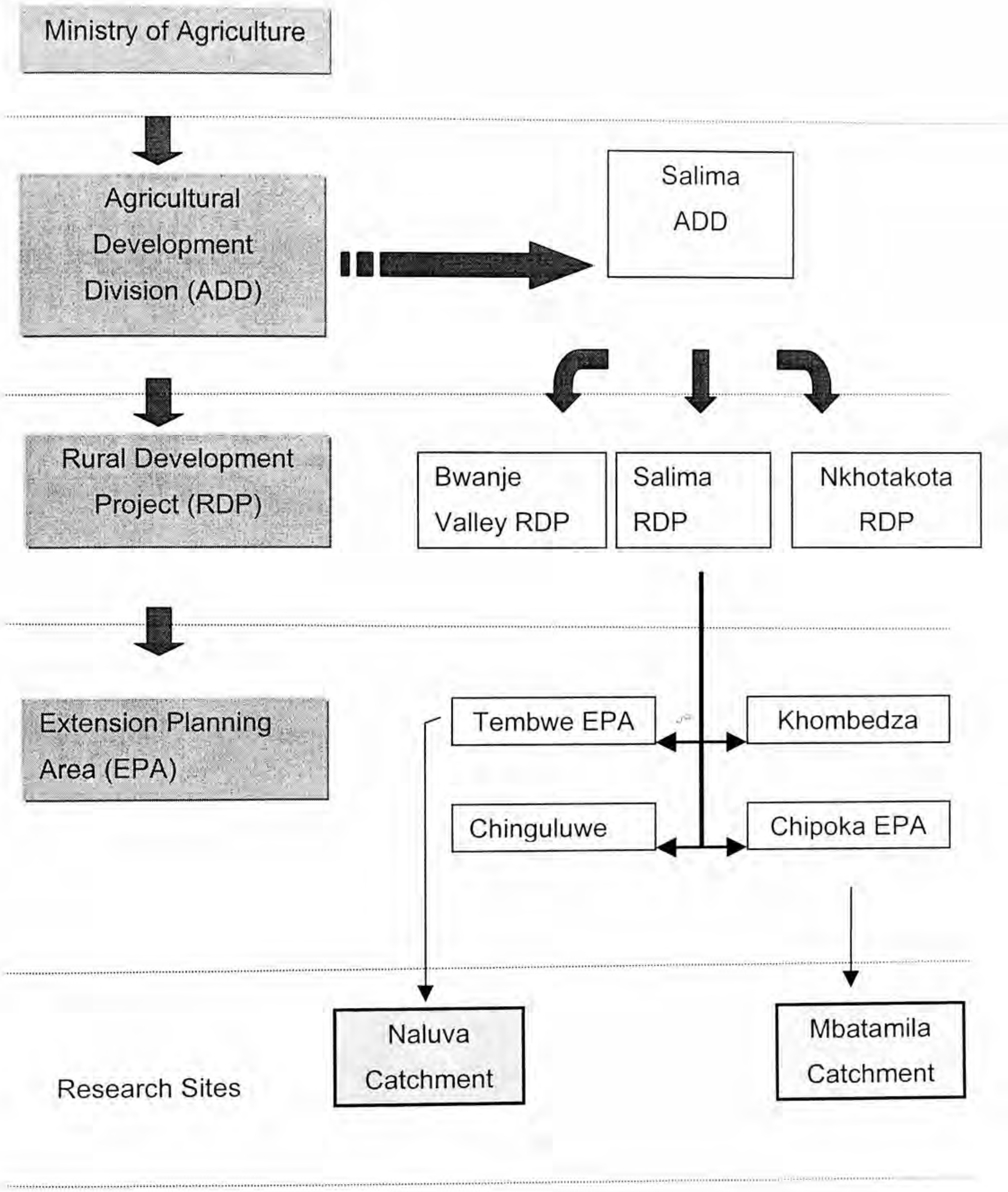


Figure 4.2: The divisions of the Ministry of Agriculture and the position of the two research sites. (The arrows represent the direction of control, information and resource flows)

The project manager, with whom all funding and management decisions rested was British. A new project co-ordinator was appointed in 1997. He is a Malawian working within the Land Resources and Conservation Branch (LRCB) of the MoALD.

Again, the benefits of this are closer co-operation and information exchange between PROSCARP and other organisations. However, the project co-ordinator is now responsible for PROSCARP as well as one other project outside of his work at the LRCB.

The project is not attempting to cover every smallholder. Sites, known as catchments, are selected in each district. It operates in each agricultural district (ADD) of the country. Some of the catchments correspond to the actual watershed, most do not. Each catchment can consist of one or several villages and vary immensely in size. The potential for the project benefits to spread to neighbouring communities is investigated later in the thesis.

Each catchment has a Catchment Committee (CC), some set up by PROSCARP, others use existing committees. They consist of three to seven members and are re-elected roughly every three years. The CC in conjunction with the FA is supposed to formulate a Catchment Area Development Plan (CADP) to determine the activities and technologies required in the villages. The CC is trained in the use of the A-Frame and other project techniques. Over a period of time the CC is supposed to become self-sufficient in the running of most of the project techniques. The eventual aim is to have each village totally self-sufficient (after a period of three years for existing sites).

The project appears to be constantly trying to introduce new interventions which include; planting of Vetiver grass on contours, undersowing and intercropping, planting of legumes, establishment of nurseries for agroforestry species and Vetiver. The newest intervention is minimum tillage, a technique imported from Zimbabwe. The interventions are carried out on an experimental basis in the actual villages. Logically, these trials could cause quite serious problems if they are not successful, for example if a farmer plants his maize crops in alleys between agroforestry species that are prone to termite attack then he or she may lose most of their crop.

The project has finished its first five-year period and has got funding for a further five years from the EU. The proposal was for a ten-year funding period to expand the programme to become nation-wide. Only five years have been promised 1996-2001. There are efforts being made to phase out the complete project control in catchments already in operation. Catchment committees are expected to be able to take-over the day to day running of the work in progress in each catchment. This would include the training of the farmers in marking of contours, planting and maintenance of agroforestry species, as well as running nurseries.

This research was carried out within the Salima RDP (Rural Development Project), which is divided into four EPAs (Extension Planning Area)(See Figure 4.2). The Ministry of Agriculture defines these. There are 12 catchments in Salima RDP. All of which are separate and quite distant from each other. The number of catchments grows each year, although Salima ADD is not planning any more expansion until other ADDs are more fully covered.

The time sequence of implementation of project activities for the first two years is suggested by the project as follows; (Government of Malawi/European Union, 1995)

1st year	Beginning of soil and water conservation activities
	Education on sanitation and hygiene
2nd year	Focus on soil improving activities
	Provision of sanplats and drinking water

4.6. Project Evaluation

4.6.1. Monitoring and Evaluation Unit

The project has a monitoring and evaluation (M&E) unit responsible for all aspects of project appraisal. As part of the monitoring programme, Beneficiary Assessment Surveys were carried out in 1993, 1994 and 1996. The 1993 report concluded that;

- The agroforestry message was well understood by the majority of participants but benefits have only been realised in few sites.
- Livestock control was necessary where agroforestry species prone to browsing were grown *(Leucaena Leucocephela).*
- The success of the project is both a social and technical problem, therefore, village level participatory planning and follow up discussions are important for designing appropriate interventions, retaining interest and solving problems
- The benefits of land husbandry interventions (contour ridging) have been felt by participating farmers
- Free maize was a strong incentive to participate, however, newer sites have less need of the incentive, although it might be justified in food deficit villages
- Knowledge of ADDFOOD activities has been found outside project sites however, spontaneous adoption has not occurred as the farmers need the advice of extension workers to start the new methods

The overall message of this survey was the requirement for more participatory planning in recognition that the top-down extension approach does not encourage a sense of project ownership among the farmers. This was especially true of the issue of free maize, which was seen to encourage dependency on the project and to possibly reduce the long-term sustainability of the project (Ministry of Agriculture, 1993).

The 1994 survey showed that attempts had been made to solve some of the problems arising from the 1993 survey. Again, the agroforestry message was well understood. A new strategy training of FAs and farmers in soil and water conservation activities rather than just imparting instructions was started. The motivation behind this is to put the technology in the hands of the local people, thus enhancing self-reliance. The project recognises three options for encouraging farmers to take up project strategies. The first is to reduce costs to the farmers early in the project cycle. The second is to bring benefits on stream quicker and the third is to lower farmers subjective discount rates. Free maize was used to reduce costs to the farmer but was discontinued. Biomass application from promoted shrubs brings benefits to farmers but can be very limited if tree densities are poor and biomass production is too little to provide tangible benefits. The project is therefore concentrating on the third option, that of convincing the farmer that current investment in land and labour will pay off in the longer term. Again, this survey emphasised the necessity for participatory extension methods and needs assessment. In addition, it is stated that a "slate of intervention strategies" available for the farmers to choose from will "stimulate interest and commitment to project activities" (Leach and Marsland, 1994).

The 1996 survey again promoted the participatory message, including a review of the role of catchment committees. The limited role of women in committees, despite the tasks that they carry out under the project, was also highlighted as an area of concern (Leach and Kamangira, 1996).

Future monitoring and evaluation will incorporate the use of aerial photographs to assess the impact of the soil conservation practices and soil fertility improving measures. Photographs from 1995 and 2000 will be analysed for changes in the physical appearance of all project sites (Government of Malawi/European Union, 1995).

Many of the problems highlighted by the monitoring and evaluation unit appear to have been taken on board by the project. Chapter 7 looks specifically at the role of participation of beneficiaries in the development process and analyses the view of the farmers within the PROSCARP project to determine how the project responds to their priorities and whether the project is truly moving towards a more participatory approach to development in practice.

4.6.2. Practical Problems of Implementation

Quarterly progress reports are prepared by the Management Unit after meetings in all the ADDS with project staff. These reports cover physical implementation of the project by reporting on the different aspects of project activities and their progress in different areas.

These reports show several practical problems such as;
Availability of transport,
Working repair of transport,
Timely release of funds for project activities,
Timely advice and release of planting materials to farmers when promised.
(ADDFOOD, 1994; Government of Malawi/European Union, 1996; Government of Malawi/European Union, 1997; Government of Malawi/European Union, 1998; Staff members, pers com.)

The relevance of these organisational and practical problems would be magnified as the project expands into a much larger number of sites, as shown in figure 4.1.

4.7. <u>Conclusions</u>

The PROSCARP project is a relatively large-scale project running within Malawi. It works in close co-operation with the Malawian Ministry of Agriculture and has good links with similar projects in operation. The operational range of the project is wide both in terms of geographical area and in issues challenged (soils, water, health, and so on). The changes within the project since its inception have shown a willingness to adapt to local conditions and constraints. The focus of the project is still very oriented towards a top down approach, despite awareness and some incorporation of participatory development and its associated methods. The scale and type of participation, as well as the farmers' attitude towards these development approaches, are analysed in later chapters.

Changes in project techniques in response to farmer opinion and problems encountered can have a major impact on the direction of the project. Initially ADDFOOD distributed fertiliser as part of the "food for work" package. This practice ended as it was not seen to be beneficial (ADDFOOD, 1994). Agroforestry species, such as *Leucaena leucocephela* were then seen as a way of maintaining soil fertility through biomass production and application. These species were planted on the marker ridges. Current strategies reflect problems encountered with establishment of agroforestry species on marker ridges. The current strategies are very broad, incorporating changes to previous technologies (Vetiver grass on marker ridges as opposed to other shrubs), as well as quite major changes in direction, such as the introduction of minimum tillage, and the multipurpose "trees on farms" strategy. There is a need to investigate the attitude of the farmers towards inputs provided by the project. Each of the components requires inputs, for example, seeds, parts for wells and sanplats. There would also appear to be a strong requirement for technical knowledge. This would suggest that it is unlikely that the technologies promoted by the project would spread to non-project villages without any intervention by PROSCARP. Another, related, issue with the levels of inputs is the impact on the project villages after the decrease or withdrawal of project support. Finally, there appears to be confusion in the project documentation about the issues of hybrid maize and other seeds for crop diversification. This is investigated fully within the study villages.

According to PROSCARP the diversity of strategies is offered to the farmers as a basket of technologies from which the most suitable can be selected by the farmer. The technologies used on the farms in the study area are analysed in detail to determine the attitude of the farmers to the changes in direction of PROSCARP since the inception of the project. Also, the potential for major changes in farming strategies is investigated to ascertain if the farmers are willing or able to modify their agricultural practices to incorporate the new techniques that are now the focus of the project.

Practical problems of implementation have been present over most of the life of the project. The scale of the problems are not necessarily worse at the time of this research as, despite the increase in site numbers from the start, money has been invested in transport. However, the proposed increase in scale of over 700% has the potential to stretch the project staff and resources considerably.

The ideal seems to be that certain sites already in the project will have completed the physical conservation measures recommended for their villages and that they will become self sufficient in nearly all aspects of the project, a major factor in the long term success of the project. This would release staff and resources for other sites. There are a number of factors influencing the ability of the farmers to become self sufficient and these are investigated.

Figures produced in quarterly reports indicate numbers of acres conserved in terms of hectares with marker ridges and ridges realigned. Also figures for wells dug and sanplats installed are shown. In terms of paper figures the project is showing distinct successes. These figures must be used as the basis for expansion. However, results of this research in the following chapters will be used to try and assess whether the approach used by the project meets the needs of the farmers. From this perspective it will be possible to try to understand whether sustainability in agriculture and rural livelihoods can be achieved by a project of such a nature.
At the time this research was conducted no sites had achieved a situation whereby project staff were no longer necessary for the continuation of PROSCARP promoted techniques. It would appear that for the project to attain aspects of sustainability that the benefits of the project must be felt after its conclusion. As this is currently not possible it must be necessary to aim for this goal. Until this is met it is unlikely that the project can be considered a success, even in the eyes of the donors or project staff.

Chapter 5 Rural Livelihoods and Agricultural Production Within the Case Study Area.

5.1. Introduction

The purpose of this chapter is to examine in detail livelihood and sustainability issues that are directly related to the five villages involved in this study. This allows the priorities of the villagers and the problems and opportunities within the village to be understood. The existence of PROSCARP assumes that the current livelihood strategies in these villages are unsustainable and that the technologies promoted by the project will lead towards a more sustainable agricultural system.

Chapter 1 critically examined the concepts behind sustainable agricultural development. The many definitions of sustainable agriculture were distilled out to provide an understanding of what sustainability in agriculture should encompass. This produced an outcome whereby sustainable agriculture is not a static definable absolute, but a changing process whereby sufficient agricultural output is produced without damaging the natural resource base on which this output is dependant. The broad conditions of sustainable agriculture at farm level were identified as;

- Provision of adequate returns to maintain or increase living standards;
- Maintenance of the social fabric of the village or community;
- Protection and conservation of the natural resource base;
- Maintenance or increases in long term production potential.

This chapter, in response to concepts of sustainable agriculture discussed in Chapter 1, analyses the farming systems within the case study area. An in-depth understanding of the problems and opportunities within the villages allows a critical evaluation of the relevance of sustainability to the lives of the villagers. The following chapter will then examine PROSCARP interventions within the villages and the reasons for adoption or non-adoption of these interventions by the villagers. This will give an overall picture of how successful PROSCARP is in responding to the priorities and needs of the villagers as well as promoting sustainable agricultural development within these villages.

5.2. The Collection and Presentation of Data.

During the data collection, both quantitative and qualitative data were gathered. Qualitative methods give a rapid feel for a problem and are essential in exploring community attitudes and priorities. They can give a rich understanding of community life (Gosling and Edwards, 1995). In each of the villages a general meeting was held to introduce the study and to answer any questions that the villagers had.

Gosling and Edwards (1995) put forward two ways of analysing qualitative research. The first is simply presentation of the data as a detailed description from which conclusions may be drawn by the author or reader. The second is the development of a framework to look at different aspects of the problem and how they relate to, and influence each other. In this study a framework was developed that gives an understanding of the main problems or issues within the study villages.

There were three main phases to the development of the framework for the collection and presentation of the data. To avoid biases inherent in predefining research objectives (Chambers, 1983) it was decided to carry out two exercises, mapping and transect walks, to learn basic information about the villagers and to then define the rest of the research, including lessons learned from the initial exercises. As suggested by Mazzucato and Niemeijer (1996) the initial exercise in each village was a mapping exercise. Mapping exercises were used to get an overall picture of each village, introducing both the villages to the author and the author to the villages. The mapping exercise was also used to stimulate discussions between villagers. The second predetermined exercises carried out in each village were transect walks (Thompson and Pretty, 1995; Mazzucato and Niemeijer, 1996). These were used both to verify the information gathered in the mapping exercise and to assess specific problems and opportunities within areas of the village. During both of these exercises villagers were very concerned with communicating the problems within their village and how this affected their lives and livelihoods. As a result of this, the next exercise was problem identification, including relationships between problems identified and ranking of these problems. This allowed a framework to be developed on which the remainder of the fieldwork was based.

The structure of the rest of this chapter follows this framework. Firstly the results of the mapping and transect walks are discussed. After this the problem identification exercise is highlighted. A hierarchy is shown in which the relationships between each of the problems are presented. The remainder of the chapter provides an in-depth examination of each of the problems identified.

Data that was gathered through participatory techniques is explained with the village name, type of exercise, the focus group and number of participants for each exercise. Quantitative data gathered through a questionnaire survey is marked as such.

5.3. Exercise 1: Participatory Mapping Exercise.

Aim: To provide understanding of the physical and biological properties of each of the villages as well as providing a base from which to pursue discussion.

After the introductory meeting in each village the first group exercise was carried out. A volunteer from the group drew the maps on the ground. During the mapping exercise there was much discussion about the location of each of the items and also what should be included and excluded. In each of the villages this exercise lasted several hours and brought out a variety of issues that were followed up with later meetings.

Although the mapping exercise was carried out initially to act as an icebreaker and to provide a general resource map for the villages, it proved to be much more useful than this. As a result of this at subsequent meetings and participatory exercises the map was redrawn onto paper and used as a reference point.

One map was produced for each of the five villages. One of the most important aspects of this exercise was the discussion that was generated by the participants during the exercise. Most of the discussion generated by the mapping exercise concentrated on problem areas within the villages, such as sloping ground, areas of low soil fertility, water sources and rivers that run dry. Also areas of common interest such as churches, sports fields, schools, wood sources and so on were drawn in. There are differences in geographical location between the two catchments involved in the study, specifically the villages in Naluva catchment had areas of highly sloping land. Mbatamila catchment had more flat land (outlined in Chapter 3). These come to light quite strongly in the mapping exercise in which soil erosion as a problem was shown. In Mbatamila Village there were minimal areas of erosion as noted by the farmers whereas in Naluva catchment substantial areas were highlighted by the farmers as showing signs of erosion.

Overall the mapping exercise was an excellent introduction to the villages. The focus of the villagers was directed away from the researcher and towards the map. In each of the villages there was an initial phase whereby the person volunteering to draw the map was uncertain of his role. However, as people became more interested in the process there was a more relaxed atmosphere. Although all the volunteers were male, the women in the group did become involved in the process. Different groups in the village added different things. For example, in Mbatamila the women were quite vocal about the positioning of the boreholes and whether they functioned or not. In the same village the men were more interested in the exact position of the football pitch. The differences between groups in the village (based on age, gender and so on) and their priorities were followed up in later exercises.

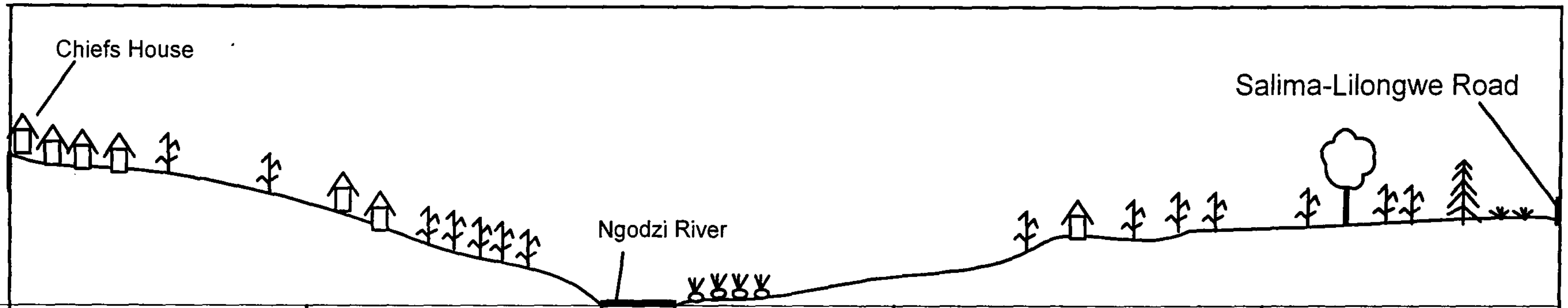
5.4. Exercise 2: Transect walks

Aim: To triangulate data from the mapping exercise and to provide direct observation of the problems and opportunities associated with differing land use types.

At the following session transect walks were undertaken both to verify the information on the maps and to further understand the area, both in terms of the physical characteristics but also local knowledge and concerns. The transects provided more detailed information than the mapping process and identified specific problems and opportunities within the chosen route. The routes in each village were chosen to represent the major ecological and production zones (National Environment Secretariat (Kenya) *et al*, 1990). This was done by identifying on the map drawn by the villagers the line of highest diversity.

The transects were walked with the interpreter and one or several volunteer farmers. Along the transect people came out to talk and often walked along with the group for some of the way. The information that was provided by each person was used to construct a diagrammatic representation of the walk, providing insights into problems and opportunities in different areas of the village.

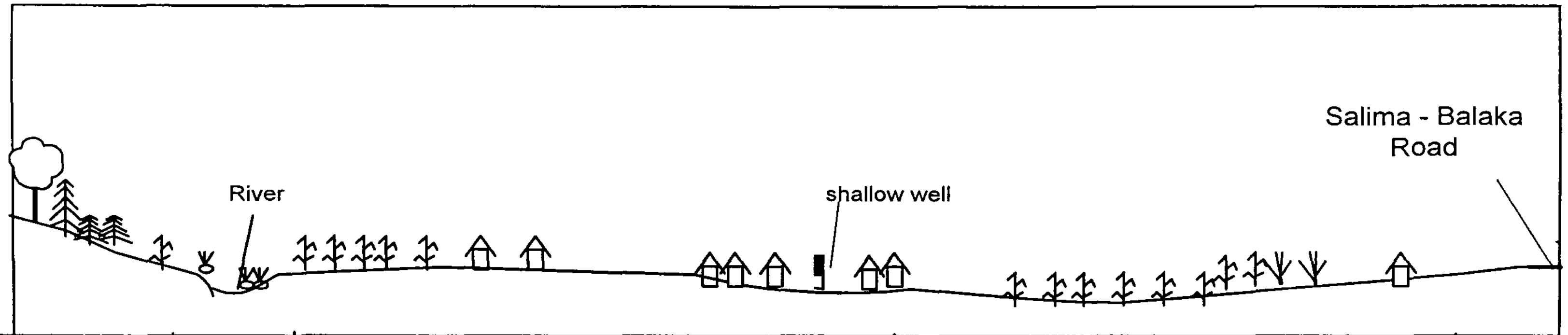
Figures 5.1 to 5.5 show a diagrammatic representation of one transect through each village. Problems identified during the walk are shown as well as any solutions suggested by the farmers.



Land Use	Settlement and Gardens	Arable		Dimba Gardens[1]	Arable	Arable / Rough land
Crops and Vegetation	Pigeon Pea Maize Mango	Maize (Alleycropped with Leucaena leucocephala) Pigeon Pea Cotton		Tomato Chinese Leaves Pumpkin Beans	Maize (Alleycropped with Leucaena leucocephala) Cotton	Maize Cassava
Problems	Untethered goats grazing Low soil fertility	Sloping land Evidence of erosion			Poor alignment of ridges Poor establishment of Leucaena Some waterlogging of maize	Stony soils with low fertility
Potential Solutions	Control goats Fertiliser				Realign ridges with help from FA Replant gaps in leucaena hedge	

[1] Dimba gardens are low lying clay soil areas usually along rivers that retain moisture and can be used to grow vegetables during the dry season

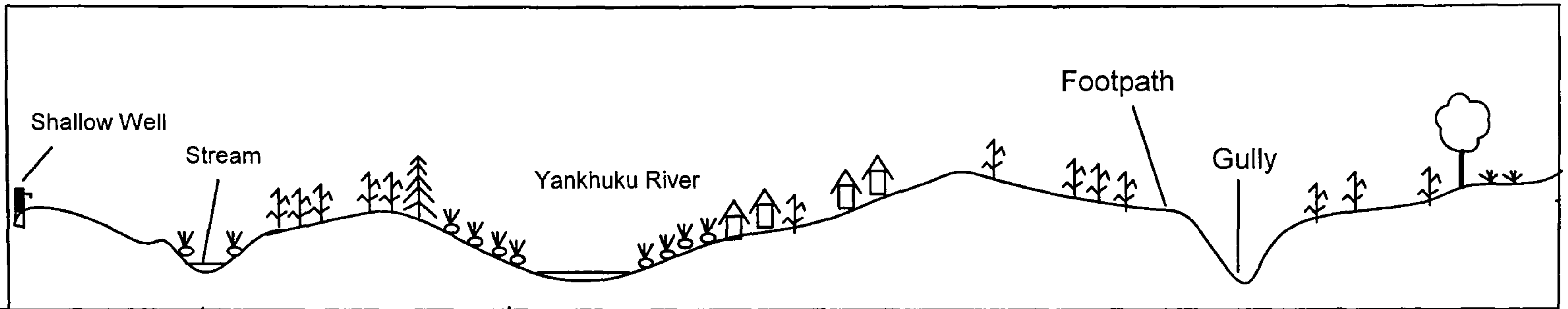
Figure 5.1 Diagrammatic representation of transect walk through Mbatamila Village.



Land Use	Sloping land at edge of forest	River with Dimba Gardens	Arable	Households with borehole	Arable	Rough land up to road
Crops and Vegetation	Mostly scrub but small maize plots	Okra Chinese Leaves Pumpkin	Maize Cotton	Trees for shade	Maize Cotton Goundnuts	no crops planted
Problems	Sloping and and rocky land Soil erosion	River drys up before rains	Ridges not on contour but fertile soils with no soil erosion problems	Too many people for one well	Ridges not on contour Soils more sandy closer to road, less fertile. Need fertilisers some soil erosion	Stony soils with low fertility
Potential Solutions	Drilling of alternative wells			Drilling of alternative wells	Buy fertiliser (not possible) Learn about soil erosion from FA	

[1] Dimba gardens are low lying clay soil areas usually along rivers that retain moisture and can be used to grow vegetables during the dry season

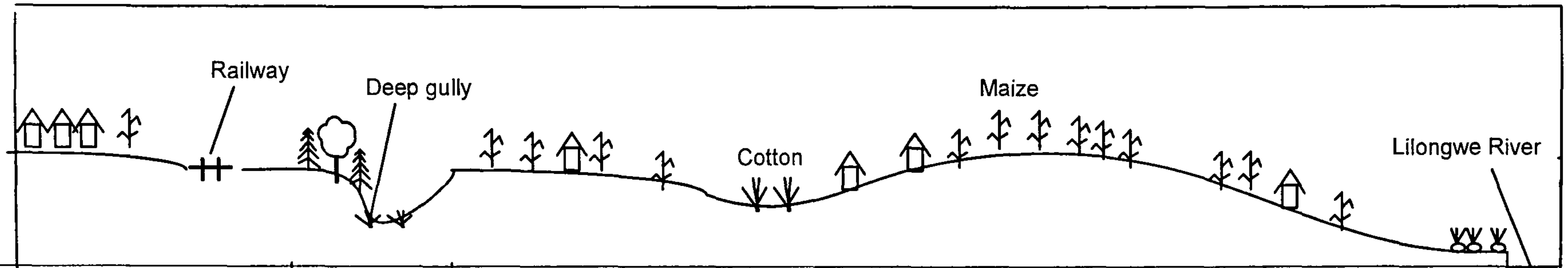
Figure 5.2 Diagrammatic representation of transect walk through Chifuwa village



Land Use	Settlement and Gardens	Arable	Dimba Gardens[1] beside river	Arable	Arable / Rough land
Crops and Vegetation	Pigeon Pea Maize Mango	Maize (Alleycropped with Leucaena leucocephala) Pigeon Pea Cotton	Tomato Chinese Leaves Pumpkin Beans	Maize (Alleycropped with Leucaena leucocephala) Cotton	Maize Cassava
Problems	Untethered goats grazing Low soil fertility	Sloping land Evidence of erosion		Poor alignment of ridges Poor establishment of Leucaena Some waterlogging of maize	Stony soils with low fertility
Potential Solutions	Control goats Fertiliser			Realign ridges with help from FA Replant gaps in leucaena hedge	

[1] Dimba gardens are low lying clay soil areas that retain moisture and can be used to grow vegetables during the dry season

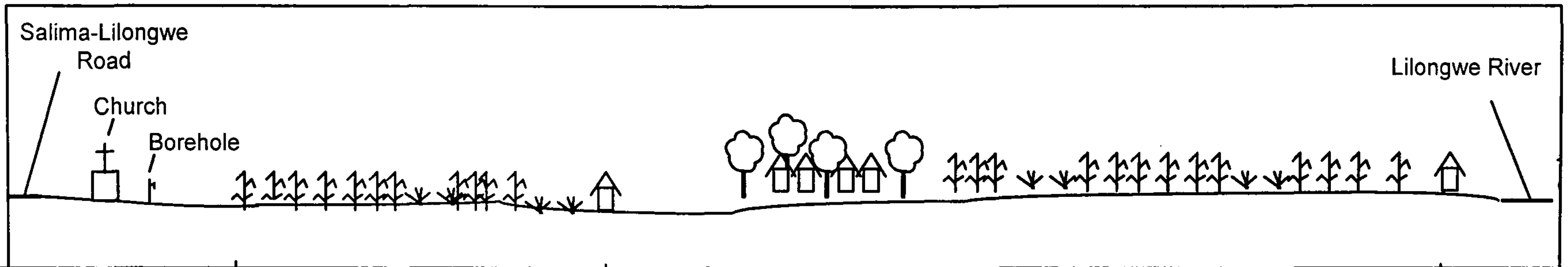
Figure 5.3: Diagrammatic representation of transect walk through Chigoneka I.



Land Use	Settlement and Gardens	Rough land around gully. Grazed by goats	All the land between the gully and river was cultivated	Dimba Gardens and Tobacco nursery
Crops and Vegetation	Pigeon Pea Maize	Scrub Grass	Most of the fields were planted with maize Two fields with marker ridges, Sesbania sesban as alleycropping species Cotton planted in lower fertile ground	Tobacco Tomato
Problems	Untethered goats grazing Low soil fertility	Soil erosion Too steep to cultivate	Direct sown Sesbania very poor establishment Marker ridge construction not finished	Tobacco nursery needs a lot of time
Potential Solutions	Control goats Fertiliser		Need FA to mark more ridges No solution to poor growth of sebania, maybe plant more or different species	Naturally fertile soil Good vegetables

[1] Dimba gardens are low lying clay soil areas usually along rivers that retain moisture and can be used to grow vegetables during the dry season

Figure 5.4: Transect walk through Chigoneka II



Land Use	Common Land	Cultivated	Common Rough land	Chiefs house and other houses	Cultivated land with several footpaths Ridges not on countour	River and Banks
Crops and Vegetation	Not cultivated	Maize Cotton Groundnuts Trees and shrubs	Grazing by goats and chickens	Several Mango trees and other large trees for shade	Majority of fields planted with maize Two fields of cotton Several trees at field boundaries	Scrub and grass
Problems		Soil not so fertile in this part of village			Relatively fertile soil but one field of maize with no fertiliser applied, yellowing and smaller than neighbouring field.	
Potential Solutions		Fertilisers			Farmers would like to learn about contour planting and alleycropping More planting of Msangu suggested by one farmer	

Figure 5.5: Diagrammatic representation of transect walk through Sanga Village, Naluva Catchment

5.5. Exercise 3. Problem Identification

Aim: To explore the major issues and problems within each of the villages, to find the relationships between them, and to rank them according to their importance.

This exercise is used to highlight the priorities and attitudes of the villagers in each village.

In each village a village meeting was arranged after the transect walks. The turnout was high at each meeting with old and young, men and women present. Firstly the group was asked to identify problems or issues that affected them. Table 5.1 lists the problems identified in each of the villages.

Problems	Mbatamila	*Chifuwa*	Chigoneka I	Chigoneka II	*Sanga*
Food scarcity	✓	✓	✓	✓	✓
Soil fertility	✓		✓		
Soil erosion	✓				
Disease	✓	✓	✓		✓
Pests	✓				✓
Lack of cash for inputs	✓	✓	✓		✓
Water supply	✓	✓		✓	✓
Access to markets		✓		✓	✓
Access to hospital		✓		✓	✓
Land [1]			✓	✓	
Labour	✓			✓	
Rainfall	✓	✓	✓	✓	✓

[1] small farm size and fragmented holdings

Table 5.1: List of problems or issues of concern identified in each of the five study villages (Source; Focus group discussion exercise)

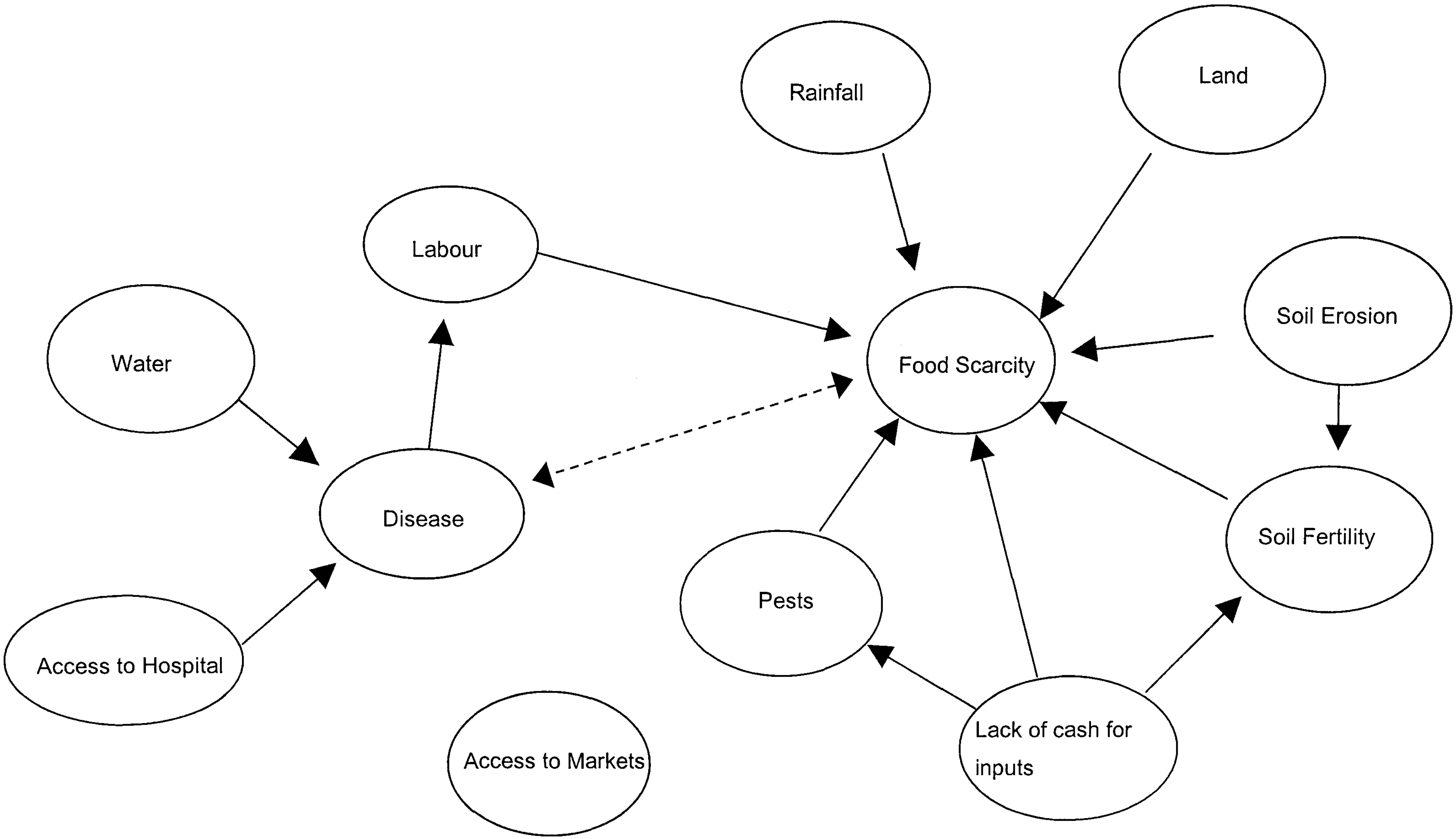


Figure 5.6: Diagram of the relationships between problems or issues identified in the villages. (Source: Participatory group exercise from Mbatamila Village)
◄-► Dashed line represents link not drawn in during this exercise but highlighted later in discussions during follow up group meetings

Mbatamila was the first village in which this exercise was carried out. The identification of some of the issues provided a lot of discussion. Lack of food was the first problem to be raised. Other issues such as soil fertility and rainfall were then raised as the cause of food scarcity. The interrelationships between the various issues provoked a follow on exercise whereby a diagram in which the relationship between each of the problems was constructed. The same approach was then used in each of the villages. Figure 5.6 shows a diagrammatic representation of the interrelationships of the issues collated from all of the villages.

The multitude of relationships between the various problems shows the complexity of the issue. It gives some idea of the scope of the development requirements in the villages. Each of the problems was written on to a piece of paper and one volunteer from the group drew in the lines suggested by the rest of the group. All of the volunteers for each exercise were male except in meetings consisting solely of the women in the village. The relevance or importance of this is discussed later in relation to gender issues.

It can be seen from figure 5.6 that food scarcity is a central issue and most of the other problems are directly or indirectly related to this. The main factor behind a lack of food identified during this exercise is insufficient crop production. The focus was definitely on agricultural production. The role of alternative sources of income or food was not raised by any of the villagers. A later exercise was carried out to determine the importance or potential for alternative sources of food or cash.

5.6. Exercise 4 Problem Ranking.

At a subsequent session it was decided to rank the problems highlighted in each village according to their severity. In each village only the problems previously suggested were used in the ranking exercise. This exercise gave more information about the specific problems in each village and allowed comparisons to be made between catchments or project and non-project villages. The main aim of this exercise was to identify the priorities of the farming community, which is vital to the understanding of how the PROSCARP project is responding to the needs of the villagers and how farmer participation can be incorporated into the project. The results of the exercise are shown in Table 5.2.

Problems	Mbatamila	Chifuwa	Chigoneka I	Chigoneka II	Sanga
Food scarcity	4	3	1	1	1
Soil fertility	5		2		
Soil erosion	7				
Disease	1	2	4		7
Pests	6				4
Lack of cash for inputs	3	5	3		5
Water supply	2	1		3	2
Access to markets		4		4	6
Access to hospital		4		2	3

Table 5.2: Ranking of problems in each village by the village members (number 1 being the most important problem). Source: problem ranking exercises.

One of the most important aspects of this ranking exercise was the fact that problems were ranked according to their severity. However, in Mbatamila (the first village to be researched) the agreement on the ranking of the seven problems showed in Table 5.2 did not generate much controversy. But problems of rainfall, land and labour issues generated a loud and spirited discussion ending in the decision not to rank these issues as the majority of the group felt that they were not problems that could be remedied. Similar debates occurred in other villages so these three problems were left out of the ranking exercise altogether.

Food scarcity was ranked as the most serious problem by all three villages in the Naluva Catchment, whilst disease and water supply ranked as the two most serious in Mbatamila catchment. All the villages suggested that the remedy to most of these problems would be ability to earn cash income but they could see no way to increase their current ability to earn cash except through increasing the amount of cash crops such as cotton or tobacco. Land scarcity means that increasing the area of crops grown is not practical without reducing food crops. Increasing the yield of cash (and food) crops is reliant on using fertilisers and pesticides that are very expensive.

Problems	Mbatamila	*Chifuwa*	Chigoneka I	Chigoneka II	*Sanga*	Total values
Food scarcity	4	5.2	8.9	8.9	7	34.0
Water supply	6	7.3	0	6.4	6	25.7
Disease	7	6.2	5.1	0	1	19.3
Access to hospital	0	4.1	0	7.6	5	16.7
Lack of cash for inputs	5	2.1	6.4	0	3	16.5
Soil fertility	3	0	7.6	0	0	10.6
Access to markets	0	3.1	0	5.1	2	10.2
Pests	2	0	0	0	4	6
Soil erosion	1	0	0	0	0	1

Table 5.3: Farmers' priorities scored to show overall importance of each problem. Ranked in order of severity of problem. (Source: Participatory problem ranking exercises)

These scores were weighted to give an overall picture of the relative importance of each of the key needs. These are shown in Table 5.3 in order of decreasing importance.

From this table it can be seen that taking the five villages together, food scarcity is the most serious problem. This was explained by the farmers as being a combination of factors; including lack of fertilisers and unreliable rainfall. Water supply is the next most serious. Soil erosion ranked lowest in importance of problems mentioned. The relevance of these findings will be explained in the following sections.

5.6.1. Framework for Understanding of Village issues

The hierarchy set out in Figure 5.6 is used to examine priority areas within the study villages. There are two main themes in Figure 5.6. The first is food scarcity, which is dependent on a number of other problems identified. The second focus is on household related issues, disease, water, access to hospital, and labour. The rest of the data are presented under these two subjects.

5.7. Food scarcity

Food scarcity was the overall issue of highest importance. Other problems that directly affect food availability are also examined in this section.

5.7.1. Land

In the colonial period the average farm household tilled 3 – 4 acres (1.2 –1.6 ha) under a system of shifting cultivation (Berry and Petty, 1992). The average area of land cultivated nationally has halved since the 1960s to 0.75 ha in 1994 due to population pressures and expansion of the estate sector (Devereux, 1997). Holdings in the study area are above the national average of land holding size at 1.3 Ha (Table 5.4).

Catchment	Village Name	Land Holding (average ha)	Catchment Average Land Holding (ha)
Mbatamila	Mbatamila	1.28	
	Chifuwa	1.13	1.20
Naluva	Chigoneka I	0.85	
	Chigoneka II	1.00	
	Sanga	0.82	0.89
	Average for five villages	1.02	

Table 5.4: Size of land holdings in the study site (Source: questionnaire survey)

However, from Table 5.4 it can be seen that this differs between villages. Mbatamila Village had the highest average land holding.

Devereux (1997) found that landholding is a reliable proxy for poverty and food insecurity in Malawi. This finding supports a policy statement published by the Government of Malawi (Government of Malawi, 1990), which states that;

- Small smallholders (<0.5 ha) are unable to produce sufficient food and would require "targeted income transfers" to protect their food security in the short term.
- Medium smallholders (0.5-1.0 ha) would have the potential to achieve self-sufficiency if their agricultural productivity is improved.

Table 5.5 shows the breakdown of landholding size by village in the study area.

If the Malawian Government policy is correct 14per cent of households in this area are not capable of meeting their food needs. A further 40 per cent need help to increase their agricultural productivity to attain self-sufficiency in food needs. This supposes that self-sufficiency is desirable, a concept that is examined later.

	<0.5 ha	0.5 < 1.0 ha	1.0 < 1.5 ha	1.5 < 2.0 ha	>2.0 ha
Mbatamila	8%	30%	42%	8%	13%
Chifuwa	16%	33%	29%	10%	12%
Chigoneka I	10%	54%	26%	10%	0%
Chigoneka II	6%	41%	31%	22%	0%
Sanga	27%	44%	18%	7%	4%
Total (average)	14%	40%	29%	10%	6%

Table 5.5: Percentage of households surveyed by landholding size (Source; Questionnaire survey).

The validity of the findings of the Government of Malawi (1990) and Devereux (1997), presented above, to the study area were tested within the study area. In order to establish reliable and locally relevant indicators of food security discussions were held during group meetings in all of the villages. Nsima, made from ground maize, is the staple diet and is eaten with a relish of vegetables or fish when available. The availability of maize was the main criterion. Relish could come from many sources and was less important. The farmers identified three main indicators of a family's ability to feed itself during the year.

1) The number of meals eaten per day. Normally three meals of nsima are eaten every day. In times of food shortage this drops to two or one. The villagers pointed to this as the most useful indicator of available food in a household.
2) The number of months that the supply of maize grown on the household farm will last.
3) Alternative sources of food when the homegrown supply is not sufficient. This is dependant on many factors, including any cash income, ganyu work, children working away from the village and sending back money.

Once these indicators had been established, data was collected through the questionnaire survey.

The number of meals eaten per day during the year does not show a significant difference between the following individual household characteristics; the category of farm size (Kruskal-Wallis, $P > 0.05$[1]), the age of the head of household (Kruskal-Wallis, $P > 0.05$), or the gender of the head of the household (Mann Whitney U, $P > 0.05$). There was however, a significant difference between the two catchments and the number of meals eaten per day (Mann Whitney U, $P < 0.05$) between August and April. The maize harvest is gathered in April/May and the farmers said that everybody ate three meals per day after harvest to compensate for any food shortages prior to the harvest. Hence, there is no difference from May to July.

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[1] Kruskal-Wallis test used for three or more non-categorical unrelated samples. Mann-Whitney U test used when there are two samples.

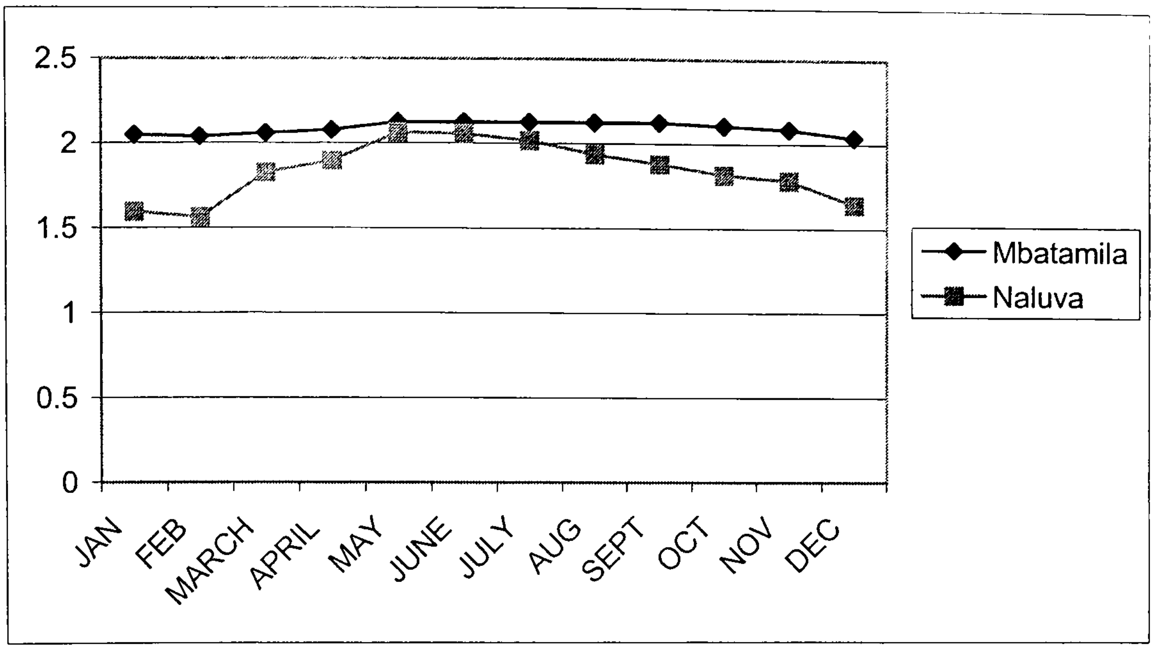

Figure 5.7: The average meals eaten per day in Mbatamila and Naluva catchments (Source: questionnaire survey).

Comparisons of the average meals eaten per day between the two catchments are shown in Figure 5.7. It can be seen that in the period coming up to the harvest in April/May that the households in Naluva have substantially less food available.

The next indicator to be analysed is the number of months that the supply of maize grown on the household farm will last. The figures provided by the farmers were based on the season prior to the questionnaire survey when average yields were gathered, as there was neither drought nor excess rainfall.

There are three factors that significantly influence the number of months that the farmers' own food supply lasts. The first is, again, the geographical location, in terms of differences between the catchments (Mann-Whitney U, $p=0.000$). It can be seen from Table 5.6 that the farmers in Mbatamila catchment have maize from their own crops for an average of more than nine months, which compares favourably to Naluva catchment.

Catchment	Mean	Number of cases	Std. Deviation
Mbatamila	9.4	104	3.5
Naluva	7.0	124	3.3

Table 5.6: The average number of months that the supply of maize grown on the household farm will last. (Source: Questionnaire Survey).

The second factor influencing the number of months food produced last season and estimated food production for the current season is the size of the land holding. There is a significant difference between farmers in the following land holding groups, 0-0.49 ha, 0.5-0.99 ha and 1.0 – 1.49 ha (Kruskal-Wallis, df=2, p= 0.07). There is no significant difference in how many months food grown by the household lasts when the landholding size is greater than 1.5 Ha (Mann-Whitney U, P=0.051).

There is also a significant difference between the age of the farmer and the number of months that the maize lasts (Kruskal-Wallis, df = 5, P= 0.001).

Age Group	Mean	N	Std. Deviation
20-29	6.1	37	3.7
30-39	7.5	54	3.6
40-49	8.5	46	3.1
50-59	9.2	30	3.0
60-69	8.9	38	3.5
70+	9.3	23	4.0

Table 5.7: The difference in mean number of months that the farmers own maize lasts depending on the age of the head of household (Source: Questionnaire survey).

Table 5.7 indicates that the younger farmers may produce less maize on average than their older counterparts. This could be influenced by the size of the household, or amount eaten. However, the size of land holding that farmers in different age groups show a significant difference (Kruskal-Wallis = 15.745, df = 4, p= 0.003).

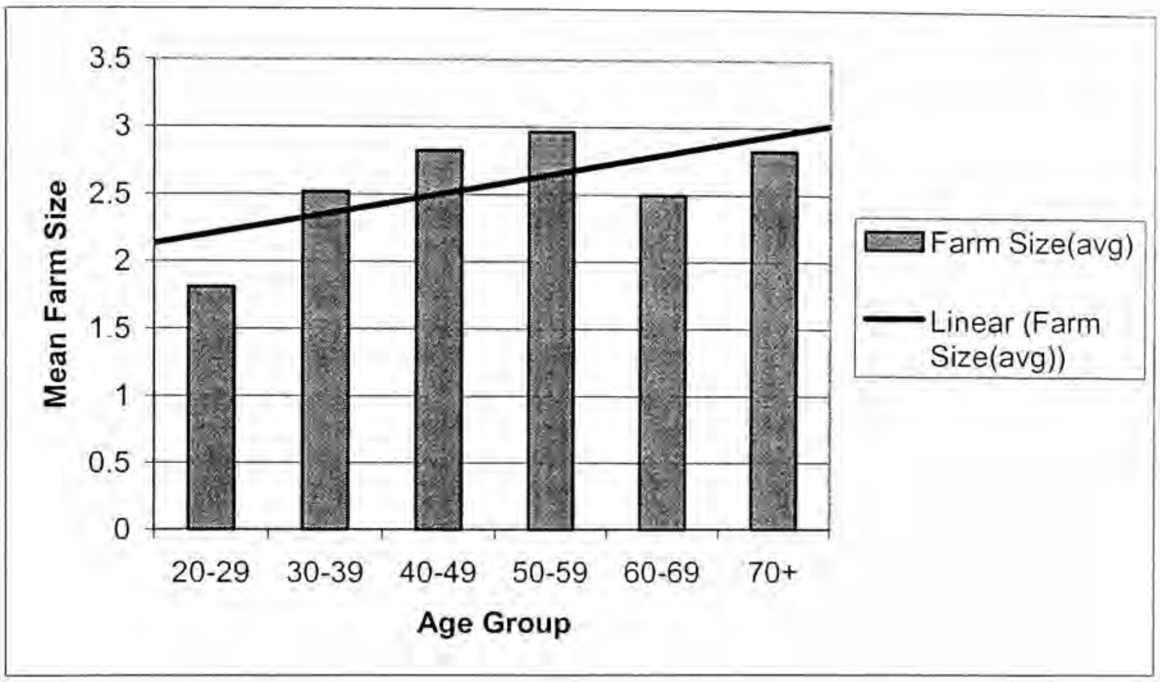

Figure 5.8: Relationship between the age of the head of household and the size of land holding farmed (source Questionnaire Survey).

Figure 5.8 shows that, on average, younger farmers have less land available to them for agricultural production. This could reasonably explain why younger farmers produce less maize than their older counterparts.

There was no difference between male and female-headed households with regard to both number of meals eaten per day and how long the households own food supply lasts (P<0.05).

The most surprising results were found when identifying whether the number of meals per day, or number of months the household's own food supply lasted, differed significantly between project and non-project villages or between catchments. There was found to be no difference between project and non-project villages (the implications of this are discussed in the following chapter). However, there was a significant difference between the two catchments in both variables. This gives rise to important policy implications if the main source of difference in food security measured by these two criteria is based on geographical difference rather than any factors internal to the village.

Alternative Sources of Food when Own Supplies are not Sufficient.
The final important factor in food security was the source of food supplies to supplement food grown by the household. Figure 5.9 shows different sources of food and the proportion of households relying mainly on each source.

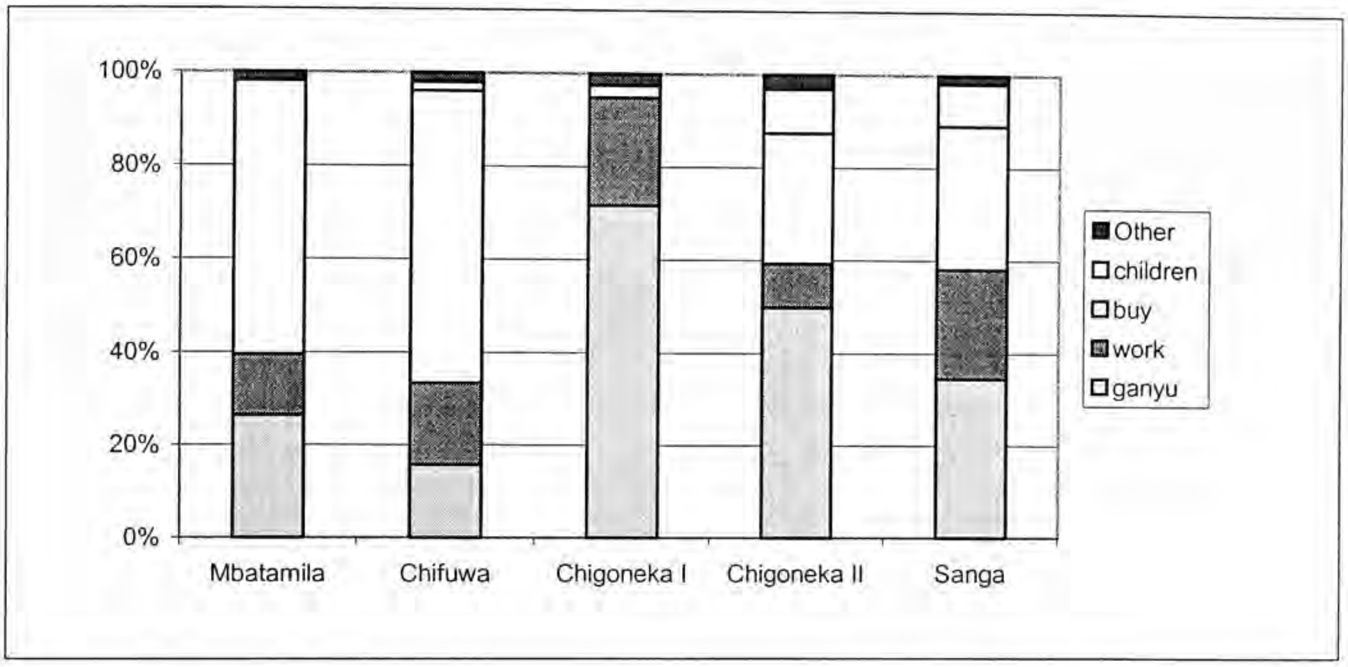

Figure 5.9: Alternative sources of food when own grown supplies are finished. (Source, questionnaire surveys).

Over half of all the households surveyed in Chigoneka I and II were dependent on ganyu labour as an alternative source of food. Mbatamila and Sanga villages had the highest percentage of households that purchased food for cash. Each of the villages shows a diverse range of alternative food sources. The employment opportunities and resource sets that influence this are investigated fully in section 5.8.2.

Land Tenure
Security of tenure within the villages was discussed. All the farmers felt that they have long-term ownership of their fields and that their children will farm the land after them. As such, security of land tenure does not appear to be a

major issue. The Village Chief in Mbatamila said that he could take land away from a family if they acted very badly but he had not done this yet and could not think of an example where this would be necessary.

5.7.2. Rainfall

All of the villages within the study grew rainfed crops only. When discussing the importance of rainfall there were several interesting outcomes. Firstly, during the problem ranking exercise rainfall, along with land, was not ranked. The reason for this was that during the discussions in the ranking exercise it was agreed that there was no solution to the problem of rainfall and so it was not possible to rank its importance. The fact that all crops are rainfed has two major related implications. The first is that drought, or excess rainfall can cause crop failure or poor yields reducing considerably the ability of farm households to produce food. The second is that alternative income sources are often based on the sale of cash crops. Again, erratic rainfall can cause the partial or complete failure of cash crops. In drought years, households with limited or no non-agricultural income can experience severe hunger.

Figure 5.10 shows the result of a diagramming exercise conducted in Mbatamila Village. It shows the variability in rainfall during the previous ten years in the village. The participants agreed that from these years there were only two seasons that produced a good harvest, 1990/91 and 1992/93. A serious drought occurred nationwide in the 1991/92 season. All of the participants agreed that rainfall is becoming more of a problem every year. They say that the rains are coming later and are more erratic each year. The older farmers said that when they were young the rains were reliable and that although they could remember some years of drought, it was never so constantly bad. As stated earlier unless there is a non-agricultural source of income in a household, the implications of drought or excessive rainfall can be very serious.

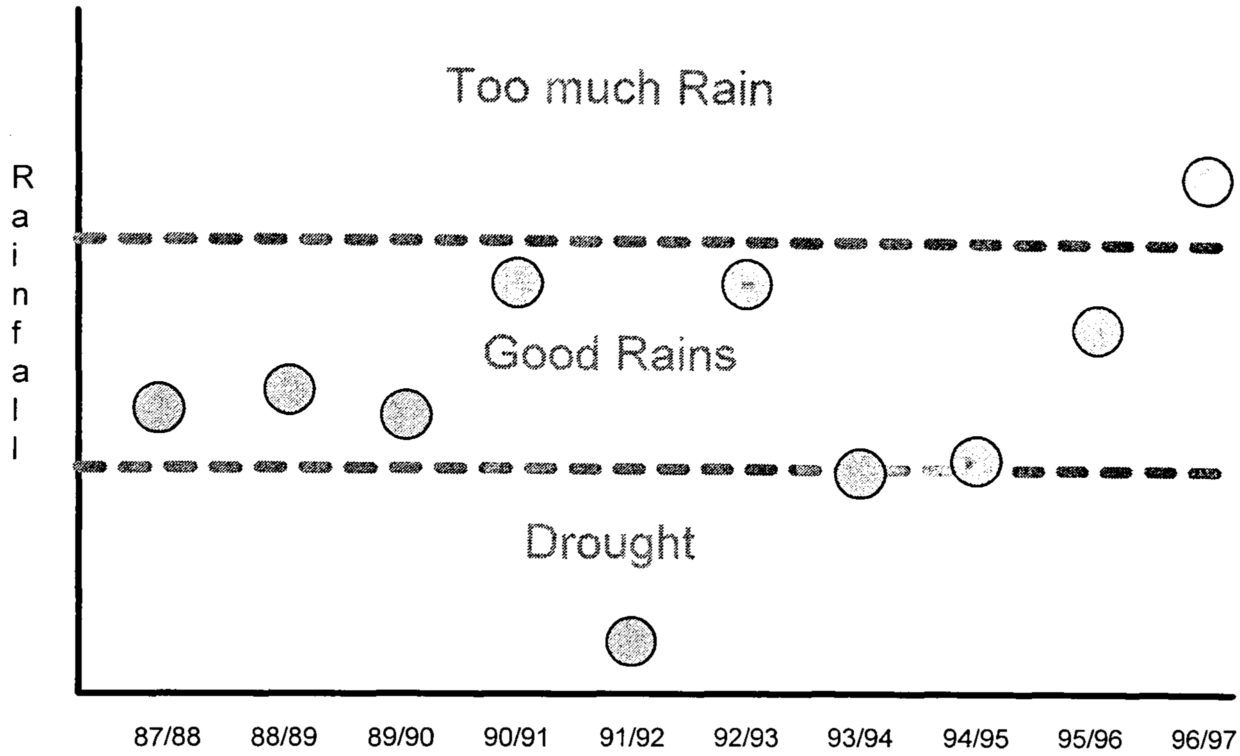

Figure 5.10: Diagram of annual rainfall constructed by villagers in Mbatamila - perceived rainfall, not absolute figures (Source; diagramming exercise, Mbatamila Village)

In each of the meetings farmers were asked what they could do to overcome the risk associated with poor rains. Diversification of agricultural enterprises was suggested in Mbatamila as one way of coping with uncertain rainfall, for example breeding of cattle for dairy or beef purposes and planting a wider range of crops or crop varieties to spread the risk. One male farmer in Mbatamila was very sure that if the villagers had more animals they would be much better off. The offspring could be sold for cash, milk could be available, and the manure from the animals could do a lot to reduce problems of soil fertility. He felt that a development project would be much better if it concentrated on helping the farmers own livestock. In Chigoneka II some of the farmers had recently started to grow tobacco. This is grown as a cash crop and the farmers in this village said that they were better off having two cash crops, cotton and tobacco, as if there is a failure of one of the crops or if the price of cotton goes down there is another option to earn cash. Chigoneka I also said that they grew tobacco to provide cash if the maize crop failed. In Chifuwa village, the only solution to erratic rains was to plant several varieties of maize so that there was a better chance for some harvest even in a really bad year. Farmers in Sanga also planted different varieties of crops. One male farmer in Sanga village said that there was nothing else that they could do except pray that the rains would come. He had a very small farm, ½ an acre of maize (0.2 ha) and a wife and three young children. He said that he and his wife must do ganyu labour whenever it was available because, even though he could not produce enough maize from his land to feed them through the year, if the crop failed they would be very hungry.

While the majority of farmers are mainly dependent on agricultural produce for both food and cash there is the potential for food shortages as a result of erratic rainfall. If the long-term trend in rainfall is for less rain or more erratic patterns of rainfall then there would be a strong argument for a focus on rainwater harvesting or increasing infiltration of rainwater in agriculture. Tied ridging is recognised as a way of holding water until it can infiltrate (Hudson, 1995). Although some farmers practised tied ridging this was not recognised by any of the farmers as increasing rainwater infiltration. It was only recognised as reducing soil erosion (see section 5.7.7). The alternative to maximising rainfall management and retention is a move away from a total reliance on agricultural produce to some form of income generating activity, not just as a survival strategy but also as a livelihood. Income generating activities currently practised in the villages are examined later.

5.7.3. Labour

All phases of crop production are carried out using manual labour. The main tool is the hoe. A seasonal calendar was constructed in each of the villages. Figure 5.11 is the results of this exercise combined from each of the villages. The only difference between the individual villages was the type of crop grown. The seasonal calendar shows the timing of labour requirements. It is obvious from this diagram that the demand for labour within the farm household peaks between the end of September and the middle of January and troughs in June and July. This peak for on-farm labour coincides with the availability of ganyu labour. This calendar gives a detailed picture of the seasonal activities within the villages.

Attempts were made to rank the priority of each activity as well as identify the gender roles for each operation. Ranking of the activities proved difficult. In Chigoneka II cotton, maize and tobacco were identified as the most important crops with less emphasis on beans and peas. However, the priority of the activities associated with these crops varied during the season depending on the workload for each month. Also, the gender roles for each operation were unclear. This exercise was attempted initially in Mbatamila Village. During a male focus group discussion the men indicated that both men and women carried out all the farming activities. A female focus group later agreed that women carried out all of the farming activities indicated, but more often than not they were left to carry out daily activities if the man was involved in non-agricultural work. It proved difficult to group activities into specific gender roles. The circumstances of each household were different and therefore generalisations were not appropriate.

Efforts were made to identify households that were most likely to suffer problems of labour shortages. Mbatamila and Chigoneka II had both identified labour as a problem and it was followed up in both of these villages. In Mbatamila several farmers said that they could not cultivate all of their land as they did not have enough help. However, these farmers were all men and they each cultivated relatively large holdings (1.5 – 2.5 ha). The situation in Chigoneka II was very different. The farmers who had indicated problems of labour were nearly all female. The problem of labour was due to the female member of the household being totally responsible for the agricultural workload. This was not only female-headed households, but households where the man is working part or full-time outside of the village. In meetings with the older members of the villages most of them indicated that they could often get a son or daughter to help them with labour or cash to replace food. Older people whose family was no longer in the area felt problems most strongly. One widowed woman in Sanga said that her children were all in Blantyre and sent money or food when they could but

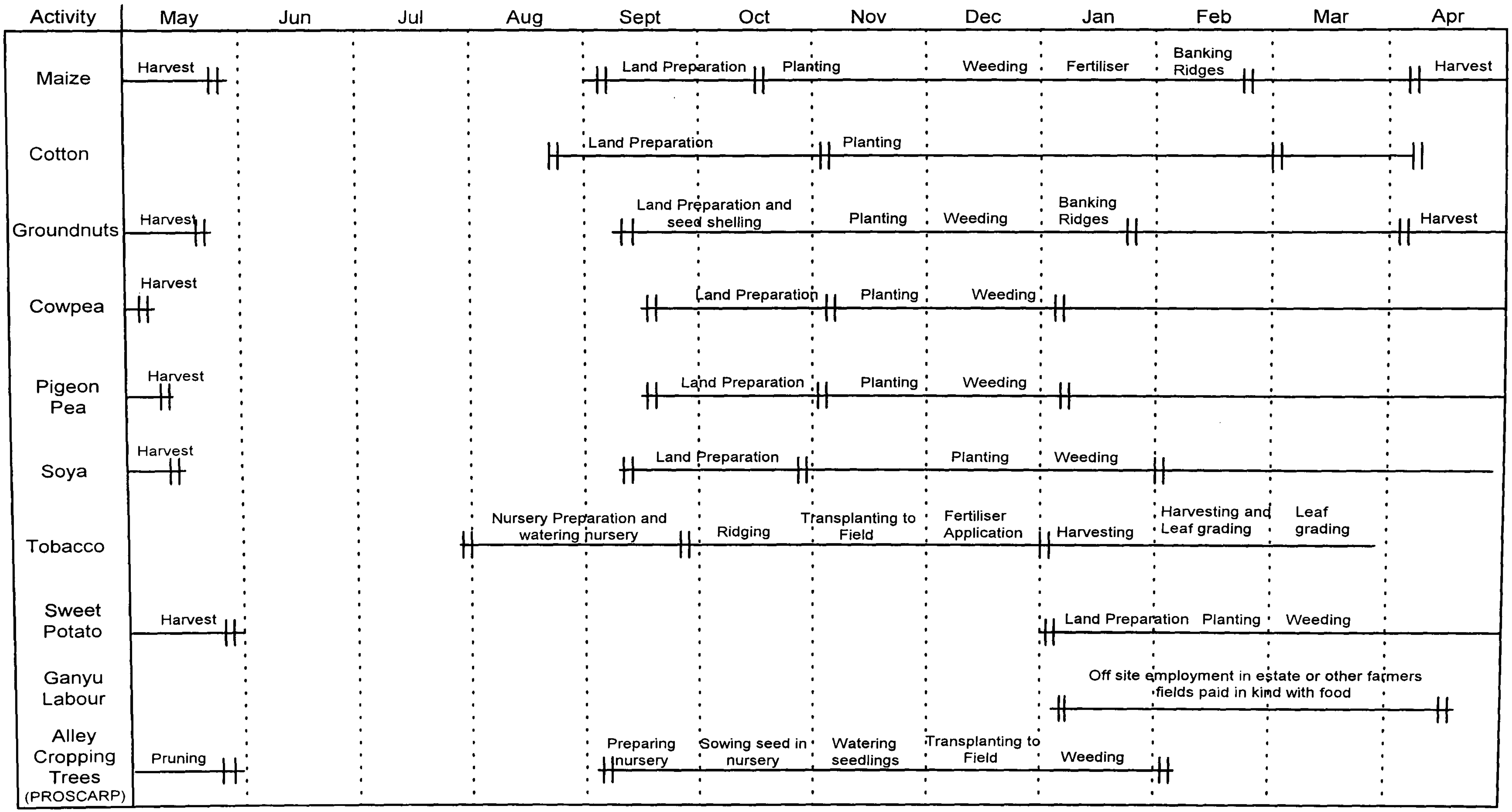

Figure 5.11: Seasonal Calendar combined from exercises in each village (Source: Participatory exercise, Focus Group: All villagers)

that this was not enough. When she was not well enough to work in the fields her neighbours sometimes helped but she often went hungry.

The issue of labour availability gave mixed results. The majority of farmers did not feel that they had major problems with availability of labour for agricultural tasks. However, there were households who felt that they did not get maximum yields from their fields due to labour problems. The complexities of gender issues are analysed in section 5.11. Problems of labour availability give rise to important policy implications for development projects. There is an obvious peak for labour in the villages. For current agricultural practices the majority of farmers do not have major problems but introducing interventions with a high labour demand during this time of high labour requirements could marginalise certain members of the community. The labour requirements and timing of PROSCARP interventions are examined carefully in the following chapter,

5.7.4. Pests

The issue of pests was discussed in each of the villages. This research did not attempt to identify all the pests for the different crop species. Instead the farmers were encouraged to discuss the worst problems and what solutions may be available.

In Mbatamila farmers suggested that the crops are more prone to pest attacks now as they are not as strong due to the low soil fertility. Two main pests of the maize crops were identified in Mbatamila, stalkborers attack the growing crop and monkeys from the forests attack the maize crop at all stages of growth and even try and come into the granaries after harvest (Plate 5.1). Other pests in stored crops include weevils in stored maize. Wood ash is mixed with the maize to reduce the weevil attacks. Tobacco leaves are mixed in stored beans to reduce the pest load.

Aphids were the main problem with composite maize in Chigoneka II as well as attacking the cowpea crop. Birds ate a lot of the sorghum seeds planted.

Plate 5.1: Granary for maize storage[1]

[1]Original in colour

In Chifuwa the farmers agreed that there are different problems each year depending on the rain, crops and so on. The main pests in this village are stalkborers, elegant grasshoppers and army worms.

Sanga village has a substantial problem with monkeys. They come in from the forest and dig up planted maize seeds, dig up the growing stalks, eat the cobs when they are fully grown and even break into the granaries after harvest to steal the maize.

In each of the villages the pests mentioned were mainly for the food crops. Cotton requires pesticides and of the 110 households surveyed, 85 per cent of these households used pesticides on their cotton crops. As a cause and effect relationship it is not possible to tell if growing cotton allows a household to purchase pesticides or if the ability to source pesticides means a household can grow cotton.

It was not possible to measure crop losses from pests. However, farmers in each of the villages showed examples of poorly thriving plants from obvious pests such as termites and stalkborers. Observations of affected areas suggest that there could be a substantial loss of yield due to pests.

There is minimal knowledge of alternatives to pesticides in the villages. Weeding of crops by hand reduces competition to the crop from other plants. It is labour intensive but the normal practice. The use of chemical pesticides is reliant on the availability of cash or credit. As a result the use of pesticides is mainly restricted to cotton, and to households that can source pesticides. Therefore, control of pest species relies on two options. The first is the ability of the farmers to buy pesticides, requiring better or more accessible credit facilities or cash income. The second is to find low cost alternatives to chemical pesticides.

5.7.5. Soil Fertility

The fertility of the soil is essential for maintaining or increasing crop production. In all of the five villages continuous cultivation is now normal. The farmers are fully aware of the reduction in soil fertility that results. In Chigoneka II the villagers identified rainfall as the main cause of loss of soil fertility, although they were not clear on whether this was due to soil erosion. In both Chigoneka I and II the farmers used box ridging to stop the soil washing away. This was a technique learned from their parents who farmed fertile soils of the Lilongwe plains and used this technique for moisture retention.

As fallowing is no longer viable on a regular basis, farmers are now reliant on other means of increasing soil fertility. Artificial fertilisers are expensive. Figure 5.12 shows changes in fertiliser prices nationally in Malawi. It can be seen that the price of fertilisers rose threefold between the 1994/95 season and the 1995/96 season.

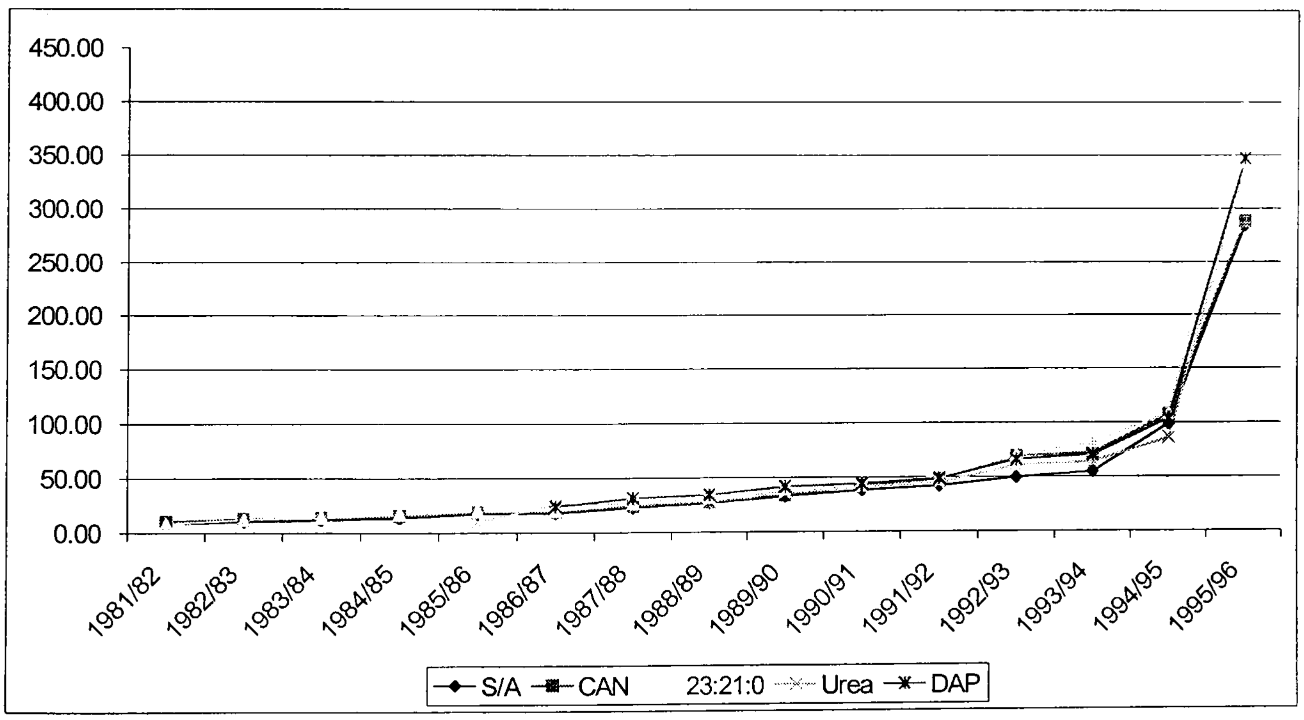

Figure 5.12 Price trends for artificial fertilisers in Malawi (Hayes, pers com).

Table 5.8 shows the number of farmers with access to artificial fertiliser within the study area. The overall usage of fertiliser is very low. Table 5.8

demonstrates that the usage of fertiliser in Chigoneka I, Chigoneka II and Sanga is considerably higher than in the other two villages. This was investigated further in the villages due to the overwhelming importance of this issue to the farmers. In both Chigoneka I and II the majority of households using fertiliser bought it with cash of their own or obtained on credit from friends or relatives. The farmers made the reasons behind this clear. The villagers had been relocated there from Lilongwe in the 1970s. Most of the villagers had family living and working in Lilongwe, which allowed access to cash, either directly from close family members, or on a loan basis. In Sanga village the majority of the farmers using fertilisers did so with credit from the MRFC. They had formed a club and had become eligible for credit. This was the only farmers' club in any of the villages formed to get credit from the MRFC. Some other farmers in Chigoneka I, Chigoneka II and Mbatamila did get credit from the MRFC. They seemed to be members of clubs formed outside of their villages. The total fertiliser usage included 17 per cent of male-headed households but only 3 per cent of female-headed households. Of the farmers using fertiliser, two were female-headed households. One of these was a woman in Chigoneka I. She farmed 0.4 ha and had been given a small amount of fertiliser by neighbour in return for some work. The other female-headed household farmed 3 ¼ ha. She was elderly but had three grown children, one who had been to university, that supported her and supplied cash for the purchase of fertilisers.

Village	Households Using Fertiliser (%)	Purchased with :		Credit from :	
		Cash	Credit	MRFC	Friends or Family
Mbatamila	2 (4%)	0	2	1	1
Chifuwa	1 (2%)	1	0	0	0
Chigoneka I	6 (15%)	2	4	1	3
Chigoneka II	9 (28%)	4	5	1	4
Sanga	13 (23%)	4	9	9	0

Table 5.8: Usage and access to fertiliser in the case study area. (Source; Questionnaire Survey)

Briefly, the evidence shows that the use of artificial fertilisers is strongly dependant on the availability of cash or credit that, due to the low levels of fertiliser usage, is problematic within the villages. Access to credit within the villages is discussed further in section 5.8.3.

The overall number of households using fertiliser is low. Alternatives to artificial fertilisers are varied, for example composting and the use of animal manure. The agroforestry promoted by PROSCARP is examined in the next chapter. Table 5.9 shows the results of a survey of the soil improving methods employed by the farmers within the villages.

It can be seen in table 5.9 that crop rotation, followed by incorporation of crop residues are the most popular soil improving methods. Possibly the most interesting result of this exercise is the fact that non project villages, Sanga and Chifuwa have the highest proportion of households not using any soil improving measures.

	Mbatamila	*Chifuwa*	Chigoneka I	Chigoneka II	*Sanga*	% of total households surveyed
Green Manure	47	6	21	19	5	20
Fallow	34	18	31	25	20	25
Crop Rotation	74	33	82	81	69	66
Animal manure	26	14	56	47	20	30
Compost	15	6	28	53	9	19
Crop residues	72	57	59	75	22	55
None	2	29	5	3	18	4

Table 5.9: Percentage of households within each village practising soil improvement methods. Source; Questionnaire survey.

Some of these techniques are related to the PROSCARP interventions. However, crop rotation is the only technique actively promoted by PROSCARP. The rest of the techniques are not actively promoted by the project and, with the possible exception of green manuring, do not require external inputs. This subject was discussed in village meetings. In Sanga village the farmers said that they were aware of some of these techniques but would require further education to carry them out. The information source of these soil improving techniques would be a useful line of future research.

Individual farmers using some of these techniques were interviewed. Animal manure was not available in enough quantity to cover much of the land. Livestock ownership is discussed in the next section. Composting was also carried out by many households but did not produce enough to add to more than a small area of land. Compost was more normally added to dimba gardens, if the household had one, rather than to the maize crops. Many farmers use crop residues as manure, which they had learned from the Field Assistant (FA), the extension agent from the MoALD promoting PROSCARP interventions in the villages. Other farmers said that they burned the residues to control pests, as well as keep the land free from snakes and rats. Due to the limitations of most of these soil improving techniques, the figures presented in Table 5.7 would appear optimistic in terms of the number of households that can maintain or increase soil fertility using these techniques.

Overall, the problems of decreasing soil fertility were stressed by all of the farmers within the study area, both at village meetings and in individual talks. Soil fertility has been declining over the lifetime of the farmers. The farmers knew that the productivity of their land was decreasing each year. However, the solution most strongly put forward was the need for artificial fertilisers. Biological methods of enhancing soil fertility were definitely seen as second best, even in the PROSCARP villages. Problems of the credit system are examined in a later section but it is clear from this section that the purchase of fertilisers is dependent on the ability to qualify for credit or a cash source. The only households in this survey that had cash for the purchase of fertiliser were households who had friends or family working outside the villages who could help them. Logically, unless credit becomes available to many more households, or farmers are able to earn a cash income on or off farm, there is little chance of the rate of artificial fertiliser usage increasing among these households. Current soil improving practices examined above are not providing a viable alternative to fertilisers. The farmers were not very enthusiastic about management and biological practices for improving soil fertility. However, there was an overall feeling that if something could be shown to be an effective replacement for artificial fertiliser then the farmers would invest time and effort.

5.7.6. Livestock Ownership

The addition of animal manure is seen as highly beneficial in all of the villages but is dependent on livestock ownership and management. Figure 5.13 shows the percentage of households in each village owning livestock. It can be seen that chickens are owned by a large number of rural households. Goats are the next most popular animals.

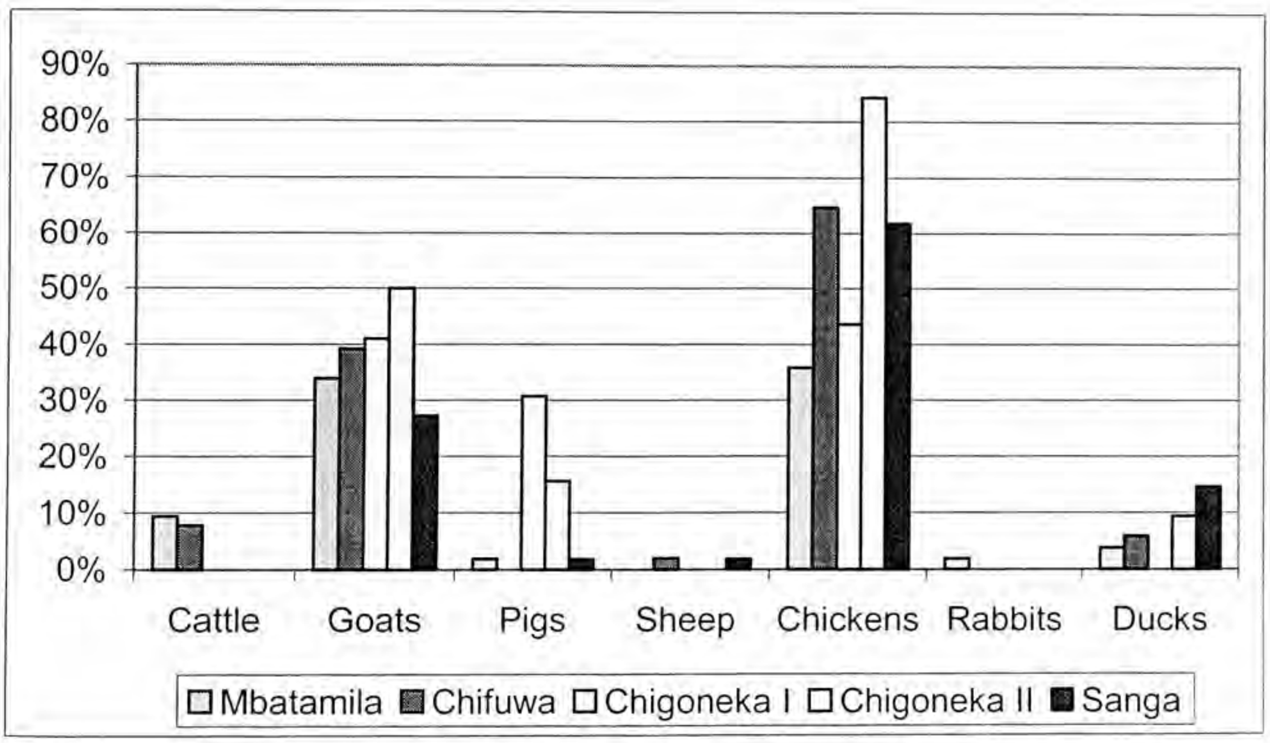

Figure 5.13: Percentage of households surveyed owning livestock. (Source; Questionnaire Survey)

Four households in Chifuwa and five households in Mbatamila own cattle. The farmers in Mbatamila were very keen to own cattle for their multipurpose products (milk, breeding, and fertiliser). However, they said that only the lucky own cattle, as most could not afford to buy a breeding animal.

Most of the livestock kept on the farms were allowed to roam freely. Two of the cattle owners had a *khola,* or enclosure for their cattle, but all were grazed some distance from the villages on common land. Goats and chickens wandered around the village. Some of the farmers said that this causes problems of livestock damage to crops. Also, logically, if the animals wander freely this will reduce the potential for the manure to be utilised on the fields.

Due to space and grazing limitations, the potential to expand livestock ownership is limited under current management practices. Improved animal husbandry, especially in terms of housing, could allow smallholder farmers to keep livestock as a more effective part of their agricultural system and at higher densities. This would require access to breeding stock, as well as training in animal husbandry.

5.7.7. Soil Erosion

In each of the villages the farmers identified soil types, sandy, clay, and loam, with sandy soils most prone to erosion and clay soils prone to waterlogging. During the participatory mapping session the farmers were asked to identify the predominant soil type in the village and to point out any areas that differ in composition or texture. As shown in Chapter 2 the soil type (sand, silt or clay) influences the erodibility of the soil. Mbatamila has predominately sandy soils with some clay and loam back towards the hills. Chigoneka I and II are predominately clay soils. Chifuwa also has more sandy soils and Sanga is mainly sandy loam with some clay soils. Erosion problems are directly related to the degree of slope and can be exacerbated by soil type. Chigoneka I and II have the highest slope of the five villages and the predominantly clay soils have areas of quite severe erosion.

Sanga village, along with Chigoneka I and II, is on the rift valley escarpment and has a high proportion of sloping land. Most of the trees in the area have been removed and the farmers in the village were very aware of the relationship between the removal of the trees and the increase of soil erosion. Three quarters of the land in the village is cultivated, the rest is too steep. Four farmers agreed that they were cultivating land that is too steep but hope that they can get some yield from it due to lack of alternative land. Nobody at the meetings said they carried out any measures to reduce soil erosion apart from planting their crops on ridges. They try to follow the contours because the FA said it was the correct way to grow crops. Nobody present could explain why. The consensus of opinion by the farmers at the meetings was that education in measures to prevent soil erosion would be necessary and very welcome. Farmers in Chifuwa village also felt that they needed to be educated on techniques for the control of soil erosion as there were currently no erosion control methods used in the village.

Soil erosion in Chigoneka I and II was recognised as a problem before ADDFOOD / PROSCARP interventions. Box ridging was used to try and prevent soil loss.

A Mbatamila village meeting showed mixed feelings about the effects and importance of soil erosion. There was a division among households that farmed marginal or sloping lands and among households with flatter more fertile soils. This gives rise to the concepts of different priorities between households in a village. In the ranking exercise soil erosion was ranked as the lowest priority. However, this was due to the fact that the majority of farmers present at this exercise farmed land with minimal slope and therefore had fewer concerns with soil erosion. This also shows how the concerns of the minority can be overlooked in a village exercise such as problem ranking. The questionnaire survey was used to get a better picture of problems of soil erosion at the individual farm level. Figure 5.14 shows the percentage of households surveyed who considered that they had no soil erosion, minor problems of soil erosion or major soil erosion.

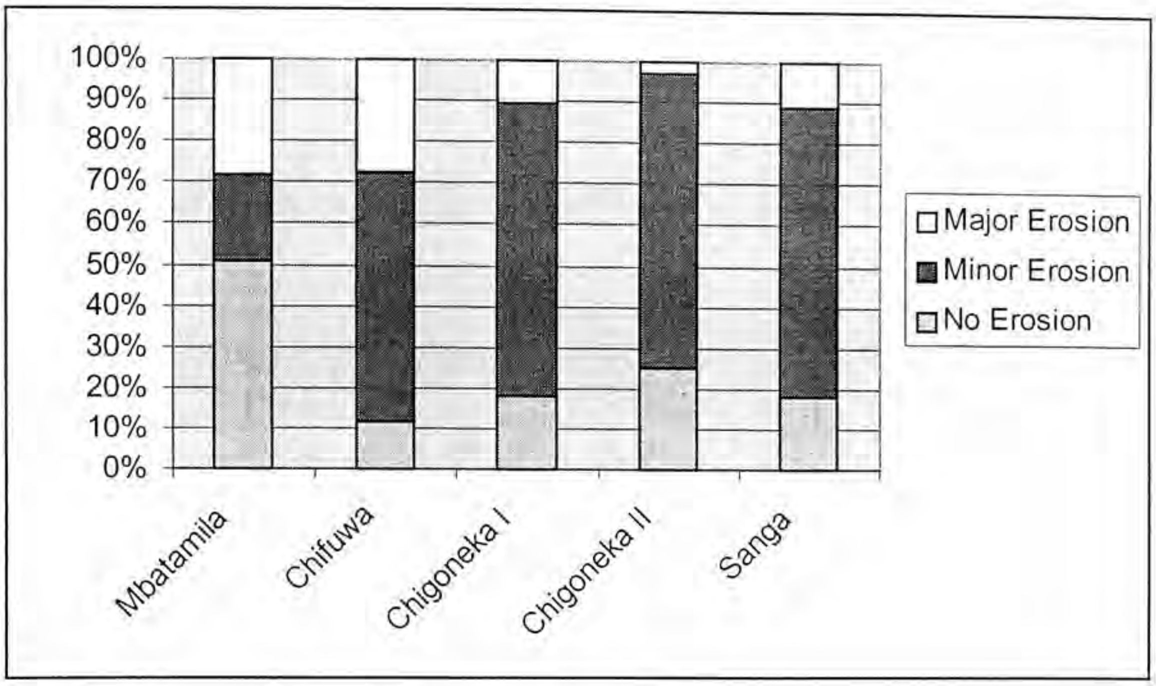

Figure 5.14: Percentage of households in each village experiencing levels of soil erosion. (Source;questionnire survey).

In Mbatamila there were a high percentage (51 per cent) of farmers who did not feel that they had any problem of soil erosion of their land. However 28 per cent of the farmers felt they had major soil erosion on the land they were farming. This verifies the findings of the village meeting, that the majority of farmers had flat land and no obvious signs of soil erosion. The farmers with severe erosion problems were at the back of the village in the hills surrounding the village. Chifuwa also had a relatively high percentage (27 per cent) of farmers who experienced major erosion problems. Again, this was explained by the farmers as being the people who farmed the edge of the village near the hills.

In Naluva catchment, similar figures were recorded for the three villages. Despite these villages being in a much hillier area there were less farmers in this catchment recording serious problems of erosion than in Mbatamila catchment and a higher number reporting minor problems of soil erosion. As farming practices are the same in both catchments, the problems of soil erosion may be exacerbated in Mbatamila by the sandy soils, while the soil type in Naluva may provide an extra degree of protection against erosion.

This section points to the need to be aware of the individual priorities of households. Logically, households that perceive a problem with soil erosion are much more likely to try and take remedial measures than a farmer that does not have any perception of soil erosion on the land that she or he farms. Mbatamila village was the only village to rank soil erosion as a problem at all in the problem ranking exercise. Figure 5.14 shows that farmers are aware of soil erosion on their land. However, it is perceived as much less important than issues such as soil fertility or water supply or the fulfilment of immediate food requirements.

5.8. Cash

Cash provides the opportunity not only to purchase food and household supplies when necessary but also is necessary for the purchase of inputs for crops, such as seeds, fertilisers and pesticides. In this section, firstly, the opportunities to earn cash are examined, followed by the availability of credit facilities for agricultural inputs.

5.8.1. Cash from Crops

Returns

There are two major cash crops grown in the study villages, which are tobacco and cotton. Figure 5.15 shows all the crops grown in each village and the percentage of households that grow them.

It can be seen from this table that maize is grown by every household (the households that did not produce maize last season were newly set up and the land was not ready in time for planting). Cotton is the next most popular crop, planted by between 35 per cent and 65 per cent of households in the study site. When questioned farmers said that the price they received for selling cotton had risen in the last few years so they were happy to plant it again. Smallholders have been encouraged to grow tobacco since 1990 when state policy changed to permit the smallholder sector to plant and sell tobacco. Tobacco is mainly grown by householders in Chigoneka I and II (Plate 5.2). This was discussed in a focus group discussion in both of these

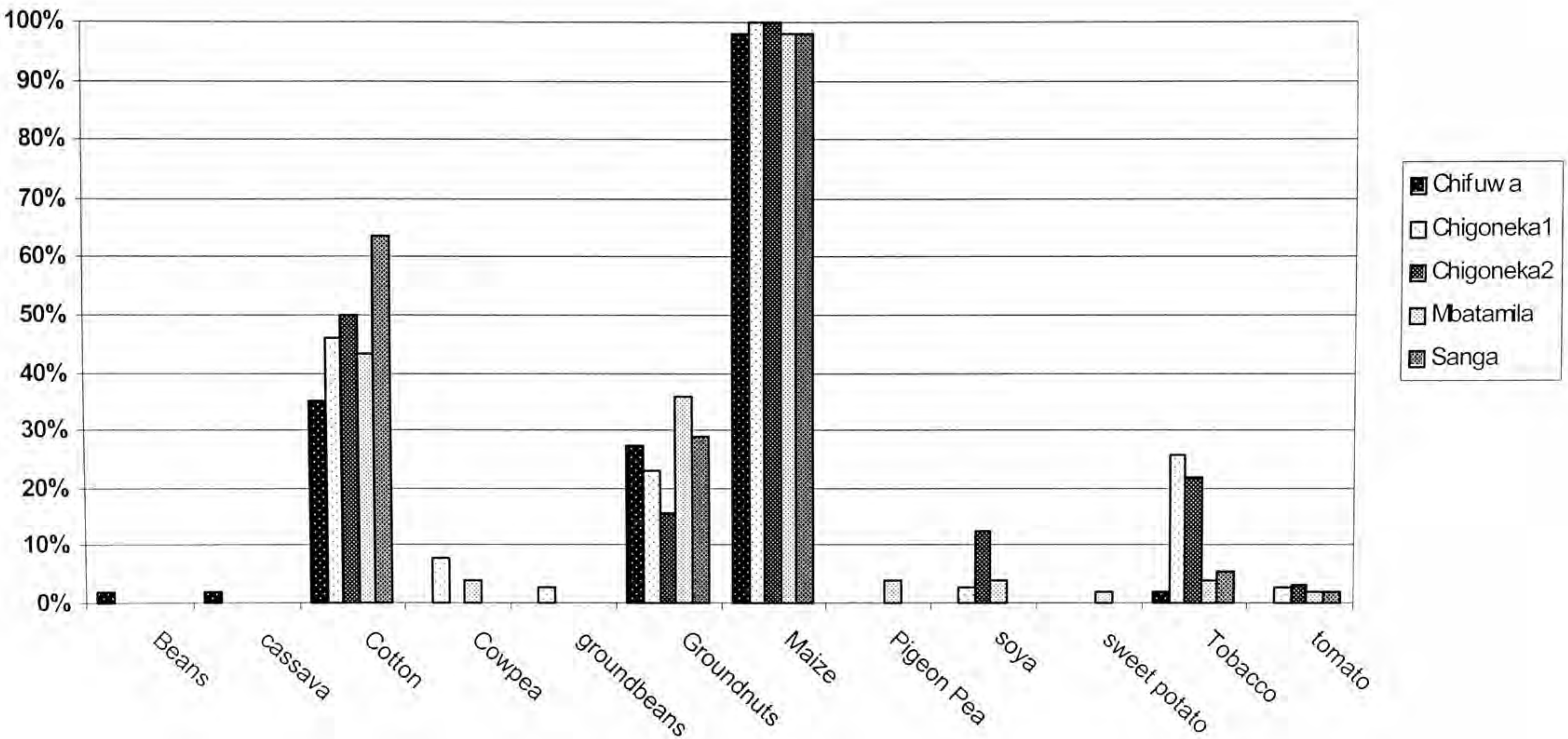

Figure 5.15 Percentage of households growing named crops in each village. Source (questionnaire survey)

Plate 5.2: Tobacco (*Nicotiana tabacum*) crop in Chigoneka II[2]

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[2] Original in colour

villages. Some of the farmers had experience of growing tobacco before. This season is the first season for either of the villages to grow tobacco. The setting up of the tobacco nurseries and knowledge is shared among the farms that have land or money to invest in the production of tobacco. A small number of farmers in the other three villages also have started to grow tobacco on an individual basis.

The farmers in Chigoneka I and II were very interested in diversifying their crop production. As well as tobacco they were very interested in increasing the amount of groundnuts grown. However, seeds were in short supply and, at least for this year, they could not increase the amount sown.

87% of farmers growing tobacco have holdings between 0.5 and 1.5 hectares. No farmers with land holdings under 0.5 ha grew tobacco. Of the farmers growing cotton, only 7% have holdings under 0.5 Ha. 65% have holdings between 0.5 and 1.5 ha. This would indicate that very small smallholders are limited in their ability to produce cash crops.

5.8.2. Alternative sources of Income

Income from sources other than crops provides a safety net when either crop production is poor or prices are depressed.

Figure 5.16 shows the results of participatory exercises in each village to determine what, if any, activities were pursued to provide an alternative source of income.

One of the most important aspects of Figure 5.16 is the number of different income sources used by the villagers in this study. There seems to be quite a strong assumption that smallholder farmers only participate in the cash economy in the sale of cash crops. Ganyu labour is practised in all of the villages and is based on a system of bartering.

Activity	Male/ Female	Timing	Mbatamila	Chifuwa	Chigoneka I	Chigoneka II	Sanga
Ganyu labour	♂ ♀	Rainy season	●	●	●	●	●
Weaving mats	♂ ♀	Dry season/ all year	●	●	●	●	●
Brewing beer	♀	Dry season	●	●	●	●	●
Fishing	♂	All year	●	●	●		●
Cooking mandasi cakes	♀	Dry season/ all year	●	●	●	●	●
Cutting grass for sale	♂ ♀	Dry season	●	●	●	●	●
Making charcoal	♂ ♀	Dry season			●		●
Selling livestock	♂ ♀	All year	●	●	●		●
Making brooms	♂ ♀	All year		●			
Selling vegetables from garden	♂ ♀	Dry season/ all year		●	●	●	●
Making clay pots	♂ ♀	Dry season					●
Butcher	♂	All year				●	

Figure 5.16: Alternative sources of income showing occupation, gender of person usually earning and time of year income is earned. Source; Participatory exercises from five study villages.

Activity	Male/ Female	Timing	Mbatamila	Chifuwa	Chigoneka I	Chigoneka II	Sanga
Work in towns	♂ ♀	All year		●		●	●
Buying and selling tomatoes	♀	Dry season					●
Making baskets	♂	Dry season	●				●
Selling bananas	♂ ♀	May - Oct					●
Carpentry	♂	All year			●		●
Receive money from family	♂ ♀	All year		●	●		●
Own buisness	♂ ♀	All year		●		●	●
Cutting firewood for sale	♂ ♀	Dry season/ all year	●	●			●
Building Work	♂	all year				●	
Drawing Water	♀	Dry Season				●	
Repairing Radios	♂	all year				●	

Figure 5.16: continued Alternative sources of income showing occupation, gender of person usually earning and time of year income is earned. Source; Participatory exercises from five study villages.

work for food. All of the other sources of income are primarily to earn cash income.

The farmers in Sanga village rely primarily on charcoal making as an alternative source of income. Fishing in the Lilongwe River also used to provide income but the Forestry Department has forbidden them to continue with this practice. Charcoal making is also the most common source of income in Chigoneka I and II. This is becoming more difficult over time as the supplies of wood are becoming exhausted. Farmers in Chigoneka I are now using a mixture of the remaining trees around the village and tree stumps that they must dig up. Once these are finished they will have to find an alternative source of income. However, none of the farmers could suggest such an alternative

In Chifuwa and Mbatamila charcoal making was not carried out at all. Weaving mats and baskets for sale was widely practised in these two villages. The mats are sold by the side of the road. The other important source of income was from fishing.

The differences in income sources between the two catchments are based on opportunity. The proximity of Mbatamila catchment to Lake Malawi allows farmers to take advantage of fishing opportunities. In addition, the reeds needed for weaving of mats are easily available in this area. Charcoal making as the main source of income in Naluva catchment appeared to be due to the initial availability of trees for this work.

Although there is a wide diversity in income sources the majority of these enterprises returned very small amounts of cash. The majority of these enterprises were undertaken to buy food during times of food shortage. It was not possible to ascertain exact incomes from the different ventures. However, the majority response to questions about income was that it had to provide just enough to buy food for the family, although this was not always the case. All of the farmers would like to be able to earn more cash but were severely limited by lack of opportunities locally.

Alternative sources of income were seen as critical to the year-round survival of many of the farm families and, unless agricultural productivity is increased substantially, the reliance on alternative income sources seems likely to become even more important. However, the current limitations in earning opportunities are considerable. The role of livelihood diversification in rural areas and potential future opportunities to increase income would appear to be a very useful area of further research.

5.8.3. Credit

Credit should be available to farmers through the Malawi Rural Finance Company (MRFC) explored in Chapter 3. Of the households surveyed, 13 farmers, or less than 6% of the total, obtained credit though the MRFC. All of these households were male-headed households. Although there were two farmers in Chigoneka II that did obtain credit from the MRFC, they were not present at the meeting at which it was discussed. According to the farmers at the meeting, they were part of a farmer group outside of the village. The farmers that were present explained that a message from the MRFC had come to the village through the FA about the credit facilities available. However, this involved a deposit of MK6 per month (approximately UK£0.05p at that time) for six months at which point they would become members and be able to obtain credit. None of the farmers joined. Some stated that they were not eligible due to defaults on credit with the precursor to MRFC. Overall a general feeling of distrust of the company and its motives was given.

In Mbatamila village the same results were obtained. However, the farmers here were much angrier about the situation. Under the government credit scheme that finished in 1993 there were five farmers' clubs set up specifically for the members to obtain credit. Under the MRFC, which took over from the government credit scheme, it is no longer possible to get credit as the farmers are not able to raise the deposit to become members. Only one of the farmers surveyed in Mbatamila was a member of MRFC.

In Sanga there was a farmers' club that received credit from the MRFC. The meeting in Sanga where credit facilities were discussed was held after the other four villages. Due to the overwhelming feelings of distrust and anger towards the MRFC in the other villages, the members of the farmers' club in Sanga were interviewed. Some of the members of this club were asked their opinions on the availability of credit and why they were happy to deal with the MRFC. They all had holdings of over 0.6 ha. Each farmer grew either cotton or tobacco as a cash crop. Each of them also worked outside the farm on income generating activities (charcoal making, carpentry, selling livestock). They had been in a farmers' club prior to the formation of the MRFC, had not defaulted on any loans, and were therefore eligible for credit. They were all confident of being able to repay the borrowings, except in case of drought. These farmers were the better-off farmers in the village, although it was be difficult to ascertain whether they were better off because they had access to credit, or whether the fact that they were better off allowed them the access to credit.

Farmers in all of the villages felt that credit facilities were essential to improve their crop performances. It would enable them to purchase seeds, fertilisers and pesticides essential to increase the productivity of their land. However, the MRFC would have to build up the trust and knowledge of most of the farmers before they would become members. Many of the smallholders do have problems of food insecurity and limited crop production. It is difficult to see how these smaller farmers would be able to repay credit unless the productivity of their land was increased. Also, uncertain crop yields due to the dependence on rainfall could result in high default rates unless alternatives to a cash crop income were available.

5.9. Household Issues

5.9.1. Disease

Diseases most commonly occurring in the villages were Malaria, Diphtheria, Diarrhoea, colds and flu (sometimes leading to pneumonia) and roundworms. There was recently an outbreak of Cholera in Chigoneka II.

Malaria is one of the main causes of death among adults according to the people interviewed in all of the villages. Malaria is one of the leading health problems in Africa south of the Sahara. Almost all the 550 million people in the region run the risk of malaria. The disease attacks between 270 and 480 million people and kills between 1.5 and 2.7 million each year (World Health Organisation, 1999). One million deaths among children under five years of age are attributed to malaria alone or in combination with other diseases. Countries in tropical Africa account for more than 90% of the total malaria incidence and the great majority of malaria deaths (World Health Organisation, 1999).

HIV and AIDS is a very delicate subject and were not discussed at any of the meetings, however, nationally, the spread of the HIV virus and the incidence of AIDS related deaths is high and increasing. It was not possible to get an estimate of the rate of HIV infection in the region. Medecins Sans Frontieres (MSF), active in AIDS prevention and education in Malawi, estimate that nearly 7 per cent of the population currently suffer from AIDS. The most affected are the 20-40 year old group (Medecins Sans Frontieres, 1997). The US Bureau of the Census estimates that, in 1996, the rate of HIV infection was as high as 70 per cent of "high risk[2]" individuals in urban areas. The rate of infection in "low risk[3]" rural individuals was approximately 16 per cent. (US Bureau of the Census, 1998). Various outcomes of the AIDS pandemic have been identified. The life expectancy in Malawi has fallen from 45 years in 1990 to 40 years in 1997 and can expect a further drop of 1.8 years by 2010 (US Bureau of the Census, 1998). This disease must drastically affect the future of Malawi. Apart from the loss of people from the workforce, and the associated negative impact on the economy, there are implications for healthcare costs and availability, as well as the social and community factors as families lose members to this disease. In 1996 the US Bureau of the Census estimated that there would be 1 million AIDS orphans in Malawi by 2000, and by 2010 an estimated 60 per cent children under 5 years of age being HIV positive (US Bureau of the Census, 1998). These figures are horrifying and the seriousness of the HIV/AIDS pandemic cannot be ignored, even in lower risk rural areas.

Access to medical assistance is a major issue in all of the villages. The two main concerns were the distance travelled and the cost of medicines. In Mbatamila catchment the nearest hospital is in Salima, approximately 15 kilometres. There is a clinic within walking distance but it charges for medical services as well as medicine so is not used very often. In Naluva catchment the nearest hospital is also Salima, which is expensive to get to as well as the cost of medicines. There is a free clinic but it is too far away to be of practical benefit and does not usually have any medicines anyway. Most of the people relied on local healers or so called black medicine.

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[2] High risk is defined by the US Bureau of the Census as prostitutes and clients, STD patients, or other persons with known risk factors

More people suffer from diseases during the rainy season, a fact mentioned in all of the villages. This is due to factors related to the causal factors for the diseases as well as the lowered resistance to disease by the villagers due to food shortages before the harvest and poor weather conditions. This is a vicious circle as the main labour requirements for agricultural production are during the rainy season from December to May (see figure 5.11). Illness at this time prevents or slows work in the fields. In women's meetings in each of the villages this was cited as a particular problem as there is no other person to carry out the work and reduced yields or crop failures can result.

5.9.2. Water supply

The availability of a clean, protected water source is an important safeguard against disease. Water in the villages can come from several sources. Unprotected rivers and lakes, hand dug wells and boreholes are the sources for the villagers within the study area. The women collect the water twice a day. The distance to the water source and the amount of time waiting to collect water can severely impede women in terms of time available for other chores (see section 5.11 for a discussion of gender issues).

There are four shallow wells in Mbatamila. They are 4 – 5 metres deep. Usually one or two of them run dry. At the time they were dug they provided sufficient water but as the number of households have increased so has the demand for water, and queues at the wells can often exceed 1.5 hours. Some of the women at the meeting said that they had started to fetch water from the river again to reduce the amount of the time that the chore takes.

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[3] Low risk individuals are pregnant women, blood donors or other persons with non known risk factors.

Chifuwa has a shallow well that was hand dug in 1952. It does not dry up but due to the volume of people using this water source there are often queues of up to two hours.

In Chigoneka I there are two shallow wells located in the village. The first was dug in 1995 and the second in 1996. Both were supplied with pumps but one of the pumps is now broken. Both of the wells often run dry by the end of September/October each year and water must be fetched from the river. However, the rains come soon after this so if the wells dry up there is normally only a short period before they are replenished by the rains.

Chigoneka II has a shallow well dug by the villagers near the river in 1994. The Water Department provided a pump which is now broken and water is lifted by means of tins attached to strings. The well runs dry by July or August and needs to be dug deeper. This requires machinery not available in the village, as the ground is too hard to deepen the well with traditional hand tools. During the time that the well is dry the villagers dig shallow wells along the riverbank for water.

Sanga village has one unprotected shallow well that runs dry every year normally for several months before the rains start. Water is obtained from the river that runs through the village. However, in a normal year the river also dries up. The only option then is to carry water from the Lilongwe River approximately 3-4 kms from the village.

Chigoneka I did not rank water supply as a problem in the problem ranking exercise but the other four villages all ranked water as one of three most important problems (Table 5.2). The solution to the problem of water supply is the provision of sufficient wells deep enough not to run dry and a reliable working pump. This would require access to machinery and parts that are currently not available in the villages and beyond the financial capacity of the villagers.

5.9.3. Access to markets

Tobacco grown in Chigoneka I and II is Burley tobacco. The tobacco is dried and sold to local traders who then sell it on the auction floors in Lilongwe about 100 Kilometres from the villages. All the other crops sold for cash, including maize and cotton, are sold to the Agricultural Development and Marketing Corporation (ADMARC). ADMARC is also the source of seeds and other agricultural inputs. Some vegetables, such as tomatoes, are sold in local village markets. The distance to the markets can be a problem. In Naluva catchment there is an ADMARC depot approximately 1.5 kilometres away. Villagers in Mbatamila catchment have to travel to Chipoka, which is 4-5 kilometres away, to the nearest ADMARC.

The introduction of tobacco as a cash crop in Chigoneka I and II is a result of the changes in government policy. Until 1990 legislation barred smallholders from growing burley and flue cured tobacco varieties in an attempt to protect the commercial estates and also to encourage smallholders to concentrate on maize production (Devereux, 1997). The lifting of this ban has seen the production of tobacco treble, the increase coming mainly from the smallholder sector (Economist Intelligence Unit, 1996). A focus group meeting was held with tobacco growers in Chigoneka I and II. These farmers had started to grow tobacco as the price of cotton was not, in their opinion, very stable and tobacco represented an opportunity to provide more cash. They saw the opening up of the tobacco market as a good opportunity for smallholder farmers to earn cash income. However, the benefits in these villages at least were limited as all the farmers growing tobacco had holdings of over 0.5 hectares and all were male. Therefore the benefits of the liberalisation of the tobacco industry are not widespread.

5.10. Seasonality

The influence of the seasons directly determines work cycles and other aspects of day-to-day issues within smallholder farming communities. Franks (1992) highlighted the potential constraints associated with labour demands and seasonality issues. This was examined in relation to the establishment and management of alleycropping within the PROSCARP project by Leach and Marsland (1994), who found that these issues can have a profound effect on rural households. The Leach and Marsland report (1994) concentrated on the impact of seasonality and labour issues specifically related to PROSCARP activities. However, the impacts on all aspects of rural living were examined in this research. This research examines a number of inter related aspects including rainfall, labour demands, water resources, disease and food availability. On farm labour demands are discussed in section 5.7.3 and figure 5.11, showing labour requirements through the farm cycle with a peak demand between September and January.

Water resources, diseases, food availability and rainfall are all discussed in earlier sections but figure 5.17 brings together all of these issues. From figure 5.17 it can be seen that the rainy season is the time of peak labour demand in agricultural work as this is the growing season. Rivers and wells often run dry prior to the rainy season and are recharged slowly during this time. So prior to and during the start of the rainy season water is often drawn from unprotected sources. This is one of the causal factors for an increase in the incidences of diarrhoea. Malaria is also prevalent during the rainy season. The number of meals eaten per day falls prior to harvest. In many cases the increased incidence of disease in conjunction with reduced calorie intake reduces the work capacity of the farmers at the time when they crucially involved in crop production activities. The final problem is the availability of Ganyu labour. This mostly involves working on neighbouring or estate farms in lieu of food. This work also occurs most frequently during the

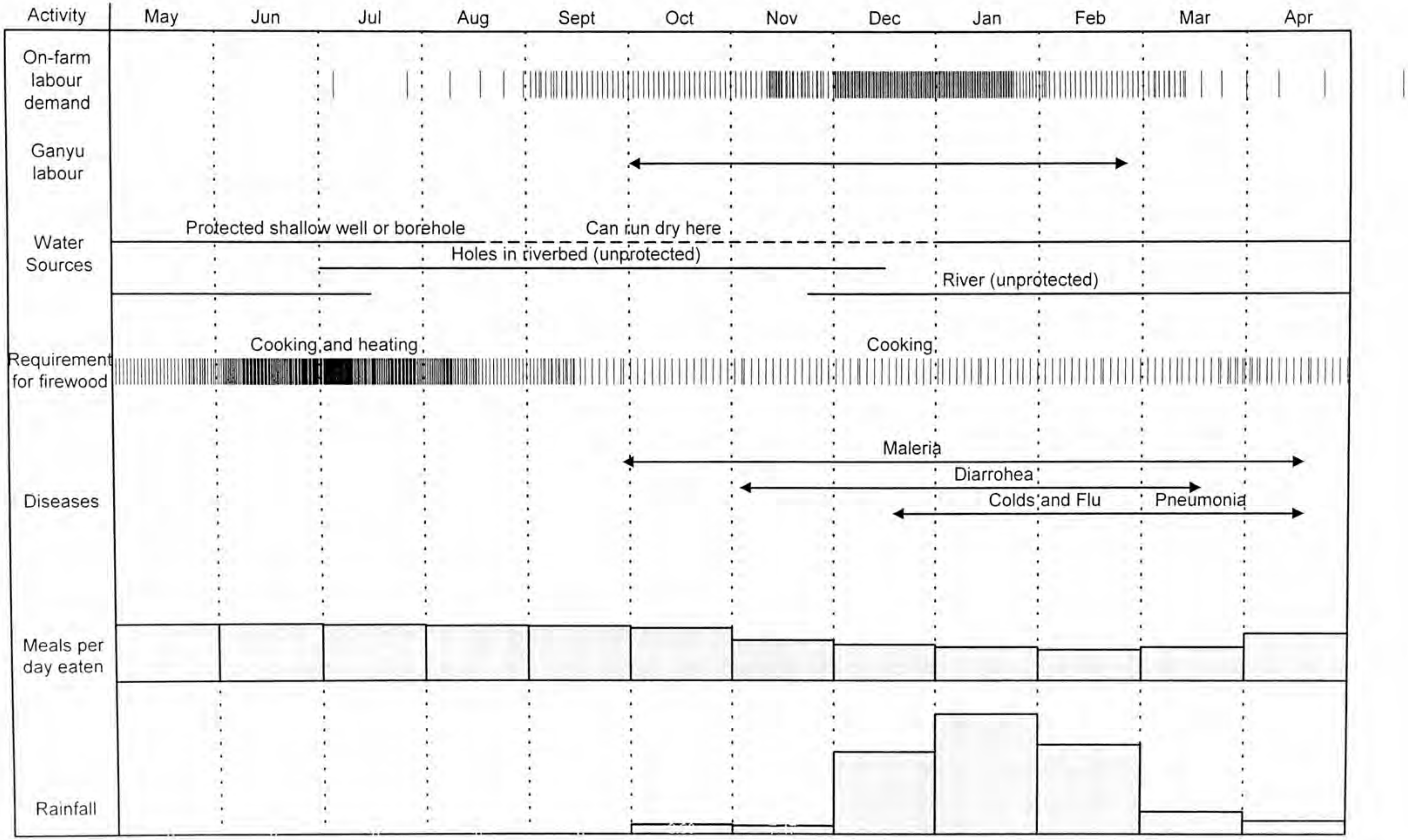

Figure 5.17: Seasonal Calendar showing relationship between different aspects of smallholder livelihoods (Source; Participatory Exercise in each village, Focus Group; All villagers

rainy season and takes farmers away from their own land at critical times.

These aspects of seasonal peaks and lows in agricultural production and livelihood issues can be a vicious circle as reduced time spent in the fields for whatever reason can lead to decreases in crop yield, less food and a higher requirement in the following season to carry out Ganyu labour. Any extra work that is introduced during the peak labour season for improved agricultural practices would need to be carefully monitored to ascertain labour requirements and the capacity for labour deficit households to undertake the work.

5.11. Gender Issues

All of the above problems are magnified in female-headed households. The percentage of female-headed households is shown in Table 5.10.

Village	Male Headed Households	Female Headed Households
Mbatamila	81%	19%
Chifuwa	69%	31%
Chigoneka I	69%	31%
Chigoneka II	69%	31%
Sanga	73%	27%
Average (all villages)	73%	27%

Table 5.10: Percentage of male and female-headed households in each village (source; questionnaire survey).

Group discussions were carried out with women's focus groups in each of the villages. Water collection was highlighted as a major issue as, although it ranked quite highly in the problem ranking sessions, it is a problem that specifically concerned the women as it is they that must collect the water every day. In addition, firewood, which was not ranked in any of the villages as a major concern, was discussed in depth. Dewees (1995) identifies a difference between an economic scarcity of woodfuel and a physical scarcity of woodfuel. Woodfuel is currently physically present within walking distance of all of the villages. Most of the women collect firewood once or twice a week as necessary. None of the villages had any substantial amounts of trees for firewood within the villages. In Sanga wood is collected from a hillside over two kilometres away. The women leave in groups at daylight and return with a full load at around 12 o clock. This must continue even during the growing season when time and labour is extremely short. In each village it was noted that the women must walk further each year as the closer trees are stripped and burnt. The average distance walked by the women in each village to collect firewood is shown in Table 5.11.

The average distance walked to collect firewood has increased noticeably over the last twenty years. Firewood used to be available within, or very close to, the villages. Increasing numbers of households collecting firewood and clearance of land for agricultural purposes has decimated nearby supplies of firewood. All of the women agreed on this. So if current trends continue, woodfuel will become physically scarce.

Village	Average distance walked to collect firewood (kms)
Mbatamila	1.0
Chifuwa	1.3
Chigoneka I	2.4
Chigoneka II	1.1
Sanga	1.6

Table 5.11 Average distance walked by women in each village to collect firewood (source; questionnaire survey)

The economic availability of woodfuel is seen by Dewees (1995) as the ability of a household to allocate land, labour or capital resources to utilise woodfuel. None of the women at the village meetings purchased fuel. The labour costs of fuelwood collection are high (up to six hours once or twice a week). In labour constrained households, especially female-headed households, the labour costs of firewood collection are very high. The women expressed strong levels of interest in planting trees within the villages for fuelwood. Chifuwa, Chigoneka II and Sanga all are visited by Forest Officers from the Forestry Department. They encourage planting of Msangu (*Faidherbia albida*) and Bluegums (*Eucalyptus* spp.) and a variety of other trees by providing seeds and advice. The timber is multipurpose but includes trees for fuelwood. The women found this to be beneficial but said that the forestry workers concentrated more on the men in the village. Female-headed households did not really benefit from this scheme and would like it to focus on households that have problems of labour for collection of fuel far from the village.

5.12. Discussion

At the beginning of this chapter an outline was suggested for what conditions would be required for a sustainable agricultural production system at farm level. Each of these is examined in turn, in relation to the conditions prevailing in the villages researched.

1. Provision of adequate returns to maintain or increase living standards. Agricultural produce is the main output from the systems examined. Although in each of the villages there are other sources of income outside of crops, these are varied and very few would be a long-term sustainable alternative to farming. Problems with current crop production include difficulties in obtaining inputs due to lack of cash and poor credit facilities, poor yields due to crop varieties, climatic conditions, poor soil fertility and pests. There is a strong reliance on crops production both for food supply and cash crops for income. Food security is a major issue in these villages. Only 9% of households surveyed ate 3 meals per day throughout the year. 56 % of households reduced to two meals per day when food ran short and 35% of households were reduced to one meal per day when supplies of food run short, normally before the harvest is due. A source of clean water and a pit latrine are recognised as very important for health and hygiene reasons. Many of the households in this study did not have access to these all the

time and some not at all. Disease is a problem and access to medical facilities, even the most basic, is limited by cash. The returns from current rural livelihoods in each of these five villages might provide enough to maintain standards of living but for the majority it does not allow for the necessary increases to provide many of the basic human rights.

2. Maintenance of the social fabric of the village or community.
Specifically in Chigoneka I and II where many maintained contacts after their relocation from Lilongwe there are many farmers leaving to work in Lilongwe. This leaves many female-headed households to cope on their own. Most of the people interviewed or speaking at the group meetings could not see a future in farming. Obtaining an education for their children was seen as the best possible future in the hope that they might obtain work outside of the villages.

3. Protection and conservation of the natural resource base.
Soil erosion is recognised as a problem. However, the lack of soil fertility is of much greater direct concern as it has an obvious impact on crop yields. Although some soil improving measures are carried out (not including PROSCARP activities), these are mainly for soil fertility and may have some effect on soil erosion control. Fallowing of the land is the traditional method of soil protection. This is no longer possible due to population pressures. The farmers are aware of the problems inherent in this but have no options. The relentless need for firewood has reduced the availability of firewood sources to the point that the women have to travel further to gather it. Although no measurements of soil erosion were carried out there were physical signs of soil erosion and soil degradation. There were no signs that the natural resource base on which agricultural production is dependant is not degrading.

4. Maintenance or increases in long term production potential.
At the present time in these villages the farmers felt that yields from crops are erratic and decreasing due to lack of soil fertility and uncertain rainfall.

There are no immediate signs of potential to increase the production potential of the land available to the farming households.

If these four very basic conditions for sustainable agriculture are used it is not possible to accept that the farming households in this research are either currently farming in a sustainable fashion or that they are moving towards a more sustainable form of agricultural production.

The elements of the agricultural system that can be manipulated are the management of soil, water and pests. At the present time most of the farm households would be reliant on external inputs to increase their yields. Due to lack of cash income and poor credit facilities this is not currently possible for the majority of the farm households.

The next chapter examines the response to the PROSCARP project and assesses if it responds to the priorities of the households as outlined above.

Chapter 6 Farmer Adoption of PROSCARP Interventions

6.1. Introduction

The previous chapter gives an overview of the agricultural and rural livelihood issues directly related to the five villages in the study area. This chapter follows on by examining the PROSCARP interventions in the three villages covered by PROSCARP. The background and techniques employed by PROSCARP are presented in chapter 4. Adoption or non-adoption of the project activities are discussed here as well as overall farmer opinion of the PROSCARP project and how it relates to their requirements and priorities.

In respect to the implementation of PROSCARP activities the PROSCARP project makes the following assumptions (Government of Malawi/ European Union, 1995):

- Introduction of new seeds and planting materials is not hampered by government regulations,
- New varieties will be accepted by farmers,
- Water tables do not fall below the reach of propagated technologies.

The following are general assumptions and are said to need monitoring (Government of Malawi/ European Union, 1995):

- The target group will adopt the promoted technologies,
- Budgetary restraints in accordance with the ceilings of the Public Sector Investment Programme do not delay the implementation of the project.

It can be seen from these assumptions that the acceptance of the technologies and cropping strategies by the farmers is a vital part to the success of the project. This research examines farmer acceptance and adoption of the technologies promoted as well as the benefits felt. Research in the two villages not covered by PROSCARP is used both to identify potential for project technologies to spread to neighbouring villages and also to provide a comparison between project and non-project villages.

The data presented here are again a combination of qualitative data collected through participatory techniques, and quantitative, through the use of a questionnaire survey.

According to PROSCARP documentation "The risk of implementing without flexibility a single national strategy is reduced significantly by offering a basket of technologies and leaving it to the farmers to determine the level and speed of adoption, and by the introduction of the participatory extension methodology in the MoALD" (Government of Malawi/ European Union, 1995). The technologies offered are examined in the following sections in turn.

6.2. Adoption of PROSCARP Techniques

PROSCARP promotes technologies in each of the following areas:

- Soil Conservation
    - Physical Conservation
        - Contour planting
    - Biological Conservation
        - Alleycropping
        - Systematic interplanting
        - Vetiver Grass
        - Minimum Tillage
        - Trees on Farms
- Water, Sanitation and Hygiene

In each of the three villages involved in the project the number of households who actively participate in the project was surveyed. The results of this are presented in Table 6.1. Mbatamila has been involved in the project since its inception in the 1989/90 growing season. The other two villages have only been involved since 1995/96 growing season. This has a direct influence on the results obtained in this research as Mbatamila has had more time for the benefits or problems of the project activities to be felt. Also when ADDFOOD started in Mbatamila village there were elements of the ADDFOOD approach that have changed considerably since that time, specifically the use of incentives, which were withdrawn in 1993/4. There have been few major changes in project strategies since PROSCARP began its activities in Chigoneka I and II. This allows the effects of the projects' recent implementation strategies to be assessed.

Name	Project Involvement	Number of Households	Percentage of Households per Village
Mbatamila	Yes	48	91%
Mbatamila	No	5	9%
Chifuwa	No	51	100%
Chigoneka I	Yes	28	70%
Chigoneka I	No	12	30%
Chigoneka II	Yes	27	84%
Chigoneka II	No	5	16%
Sanga	No	54	100%
Total		230	

Table 6.1: The total numbers of households who feel they actively participate in the PROSCARP project. (Source: Questionnaire Survey)

Mbatamila has the highest proportion of households involved in the project. Since the project started more people have become involved over time (ADD officers, pers com).

Analyses of the characteristics of the head of households were carried out to ascertain if either age, gender or education level of the decision maker influenced participation in the PROSACRP project. No relationship was found between participation in PROSCARP and either the age of the head of household (χ^2 = 4.237, d.f. = 2, P = 0.120), the gender of the head of household (χ^2 = 0.505, df = 1, P = 0.477), the education level of the household head (Kruskal-Wallis = 0.877, df=3, P=0.831) or the land holding of the household (Kruskal-Wallis = 5.562, df=3, P=0.135)

This is a measurement of households who feel that they participate in the PROSCARP project. It does not take account of the level of participation or the technologies adopted. However, it does point to the fact that households are equally likely to participate in PROSCARP regardless of age, gender, education, or farm size.

In this case, it can be said that the project is reaching all the members of the community in which it is active. A major consideration avoiding the "person" or "elite bias" put forward by Chambers (1983) as one of six biases impeding outsiders' contact with rural poverty. However, this is a measurement of the people who consider themselves to be participants in the PROSCARP project and does not take account of ability or willingness to accept or implement the various strategies promoted by the project. In the next sections household uptake of the specific project strategies will be examined in turn.

6.3. Physical Conservation

The main thrust of the physical soil conservation measures promoted by PROSCARP is the pegging out (using an A-frame) and construction of marker ridges (every sixth ridge) with the ridges in between realigned to the marker ridges.

6.3.1. Marker Ridges

Pegging of Marker Ridges

During a general group meeting in each of the project villages, the farmers were asked if they pegged their own land. None of the farmers had done so. All of them had the help of the FA to use the A-frame and peg the ridges. PROSCARP has made an effort to train the farmers to use the A-frame. When the farmers were asked if they had received training in the use of the A-frame the majority of the farmers in each village said that they had received training. However, they still did not feel confident to peg out their own land without the presence of the FA. This has considerable implications for the longer-term success of the project and the rate of technology uptake. If the FA is required for every farmer to peg his or her land it will not be possible for farmers to adopt contour farming if the project funding stops or the FA is too busy. In Chigoneka I there was one farmer at the meeting that had not pegged his land and was waiting for the FA. In Chigoneka II the same situation was recorded. Five farmers had not pegged any of their land and all said it was because they needed help from the FA. In Mbatamila two out of six farmers at the meeting that had not pegged their land were waiting for the FA. The other four did not give a reason for not pegging their land. Overall, there was a distinct lack of confidence among the farmers about this technique. Much more effort would be required to train the farmers and allow them to build their confidence. At the current time the ownership of this technology is still firmly in the hands of the project (and the extension agents). The importance of this is examined later in terms of the power relationships between the project and the beneficiaries and the consequences for full participation of the farmers in the development process.

Construction of Marker Ridges and Ridge Realignment

The number and total amount of marker ridges constructed in each of the villages is shown in Figure 6.1.

Mbatamila village has been involved in the project for the longest time and has the highest percentage of households participating in the project (Table 6.1). However, there is a much lower proportion of households within this village that have a high proportion of marker ridges constructed on their land than the other project villages. Chigoneka I and II although recent entrants to the project have both got nearly twice as many households who have completed marker ridge construction. When marker ridge construction was discussed at the village meetings in each of the villages there were two explanations suggested for the successful construction of marker ridges,

- Help from the Field Assistant (FA) to mark out the ridges using the A-frame, and

➢ Perceived necessity by the farmer for the construction of marker ridges.

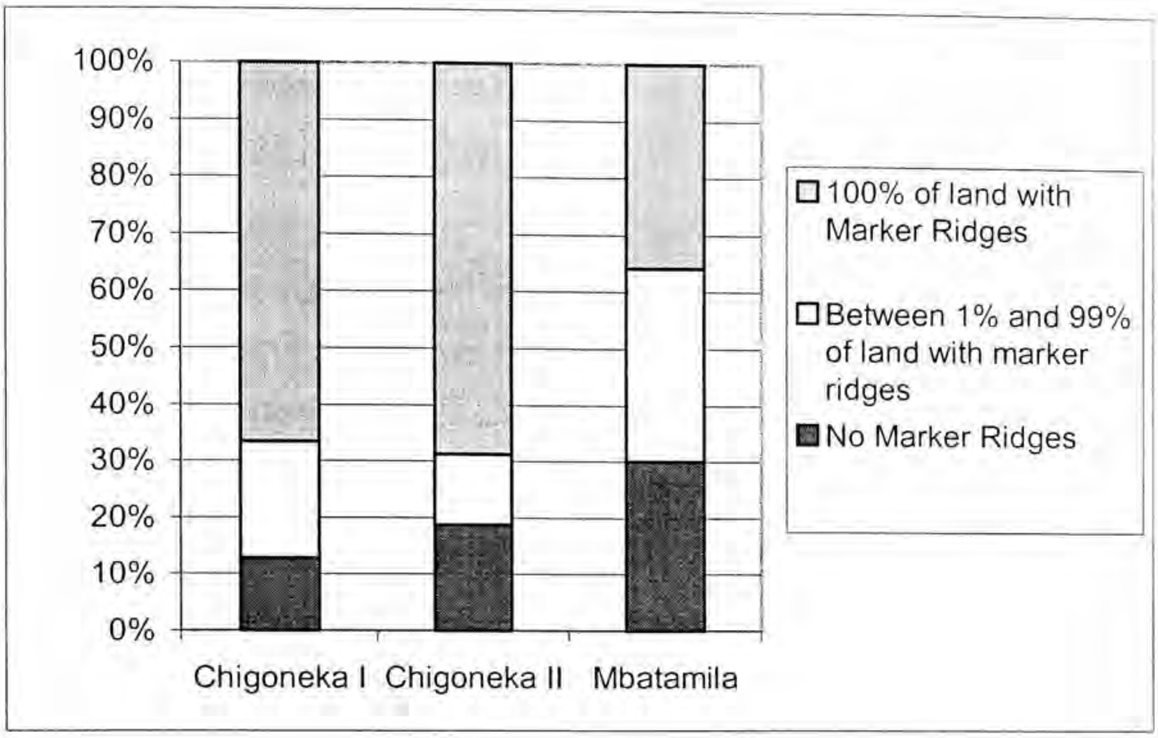

Figure 6.1: Percentage of Households surveyed within each village that have no marker ridges constructed, 1-99% of their land containing marker ridges, or all of their land with marker ridges constructed. (Source: Questionnaire survey)

In terms of the perceived necessity for the construction of marker ridges, Mbatamila is situated on less hilly ground and the majority of farmers who were in favour of the construction of marker ridges were those who had land adjacent to either the hills at the back of the village or along the river banks where there is more slope. One farmer in Mbatamila village raised the problem of waterlogging of crops planted on the contour. After the meeting he showed some examples of this on his land. The soils were clay and in a low-lying area of the village. Water from recent heavy rains was held between the ridges and the maize plants had failed entirely in patches due to waterlogging. This points to an interpretation of the lower number of marker ridges constructed in Mbatamila village being due to certain farmers feeling that contour planting is not required. In Chigoneka I and II no farmers raised this point. All of the farmers that had not yet finished constructing marker ridges were going to do so when the land was pegged.

Despite the problems of labour availability in female headed households, highlighted in the previous chapter, there was no significant difference between gender of the household head and the percentage of land with marker ridges planted (χ^2= 0.646, df = 2, p = 0.724). This topic was discussed with female groups. The marking and construction of marker ridges is carried out during the dry season. This is the season with the lowest labour requirements for agricultural work and so allows more time to complete the work. It appears that the major labour shortages felt by the female-headed households are during the growing season as shown in Chapter 5. During this time crop production must take place as well as daily chores. Also this is the time when most off-farm employment can be found in larger estates.

Realignment of ridges between the marker ridges was not a problem for any of the farmers.

One of the problems of contour farming was highlighted in Chigoneka II. This is the limited effectiveness of the technique on steeper slopes, or if the rainfall runoff is allowed to concentrate before it reaches the area under contour ridges. One female farmer brought me to see one of her fields. The field was hilly with slopes of up to 30%. The neighbouring farmer had land above and beside this field and did not plant on contour ridges. As his crops were planted with the slope the runoff was such that the rainfall had severely broken through the female farmer's ridges (Plate 6.1). The result was the loss of maize crops at this point as well as the need to realign and rebuild the ridges. There are two implications from this. The first is that soil conservation, in terms of physical structures, is most effective if carried out at the watershed (or micro watershed) level. The second is that contour farming is not as effective on steeper slopes. Although cultivation of slopes this steep is not recommended, many of the smallholder farmers do not have a choice as there is no alternative land available to them. Recommended measures for cultivation of steeper marginal lands focus on greater mechanical measures, such as terracing (Hudson, 1995). There are no

Plate 6.1: Concentrated rainfall runoff breaks through contour ridges, reducing yields of maize[3].

[3] Original in colour

alternatives to contour planting promoted by PROSCARP and no farmers in any of the villages were aware of any other techniques.

In both non-project villages, Sanga and Chifuwa, there were a small number of farmers that said they had marker ridges (Sanga 15 households, Chifuwa 10 households). Some of these farmers were interviewed to follow up on why they had used this technique and how they had learned it. In Chifuwa Village two farmers were interviewed. They had learned the technique from the FA (who is the same person promoting PROSCARP techniques in neighbouring Mbatamila village) and had managed to get some *Leucaena leucocephala* to plant on them. However, the FA could only help for a short time and stopped totally last year. There is not enough *Leucaena leucocephala* to plant on their marker ridges and most are now planting sorghum and some *Faidherbia albida* instead. They are waiting for somebody else to come and help to teach them more. When asked if any of the farmers had learned how to use the A- frame to mark the contour lines they all agreed that they could not and would require assistance to continue or finish the marker ridges.

In Sanga village there were three farmers interviewed that claimed to have marker ridges constructed. None of the three farmers had actually marked out ridges on the contour but had estimated where the ridges should go and had prepared their land so that their ridges went across the slope, approximating contour planting. They said that the FA had told them it was the correct way to farm and had tried to follow this technique, despite no way to precisely mark the contour lines.

Each of the farmers interviewed in Sanga and Chifuwa were keen to try new techniques that might help to increase the productivity of their farms. The main problem is that contour planting is dependent on the use of an A-frame or similar technique to mark out the contour lines to which the ridges can be realigned. The FA for each catchment does not have the time to carry out the marking of the contour lines in villages outside PROSCARP interventions and so Sanga and Chifuwa villages are not able to benefit directly from this practice.

The benefits of contour planting are well understood in the PROSCARP villages. In each village during the meetings the construction and benefits of contour planting were well explained by the farmers present. In Chifuwa and Sanga the farmers had less knowledge of the practical aspects of marker ridge construction and ridge realignment. However, the general impression was that farmers were enthusiastic to learn more about the benefits of contour planting but would need to lean about the A-frame.

Contour farming is not a major change in agricultural techniques for the farmers. The overall impression from the farmers is one of enthusiasm to adopt contour farming. There are some limitations. The first is the ability of the farmers to construct and use an A-frame (or alternative) to peg out the contour lines. The second is the appropriateness of contour planting on steep slopes. At the present time there is no alternative available to the farmers. The final limitation is the usefulness of runoff control in limited areas. PROSCARP operates in selected areas, not necessarily a watershed or micro catchment. The control of soil erosion is therefore limited to these areas, unless education and extension messages reach other farmers. These are currently at a very low level in the non-PROSCARP villages included in this study.

6.4. Biological Conservation

Table 6.2 shows the agroforestry species used in the villages with their main uses in agroforestry and within the villages. Their origin, benefits and any particular problems are also listed (Bunderson *et al*, 1995).

6.4.1. Alleycropping

The main agroforestry species promoted by the project for alleycropping has been *Leucaena leucocephala*. It is a fast growing, drought resistant,.

Species	Origin	Potential Agroforestry uses	Uses	Benefits	Potential problems	Altitude
Leucaena leucocephala	Exotic but naturalised through the tropics	Alleycropping Boundary Systematic Interplanting Fodder bank Short term fallow Contour vegetation strip Woodlot	Biomass/ green manure Fodder Fuelwood Construction	Drought resistant Fast growing Leguminous	Termite attack Psyllid attack Browsing by animals Poor growth in acidic or low nutrient soils	Low to medium
Glyricidia sepium	Exotic	Alleycropping Boundary Systematic Interplanting Fodder bank Short term fallow Contour vegetation strip Woodlot	Green manure/biomass Fuelwood and construction Live fencing	Nitrogen fixing	Potentially poisonous to monogastrics	Wide range
Tephrosia vogelii	Indigenous	Alleycropping Boundary Systematic Interplanting Short term fallow Contour vegetation strip	Biomass/green manure Insecticide Can be used to kill fish for eating	Easy establishment Fast growing Suitable for wide range of soils Nitrogen fixing	Short lived Susceptibility to root nematodes Poor response to pruning	Medium to high

Table 6.2: Agroforestry species used in the study area; their main uses and drawbacks (Bunderson *et al*, 1995).

Species	Origin	Potential Agroforestry uses	Uses	Benefits	Potential problems	Altitude
Sesbania sesban	Indigenous	Alleycropping Boundary Systematic Interplanting Short term fallow Fodder bank Contour vegetation strip	Biomass/green manure Fuelwood Fodder Medicinal	Easy establishment Fast growing Deep root system and nitrogen fixing	Short lived Susceptibility to root nematodes Poor response to pruning	Wide range
Senna spectablis	Exotic	Alleycropping Boundary Systematic Interplanting Short term fallow Contour vegetation strip	Biomass/green manure Fuelwood Light construction		Potentially poisonous	Wide range
Faidherbia albida	Indigenous	Boundary Systematic Interplanting Short term fallow Woodlot	Multiple Loss of leaves adds soil fertility under canopy Fuelwood, Fodder Edible seeds Medicinal, Shade	Increase in soil fertility due to leave loss Leaves lost during growing season	Long growth time (7- 10 years) Sensitive tap root	Wide range
Vetivera zizanoides	Introduced	Erosion control Stabilise embankments/ gullies	Stabilise marker ridges, Gully control Thatching	Propagates from slips Drought resistant		Wide range

Table 6.2 continued: Agroforestry species used in the study area; their main uses and drawbacks (Bunderson *et al*, 1995).

nitrogen fixing tree that can be used for green manure, soil conservation and livestock feed (Young, 1989; Bunderson *et al*, 1995). *Leucaena* is used for alleycropping, planted on the marker ridges (at 4.5 metres to 5.4 metres apart depending on the degree of slope), to improve soil fertility both directly through nitrogen fixation and indirectly through pruning and application of biomass as a green manure. *Leucaena* also helps stabilise the marker ridges (Bunderson *et al*, 1995). *Leucaena* has been used in Mbatamila village since project start-up in 1989. Over 66% of marker ridges planted in Mbatamila use *Leucaena* (40% and 45% respectively for Chigoneka I and II). Although the farmers present at the meeting were aware of the benefits of growing *Leucaena* they expressed serious reservations about the species citing problems of seed shortages, establishment and survival. The use of biomass from *Leucaena* as an alternative to artificial fertiliser was seen as a good alternative. However, very few of the farmers present had managed to harvest sufficient biomass to achieve noticeable improvements in crop yield. In Mbatamila there were problems with termite attacks on *Leucaena leucocephala.* They had asked PROSCARP for pesticides to control the termites but these were not provided. Psyllid attack was also commonly referred to. Hoekstra *et al* (1995) recommends the planting of *Leucaena* be reduced or stopped entirely, in response to the severity of Psyllid attacks throughout the country. There is the potential for natural predators of the Psyllid to increase in numbers, in response to increased prey, reducing the impact of the Psyllid. This is not proven at present though (Hoekstra *et al*, 1995) and is of little practical benefit to farmers currently with *Leucaena* on their land experiencing problems of Psyllid attack.

Other agroforestry species promoted are *Sesbania sesban*, *Glyricidia sepium*, *Senna spectablis* and *Tephrosia vogelii*. All of these are leguminous, contributing to soil fertility. Pigeon pea (*Cajunas cajun*) is also used as a soil improving crop and is planted by some farmers on marker ridges.

Plate 6.2: Maize alleycropped with *Tephrosia vogelii*[1].

[1] Original in colour

Plate 6.3: ***Cajanus cajan*** **(Pigenon Pea) planted on marker ridges, undersown with direst sown** ***Senna spectabilis***[1]**.**

[1] Original in colour

In Mbatamila farmers were happy to plant *Glyricidia sepium* and *Senna spectablis* for green manure and soil improvement but also encountered difficulties with initial establishment of the plants and yield of biomass. In Mbatamila the farmers were not optimistic about the yields of biomass from the alleycropping species becoming a realistic fertiliser alternative. However, as cash or credit to purchase artificial fertilisers was not available to most of the farmers present there seemed to be an overall willingness to keep trying on the basis that any improvement in soil fertility was welcome.

It is more difficult to ascertain how successful agroforestry species are in Chigoneka I and II as these villages have only been active in the project since 1995/96. 1995/96 was a year of very low rainfall followed by 1996/97 that had abnormally high rainfall. This has presented difficulties in tree establishment and for those that have established agroforestry species on their land, it is too soon to show any real benefit. The farmers were enthusiastic about the potential benefits, as the majority of farmers are unable to obtain credit for the purchase of artificial fertilisers.

The potential benefits from agroforestry are again very well understood by all of the farmers present at the meetings in the three project villages. As artificial fertiliser is very difficult to get, the potential for agroforestry to increase the fertility of the soil is paramount. The major problems identified by the farmers involved in alleycropping are of a practical nature, such as problems of establishment, pest losses and insufficient biomass yield. Although the focus of PROSCARP is moving away from alleycropping, there is still a strong emphasis (and expectations) among the farmers on maintaining or increasing the levels of soil fertility enhancing species on their land. This is supported by the project, although Vetiver grass is now the species of choice for planting on the marker ridges.

6.4.2. Systematic Interplanting

The one species that was unanimously recognised as being of great benefit in all villages is *Faidherbia albida* or locally known as Msangu. This tree is native to Malawi (Bunderson *et al*, 1995) and occurs in every village. This tree loses nutrient rich leaves during the rainy season improving soil fertility whilst allowing crop growth under the canopy. Yields of maize crops under the canopy can show increases of 50 to 250 per cent compared to crops outside the canopy area. (Bunderson *et al*, 1995) and increases from 50 to 100 per cent in soil organic matter and nitrogen have been reported under the canopy (Young, 1989). As the tree species is already present in the villages, if in limited numbers, the benefits are easily seen in the healthy vigorous growth of maize under the canopy. The PROSCARP project is seeking to establish systematic intercropping of Msangu at 10 metre by 10 metre intervals. Other benefits of Msangu include its use for fuelwood and building materials. Some of the problems associated with Msangu are the long-term return on investment as tree maturation is 7 to 10 years. Also care is needed in planting out as the tap root is sensitive. The majority of farmers appeared enthusiastic about this tree species with the reservation that artificial fertiliser would be needed to bridge the gap between tree planting and tree maturation. Many farmers already had one or more Msangu trees growing on their land and had kept them because of their soil improving capabilities.

6.4.3. Vetiver Grass

Vetiver grass (*Vetiveria zizanioides*) has been introduced in the last two growing seasons as a drought resistant, deep-rooted perennial grass species. It is mainly used for soil stabilisation on marker ridges, steep slopes and gullies.

The other main use of vetiver grass in the villages was for gully stabilisation. Some examples of this were shown during the transect walks in Chigoneka I and II. As the grass had been planted during the current growing season, it was too soon to establish the success of the technique in the more badly eroded areas. However, the farmers that had used it for gully stabilisation were keen on the potential benefits and would be happy to plant more.

Plate 6.4: Systematic interplanting of *Faidherbia albida*[5]

Plate 6.5: Vetiver nursery[5]

[5] Original in Colour

Farmers are currently being paid by the PROSCARP project to plant Vetiver nurseries, making it difficult to ascertain farmer opinion of this strategy. There were some logistical problems with the setting up of the vetiver nurseries in the Chigoneka II. Three nurseries were attempted. One man had to drop out completely as his house blew down and he did not have enough time to work on a nursery. The distribution of the vetiver for the nurseries was late due to transport problems at PROSCARP. A woman farmer had given up on the vetiver arriving and had planted the land with maize. Therefore when the vetiver arrived she had to plant it between the maize and did not expect to receive full (if any) payment for the nursery. She was quite angry about this. The chairman of the Catchment Committee had managed to plant a 70 metre by 9 metre nursery.

During a group meeting at Mbatamila the benefits and problems of vetiver were discussed in depth. The main objection to the species was the lack of alternative uses. It is not a nitrogen fixing species, does not provide biomass and is not suitable for animal fodder.

Overall, the farmers were well aware of the benefits of vetiver in terms of preventing soil loss and were willing to plant vetiver on their marker ridges. However, there is no direct benefit on soil fertility and the farmers were still left with the problem of finding alternatives to increase soil fertility.

6.4.4. Minimum Tillage

At the time of this research the only minimum tillage trial within the study area had been established on the chairman's land in Mbatamila. To date no explanation had been given to the farmers about the purpose or benefit of planting in this way. It is not a technique that the farmers are at all familiar with. A person was expected to come to the village soon after to begin training in the technique. On explaining it to them in outline there was a very mixed reaction with less labour seen as one of the possible benefits. The negative aspect expressed by the farmers is that it would be too difficult to control pests with this system. The recent advent of minimum tillage made it impossible to gauge the farmers' reactions accurately. The farmers had not been approached by any of the PROSCARP staff before the trial had commenced and no research appears to have been carried out previously by PROSCARP to assess the acceptability of minimum tillage to the farmers. The on-farm trials will establish many of the practical problems and benefits of minimum tillage. However, there does not appear to be any input from the farmers at all in the design and implementation of the trials. This issue is investigated further in the following chapter.

6.4.5. Trees on Farms

The change of focus of PROSCARP from alleycropping to a more general "trees on farms" happened at approximately the same time as this research. Therefore, there were no interventions in the villages directly related to this strategy. Farmers' knowledge of tree species and the importance of trees within the villages were investigated in detail and the results are presented in chapter 8.

6.5. Crop Diversification

The subject of crop diversification caused confusion in the village meetings. According to PROSCARP farmers were provided with seeds for soya, cowpeas, pigeon peas and, in some cases, improved maize varieties. These are distributed on a revolving fund basis and repaid in cash or kind with interest. At the village meetings in the project villages the farmers were asked whether they had received seeds, and if so, which crops, and if they had paid them back.

In Chigoneka II the farmers had received composite maize last season and some cowpea seeds. However the yields on the cowpea were especially low due to aphid attack and the maize yields were only what could be expected from unfertilised maize. The farmers were rather angry with the whole issue of seed distribution. They felt that it was a ridiculous situation for PROSCARP to give out maize seed but no fertiliser to help grow it. Also, the cowpea seeds proved susceptible to aphids and the farmers felt that they were wasting their time growing a crop prone to aphid attack without the appropriate pesticides to control the problem. All the farmers felt that the seeds had been given for free. Nobody mentioned the repayment of seeds. When questioned about this the general reply was that if they were given seeds to grow crops but not the necessary inputs to obtain good yields from the crop it was not possible to repay the seeds given. In the current season a high proportion of the village had received soya seeds. A very small number had received cowpea and sorghum seed. Nobody had received maize or pigeon pea at all.

In Chigoneka I composite maize was distributed in the previous season. This season some soya seed was received but not all farmers got seeds. The farmers did not specify if there was a reason for the choice of farmers for seed distribution. In this village the seeds were also seen as free. The farmers agreed that they would be better off if the project distributed fertiliser instead of seeds (or as well as seeds!).

At the meeting in Mbatamila village, the farmers present explained that seeds are delivered to the village and distributed to the farmers by the catchment committee and the FA. They are provided by PROSCARP and must be paid back with 20 per cent interest. However, they also said that if there was a problem with reduced yields due to drought, pest attack, or other problems, there is no penalty for not repaying the seeds to PROSCARP. This contrasted strongly with the attitude of the farmers in Naluva catchment. Last season composite maize and cowpeas were distributed. The cowpea crop suffered from aphid attack and very poor yields were obtained. The farmers had requested pesticides from PROSCARP but none was provided. This season soya was widely distributed.

Overall, there is apparent confusion surrounding the issue of crop seeds in terms of whether they are free, to be repaid, an interim measure until local seed multiplication happens, or just an incentive to carry out PROSCARP work. Farmers in Naluva catchment were very negative about seed distribution. Although the farmers in Mbatamila were aware of the conditions under which the seeds were distributed, there appeared to be little motivation for seed repayment. The consequences of the crop diversification programme are hard to establish, but the impression given by the farmers was that the seeds were considered to be free inputs. Poor yields were returned by many of the farmers growing cowpea would not appear to be a great encouragement for the investment of seeds and labour in the next season to continue with this crop.

6.6. Water, Sanitation and Hygiene

6.6.1. Health and Nutrition

The Women's Home Assistant carries out visits to the project villages. The programme includes education for the women about household hygiene, rubbish disposal, food preparation, nutrition and childcare. Discussions were held with a female focus group in each of the project villages. They were enthusiastic about this aspect of the project as they could see the benefits in reduced diseases and child health from implementing the information gained in the education programme. However, visits from the Women's Home Assistant have now become infrequent. In Chigoneka I and II there were no visits at all during 1996. This has led to a lot of discontent as the women are now very aware of the benefits of the programme since it has started but have been denied the chance to learn more. This reflects badly on the whole of PROSCARP as the Woman's Home Assistant is representing the project and the failure of this aspect of the project to be consistent reduces the overall opinion of PROSCARP held by the women in the villages.

6.6.2. Sanitation

PROSCARP also promotes the use of pit latrines and the provision of sanitation platforms (sanplats) to cover the pit latrines. PROSCARP encourages households to dig a pit latrine and has provided materials for the construction of sanplats. Table 6.3 shows the percentage of households who have dug a pit latrine and those who have a covered pit latrine. The villages in the PROSCARP project show no noticeable difference in the total number of pit latrines from the non-project villages. However, the number of sanplats installed is much higher in the project villages due to the requirement for materials to make the sanplats.

	Percentage of Households with uncovered pit latrine	Percentage of households with pit latrine and sanplats	Total Houses with sanitation
Mbatamila	15.1%	35.8%	50.9%
Chifuwa	60.8%	5.9%	66.7%
Chigoneka I	10.3%	38.5%	48.7%
Chigoneka II	18.8%	53.1%	71.9%
Sanga	52.7%	0.0%	52.7%

Table 6.3: Percentage of covered and uncovered pit latrines in the villages. Source: Questionnaire Survey.

The benefits of sanitation were well understood. In Mbatamila it was mentioned that the pit latrines and sanplats were sufficient when they were initially constructed. However, due to the increasing number of households and people it would be necessary to construct more. The provision of sanitation facilities is a very positive aspect of PROSCARP within the villages. However, the construction of sanplats is still dependent on the provision of inputs from PROSCARP. Where more sanplats are required, the villagers are waiting for PROSCARP to help them. There appeared to be a very passive acceptance of the need for external help to construct sanplats. This may be due to the limited importance placed on sanplats within the villages. Farmers that were not involved in the sanitation programme in the village may have a pit latrine but none of these farmers showed any enthusiasm for investing time or effort to construct sanplats. The implications of this are the fact that the farmers are happy enough to have a sanplat if the project helps. However, there does not appear to be an overall change in the attitudes of the farmers regarding the necessity of a covered pit latrine.

6.6.3. Water

In Mbatamila in 1992 four shallow wells were dug in the village with the help of the PROSCARP programme. They are 4 – 5 metres deep. Usually one or two of them run dry every dry season. At the time they were dug they provided sufficient water but as the number of households have increased so has the demand for water and queues at the wells can often exceed 1.5 hours. Some people now use the river again, which is not a safe source of water.

In Chigoneka I there are two shallow wells located in the village. The first was dug in 1995 and the second in 1996. Both were supplied with pumps but one of the pumps is now broken. PROSCARP was responsible for the boreholes and the pumps. Both of the wells run dry by the end of September/October each year and water must be fetched from the river until the rains come.

Chigoneka II has a shallow well dug by the villagers near the river in 1994. The water department provided a pump which is now broken and water is lifted by means of tins attached to strings. The well runs dry by July or August each year and needs to be dug deeper. This requires external help, as the ground is too hard to deepen the well with traditional hand tools. During the time that the well is dry the villagers dig shallow wells along the riverbank for water.

In all of the project villages, one of the main benefits of PROSCARP was seen as the provision of shallow wells. This is despite the fact that the wells do not always provide water all year around and are not always sufficient for the amount of people in the village, as well as the problems with broken pumps and repairs.

6.7. Potential Constraints to Adoption

6.7.1. Labour

Due to the peaks in demand for on farm labour, discussed in Chapter 5, the labour requirements for the implementation of PROSCARP techniques was discussed in detail with focus groups of farmers who had constructed marker ridges and who had at least one species of agroforestry tree on his or her holding. The demand for labour within the farm household peaks between the end of September and the middle of February. This also coincides with the availability of Ganyu labour. Figure 6.2 shows the timings of agroforestry interventions during the farming year. The main clash of labour demands between agricultural crops and agroforestry crops is the planting out of seedlings from the nursery or the direct sowing of agroforestry seeds. This takes place during the main growing season. In Mbatamila it was not suggested as a major labour concern as the farmers were mainly filling in gaps in their hedges rather than establishing a new hedgerow. In Chigoneka I and II the majority of farmers were still in the establishment phase for their alleycropping hedges. This is due to the recent entry of these villages into the project, as well as the poor establishment of hedges due to drought in the previous years. In these cases the four out of seven farmers present at the Chigoneka I meeting felt that they had too much work to do for this year. All of the farmers said they were aware that once the hedges were fully established the amount of labour required would be substantially reduced. Application of leaf biomass was not considered by the farmers to cause a problem, as it was a high priority in terms of soil fertility. The pruning of the hedges did not receive as high as priority as the application of biomass. The hedges should be pruned in their second year. The first pruning should be within two weeks of crop planting, the second after 6 – 8 weeks if shading of, or competition with the crop is noticed. The last pruning should be just after crop harvest (Bunderson *et al*, 1995). These do not correspond particularly well with the timing of pruning given by the farmers. One farmer in Mbatamila said that he pruned his hedges when the FA told

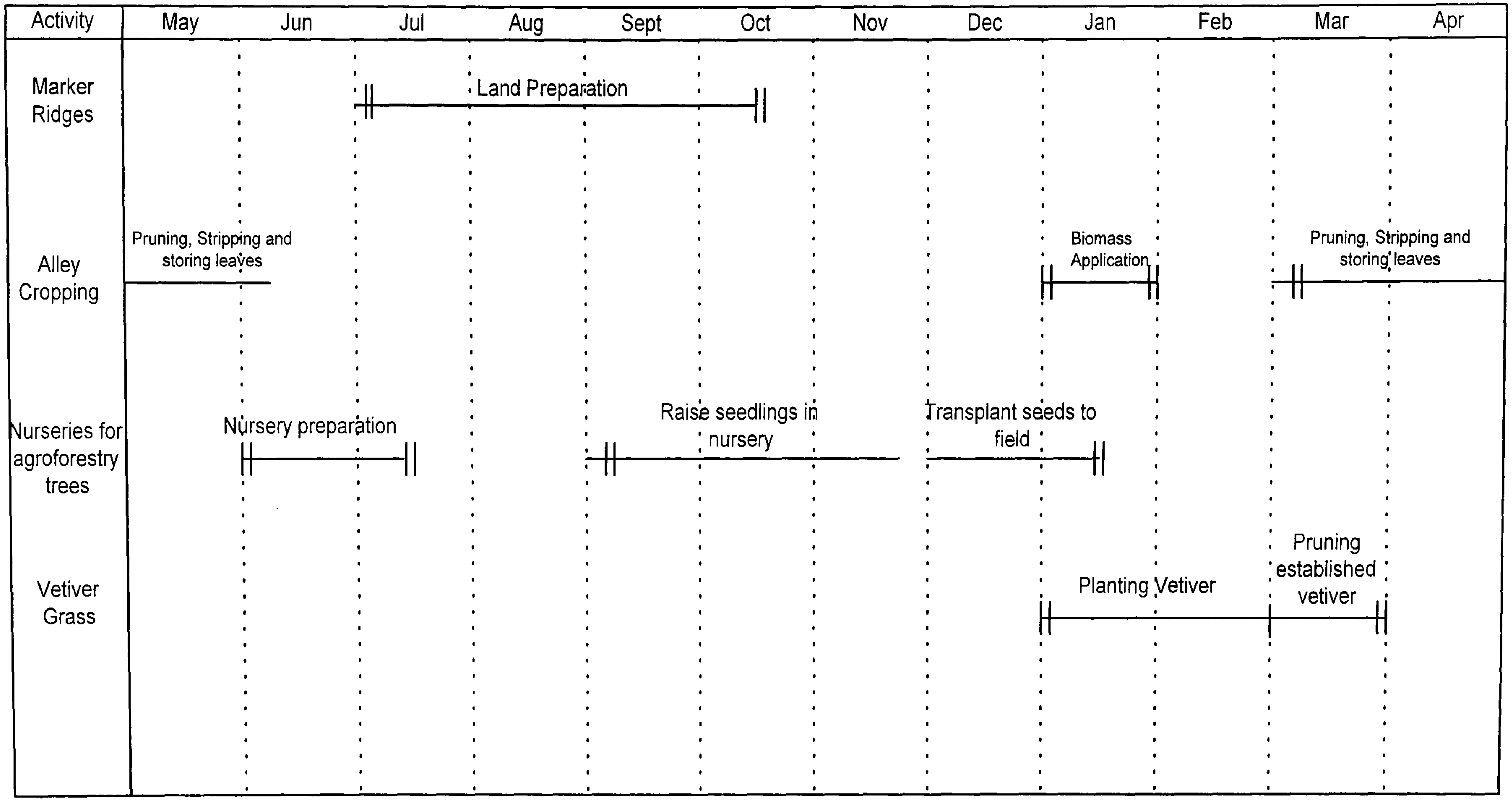

Figure 6.2: Seasonal Calendar for PROSCARP interventions from Chigoneka II (Source; Participatory Exercise, Focus Group; All villagers)

him to. Nobody else disagreed. In Chigoneka I the farmers were less concerned with pruning and gave it more priority after the main growing season when they were not so busy. Farmers in Chigoneka II said that they pruned their hedges between March and May as shown in Figure 6.2.

The issue of labour constraints to adoption indicates that the labour demands of the current interventions in the villages are not a major problem. The labour requirements in the first year of adoption can be higher but none of the non-adopters cited labour shortages as the reason for non-adoption.

6.7.2. Gender

The other aspect of labour constraints to adoption was that of female-headed households. Female-headed households present at these meetings said that they were able to carry out PROSCARP interventions. The main problem raised by the women was that it they became sick or could not work for other reasons then the work in their fields was not done. This affected all crops but if labour was a major problem then the maize or cash crops took priority over any of the agroforestry crops. Female-headed households also had problems with the sanitation component of the project as they did not have the labour available for the digging of the pit latrines or the construction of the sanplats. The female-headed households that had a pit latrine dug had received help either from a neighbour or other family members.

The main difficulty that the female headed households face is that they do not have another adult to provide labour. This does not act as a disincentive to adopt PROSCARP interventions. However, if the woman becomes sick or has to take on ganyu labour or other work to supplement household food supplies, this can be the cause of labour shortages in the field. This applies to all aspects of agricultural production, not just PROSCARP activities. Also any interventions that require heavy manual labour, such as digging a pit latrine, become problematic in a female-headed household.

6.8. Farmer Opinion of PROSCARP

A survey was carried out to determine farmer opinion of the various aspects of the PROSCARP project. The survey asked whether PROSCARP contributed to the farmer's ability to:

- Feed his or her family,
- Improve the fertility of the soil,
- Improve the health of his or her family, and
- Improve access to safe water.

The results of this are presented in Table 6.4. There was no significant difference between the characteristics of the household in terms of farm size or the age or gender of the household head and their opinion of the benefits of PROSCARP on soil fertility, health or water.

Village Name	Food (% positive)	Soil Fertility (% positive)	Health (% positive)	Water (% positive)
Mbatamila	50.9	43.4	41.5	75.5
Chigoneka I	23.1	20.5	43.6	66.7
Chigoneka II	31.3	40.6	62.5	75.0

Table 6.4: Results of a survey of farmer opinion to the PROSCARP project.

It can be seen that the most positive response to the PROSCARP project is related to the water programme. This came across very strongly in the village meetings. Although the wells can run dry during the dry season, the fact that clean water is available in the villages for most of the season is a major improvement in quality of life in the villages. This also reduces the incidence of water borne diseases and in many cases reduces the total amount of time that the women must spend on household chores.

The ability of the PROSCARP project to improve health in the family is also recognised. This is in response to both the education received about health and hygiene as well as the availability of clean water and sanitation facilities.

The least positive responses were towards the ability of the PROSCARP project to increase the fertility of the soil and to help increase food production. This may be linked to the evidence presented in Table 5.1, farmer ranking of problems, which demonstrates that food scarcity was ranked the most serious problem in three of the five villages.

Agroforestry is the main focus of the PROSCARP project with the long-term aim of both increasing soil fertility, and thus food production, and reducing soil erosion. The lower opinion of this aspect of the project is explained by the problems related to the agroforestry elements of the PROSCARP activities. These are set out in detail in the previous section on agroforestry.

There was a significant difference between the opinion of farmers in Mbatamila catchment and Naluva catchment as to the benefits of PROSCARP on food availability ($\chi^2 = 8.108$, df = 2, p = 0.017). Over half the farmers surveyed in Mbatamila village felt that PROSCARP had increased their ability to feed their family. The number of farmers in Chigoneka I and II were much lower (Table 6.4). Although it was not possible to ascertain the exact reasons for this difference, it appears to be related to the length of time that the project has been active in the villages. The alleycropping species in Mbatamila have started to yield some biomass. Although the levels are not sufficient there are some returns on the labour invested. In Chigoneka I and II the recent start up of the project, in conjunction with the droughts experienced in this time mean that the alleycropping species have not shown any appreciable benefits in terms of soil fertility.

The opinion of the households surveyed in relation to the positive benefits of PROSCARP on food production is also significantly influenced by the gender of the head of household ($\chi^2 = 4.283$, df = 1, p = 0.029) and the farm size

(χ^2 = 8.992, df = 3, p = 0.029). Only 22 per cent of female-headed households felt that PROSCARP did contribute to their ability to feed their family while 42 per cent of male-headed households felt that PROSCARP helped them feed their families.

Figure 6.3 shows the impact of farm size on the opinion of the farmer as to whether PROSCARP contributes to his or her ability to feed their family.

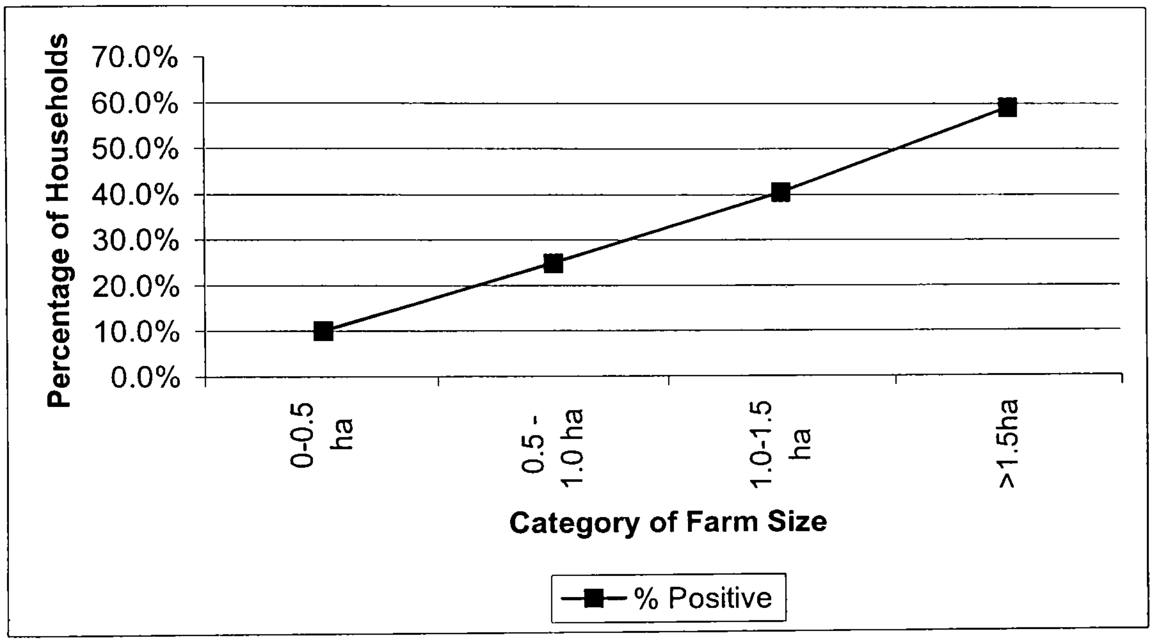

Figure 6.3: The relationship between farm size and the opinion of farmers as to whether PROSCARP contributed to the farmers ability to feed his or her family (Source; Questionnaire survey).

It can be see from Figure 6.4 that only 10 per cent of the smallest farmers (0 – 0.5 hectares) feel that PROSCARP has a positive benefit on their ability to feed their family. As the size of the farm increases the number of farmers who replied positively increases. It was shown in Chapter 5 that farm size is a major factor in determining food security within a household. The relationship between farm size and the effects of PROSCARP on food security has a positive and negative side. The problems of food insecurity in farms with smaller holdings do not appear to be addressed by the techniques introduced by PROSCARP. However, farmers with larger holdings record a more positive attitude.

These findings would point to the need for more in-depth research into alternative technologies or technologies more suited to farmers with less land. The technologies introduced by PROSCARP appear to be implemented on a blanket coverage basis. This approach does not appear to fit in with the specific problems of individual households, specifically in terms of increasing food production, a central focus of the PROSCARP project.

6.9. Potential for PROSCARP Technologies to Spread to Non Project Villages

The two non-project villages, Sanga and Chifuwa, were both assessed to ascertain the potential for adoption by the villagers of PROSCARP technologies. The main conclusion of this assessment was that the majority of PROSCARP technologies require inputs or training that are not easily available to farmers not under the influence of the project. This is strongly demonstrated by the examination of marker ridge construction in Sanga and Chifuwa. The farmers in these sites did not know how to use the A-frame for marking out of contour ridges. Even the farmers who had constructed some marker ridges using the A-frame were not able to mark out the rest of their land without the direct help of the FA. This echoes the findings of this research in the project villages where, despite efforts to train the farmers in the use of the A-frame, farmers are still not confidant enough to mark out their land without the help of the FA.

6.10. Discussion

The PROSCARP project has achieved successes. The number of people involved in the project is high. The water, health and sanitation components of the project are quite successful. This acts as a good basis as it encourages positive reactions from the beneficiaries to the project overall. However, it appears important that these aspects of the project do not degrade over time. The failure of the Women's Home Assistant to visit both Chigoneka I and II in the previous year lets the whole project down. The participation of households in the project is not directly related to farmer characteristics such as the age, gender, education of the head of the household or the land holding size.

Techniques such as contour planting and alleycropping are being implemented in the villages. The rate of uptake is different between the older site, Mbatamila, and the more recent project entrants, Chigoneka I and II. The farmers involved in the project were aware of the potential benefits of agroforestry. The main problems seem to be related to the management and yield of the species planted on the marker ridges. The majority of farmers have realised minimal, if any benefits from the alleycropping.

The PROSCARP project is attempting to adopt a more participatory approach but the potential benefits of this have yet to be felt. Techniques such as pegging of marker ridges using an A-Frame are still dependent on the Field Assistant helping out. The potential for farmers to participate is strongest here.

Although the objectives and goals of PROSCARP have changed considerably since the start of the project in 1989, it is clear that the changes were not initiated by the beneficiaries themselves. The project receives funding to promote soil conservation. Although the villagers are aware of the problems of soil erosion they are much more concerned with soil fertility. Contour planting and the use of Vetiver Grass on marker ridges are both specifically to control erosion. Alleycropping and interplanting of soil improving species can do much to increase the fertility of the soil but it is here that the most problems are felt. This highlights a need 6 to have a broader range of technologies or scope for adaptation with techniques implemented to allow farmers to chose which agricultural strategies are most suited to their circumstances.

PROSCARP is reliant on the participation of the farmers to carry on the project cycle while project staff can decrease support and move on to other sites. At the current time this is not happening. There is a strong argument here for a much greater change in project management and implementation. It would require time, effort and training to increase the participation of the farmers, assuring that each of the project villages is self sufficient in both knowledge and inputs and that the project reflects the needs and priorities of the beneficiaries. This would lead to a greater chance of the benefits of the project being felt after the withdrawal of project support.

The final point raised in this Chapter is the apparent dependence of the farmers on PROSCARP to initiate and train the farmers in the techniques promoted and also to supply the materials necessary for the adoption of these techniques. It is difficult to identify the causal factors for this dependency. It may be a cultural phenomenon or is perhaps unwittingly endorsed by the activities of PROSCARP, due to the reasonably high levels of inputs provided by the project. Unless the farmers become more proactive in the design and management of agricultural development it is unlikely that the benefits of the project will continue after PROSCARP support is withdrawn. The independence and self-sufficiency required to take responsibility for development activities within the farmers own community or farm is the basis of the participatory development paradigm and this subject is analysed in more detail in Chapter 7.

CHAPTER 7 Farmer Participation in Development

7.1. Introduction

The conventional rural development paradigm is a centralised top-down approach. A multitude of critics (Chambers, 1983, Stocking, 1985; Reij *et al*, 1986; Hudson, 1987; Pretty and Shah, 1994, Chambers, 1997) have written about the failures of rural development initiated, researched, funded and implemented by external people or organisations. New approaches to rural development (discussed earlier) have as a central tenet the participation of the beneficiaries. The promotion of a participatory approach to development is based on the view that "*the production of knowledge and the generation of potential solutions should be devolved onto those whose livelihood strategies form the subject for research*" (IIED, 1995). Participation is becoming a dominant theme in development agencies, both NGOs and Governmental (Cernea, 1985; Oakley *et al*, 1991). However, the term participation has been used in a variety of ways by different agencies and individuals. The PROSCARP project is trying to incorporate a more participatory approach as shown in Chapter 4. It is the purpose of this chapter to examine some of the paradoxes inherent in participatory development process and to see in what way this relates to the situation found in the PROSCARP project.

7.2. Participation

There is no single agreed definition of participation within the development process. Participation is seen by Pretty *et al* (1995) as a "*part of a process of dialogue, action, analyses and change*" for the "*emancipation of disempowered people*". The concept of participation appears in nearly all recent development literature in some form (farmer participation, popular participation, participatory development). The problem is that participation can have many different meanings depending on the context in which it is used. In order to understand the concept of farmer participation in the development process it is useful to examine the following types or methods of participation. Paul (1987) identifies methods of participation as; information sharing, consultation, decision-making, and initiating action. A typology of participation is presented by Pretty (1994) (Table 7.1) ranging from passive participation through to self-mobilisation. The common factor in these and other attempts to explain or classify the concept of participation is the power relationship between the implementing agencies and the beneficiaries. In the "top down " approach to development all the power lies with the implementing agency. They identify the problems and design and implement the solutions. From Table 7.1 this would be represented by passive participation. Participation in the form of initiating action (Paul 1987) or self-mobilisation (Pretty 1994) leads to a flow of information and control from the beneficiary group to the agency, with the agency providing technical assistance and/or resources. In this case, the power in the form of learning, action and decision-making rests with the beneficiaries. Forms of participation in development can lie anywhere between these two extremes. Again this is best represented by the typology proposed by Pretty (1994).

The premise behind the current use of participatory development is that passive participation will not lead to long-term success. The full involvement of the beneficiary community is required to achieve lasting sustainable development (Scoones and Thompson, 1994; Pretty, 1995; Chambers, 1997).

From the investigation of the PROSCARP project in Chapter 4, the type of participation achieved in Table 7.1 (Pretty, 1994) would fall into the following categories. At the outset of the project in 1989 under the title ADDFOOD the type of participation would fall into the category of passive participation or participation for material incentives. This type of participation is low on the scale. As the project has matured it has changed. The PAPPPA/PROSCARP phase of the project appears to have moved into the category of functional participation. This can be seen in the setting up of the catchment committees.

	Type of Participation	Description
1.	Passive participation	People participate by being told what is going to happen or has already happened. It is a unilateral announcement by an administration or project management without any listening to people's responses. The information being shared belongs only to external professionals.
2.	Participation in information giving	People participate by answering questions posed by extractive researchers using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings, as the findings are neither shared nor checked for accuracy.
3.	Participation by consultation	People participate by being consulted and external agents listen to views. These external agents define both problems and solutions, and may modify these in the light of people's responses. Such a consultative process does not concede any share in decision making and professionals are under no obligation to take on people's views.
4.	Participation for material incentives	People participate by providing resources, for example labour, in return for food, cash or other material incentives. Much on-farm research falls into this category, as farmers provide the fields but are not involved in experimentation or the process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
5.	Functional participation	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated social organisation. Such involvement does not tend to be at the early stages of project cycles or planning but, rather after major decisions have been made. These institutions tend to be dependent on external initiators and facilitators, but may become self-dependant.
6.	Interactive participation	People participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives, and make use of systematic and structured learning processes. These groups take control over local decisions and so people have a stake in maintaining structures or practices.
7.	Self-mobilisation	People participate by taking initiatives independent of external institutions to change systems. They develop contacts with external institutions for resources and technical advice that they need, but retain control over how resources are used. Such self-initiated mobilisation and collective action may or may not challenge existing inequitable distributions of wealth or power.

Table 7.1 A Typology of Participation (Source: Pretty, 1994, adapted from Adnan *et al*, 1999)

PAGE

NUMBERING

AS ORIGINAL

Tree Species		Villages[6]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Chichewan name	Botanical name												
Bwabwa		3			✓								
Bwemba	Tamarindus indica	3,4,5	✓			✓							
Chimphakasa		2,3,5		✓	✓	✓				✓	✓		Hoe handles
Chitimbe	Bauhinia thonningii	1,4,5			✓	✓				✓			
Chiwumbu		4,5			✓	✓						✓	
Kachere	Ficus natalensis	4,5	✓		✓	✓							
Kadale		1,2,3,4,5		✓	✓	✓			✓	✓		✓	Hoe handles, Charcoal,
Kafupa		2							✓	✓			
Kakunguni	Combretum molle	3											House construction
Kalama		3				✓				✓	✓		
Kamphonje		4						✓					Carvings
Kangaluche		3,5							✓	✓		✓	
Kangangowe		4				✓							Weaving mats
Kaphoni		4			✓								Wind break
Khobo		3,4				✓					✓		
M'bawa	Khaya anthotheca	3,4,5				✓			✓				
Masawo	Zizyphus mauritania	2	✓			✓							
Matowo	Azanza garckeana	2	✓							✓			
Mbongozi		3,5			✓	✓			✓				
Mfula	Sclerocarya birrea	1,3,5		✓	✓	✓		✓	✓				leaves ripen bananas
Mgoza		3,4,5			✓	✓	✓	✓	✓	✓			Multi purpose
Mgwebe	Hyphaene crinata	2	✓						✓	✓			
Mkalankhanga	Burtdavya nyasica	2,3,4,5		✓	✓	✓							Granaries, Charcoal

Table 8.1: Trees and shrubs and their uses identified by farmers in each of the villages

[6] 1=Mbatamila / 2=Chifuwa / 3=Chigoneka I / 4= Chigoneka II / 5= Sanga

Tree Species		Villages[2]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Chichewan name	Botanical name												
Mkhuthe	Podocarpus species	2,3,4		✓	✓	✓			✓			✓	Fibres, Charcoal
Mkhuwo/Mkhulo	Pterocarpus stolzii	3,4,5	✓		✓	✓			✓	✓			
Mkhwankhwa		5			✓								
Mkuyu	Fiscus capensis	1,2,4,5	✓		✓	✓						✓	Medicine for ringworm
Mlambe	Adonsonia digitata	1,2	✓										Food and Fibres
Mlembere		3,4				✓				✓		✓	Fibres
Mlombwa	Pterocarpus angolensis	1,3,4,5	✓		✓	✓			✓				Charcoal
Mnjenjeti		3,4		✓		✓						✓	
Mnyanyaui		5				✓							
Mombo	Brachstegia hoelimii	4,5			✓	✓							Fibres
Mphando	Bauhinia petersiana	2,3,4,5			✓	✓		✓		✓		✓	Fibres, Granaries
Mphemphe		5											Fibres
Mphoka		3,4			✓	✓			✓	✓		✓	
Msambamfumu	Afzelia quanzesis	4				✓			✓				Charcoal
Msangu	Faidherbia albida	1,2,3,4,5		✓		✓	✓		✓				
Msekese		1,2,5	✓			✓	✓						Charcoal, Hoe handles
Mshawa		3										✓	Toothache
Mshumwa	Diosypros mesipiliforminis	3				✓			✓				
Msolo		3			✓							✓	
Mtandangoli		3											Hoe handles

Table 8.1 continued: Trees and shrubs and their uses identified by farmers in each of the villages

Tree Species		Villages[2]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Chichewan name	Botanical name												
Mtangatanga	Albizia lebbeck	2,3,5						✓	✓				Charcoal
Mthethe	Acacia polyacantha	1,2,3,4,5		✓	✓	✓				✓			
Mthuthu	Tephrosia vogelii												
Mtondo	Covddyla africana	1,2,3,4,5		✓		✓		✓	✓			✓	
Mtongongoli		3				✓							
Mtsewa	Sclerocarya coffra	3			✓	✓				✓			Hoe handles
Mtumbu	Kirikia acuminata	2,3,4				✓			✓		✓	✓	
Muwale	Erythrina abyssinica	3,4				✓						✓	
Muwawani		3,4,5				✓						✓	
Mvunguti	Kugolia africana	2,3,4			✓	✓		✓	✓	✓			Wind break
Naphini	Sclerocarya coffra	3,4				✓			✓	✓		✓	Wind break
Nsewa	Sclerocarya coffra	3,5				✓				✓			Fibres
Nswaswa		3,4			✓	✓							
Ntawa		4								✓			Fibres, Hoe handles
Nyungo	Rauvolfia cafera	5		✓	✓								
Phopho		3				✓						✓	
Sanga	Faidherbia albida	3,4			✓	✓				✓			Charcoal, Fibres
Shisale		3,4	✓			✓						✓	Hoe handles
Thombozi		3,4			✓	✓			✓	✓		✓	Granaries

Table 8.1 continued: Trees and shrubs their uses identified by farmers in each of the villages

The groupings of participation in Table 7.1 fit well with the situation found in PROSCARP, except for the issue of participation for material incentives. The other six categories show increasing levels of participation to what can be considered as the best possible scenario, self-mobilisation. However, the food for work programmes such as that implemented by PROSCARP is more of an employment opportunity than a form of participation. The project stopped this form of intervention early on in the project lifecycle as the results of monitoring and evaluation found that less successful farmers would withdraw from the project entirely if the free maize was withdrawn. This study concluded that the long-term success and sustainability of the project was likely to be greatly enhanced by the more active participation of the farmers in the project rather than by the use of incentives. (Leach and Marsland, 1994). If participation for material incentives can be seen as a form of participation at all, it would seem to be the least likely to produce long term benefits to the community and therefore should be the first or lowest category within this typology.

The function of the catchment committees is set out in the following section and it is hoped that by passing responsibility to the farmers that they will become self-sufficient. The project has initiated Beneficiary Assessment Surveys that were carried out in 1993, 1994 and 1996 (Ministry of Agriculture, 1993; Leach and Marsland, 1994; Leach and Kamangira,1996). These 1994 and 1996 surveys used methods from within the PRA toolbox, and show a tendency towards interactive participation. Although to fully fit into the category of interactive participation it would be necessary for the results of this exercise to be used to formulate action plans or the setting up or strengthening local institutions within the villages. The realities of this are examined later. From the perspective of the literature produced by the project it would seem that, on the scale in Table 7.1, a movement is occurring towards a more participatory approach, whilst not yet approaching any form of self-mobilisation. This would suggest that the typology of participation suggested by Pretty (1994) is appropriate as a guideline or scale within which the PROSCARP project is progressing. This, however, does not show the full picture and a more in-depth review of the type of participation aimed at, achieved and perceived by the beneficiaries is examined later in this chapter.

Issues involved in the power relationships and shifts in the balance of power inherent in a move towards active participation of the beneficiaries, as well as the purpose of participation, are examined in more detail in section 7.3.

7.3. A Brief History of Participation in the Development Process

The historical basis for participatory development has evolved from a number of sources with no apparent common thread. It appears to be a convergence of complementary methods and ideals that have led today to a strong subject area based around Participatory Rural Appraisal (PRA) or Participatory Learning and Action (PLA). PRA is based on the use of participation as an end. Chambers (1997) sees five sources of inspiration for participation, outlined below.

- Action-reflection research, in which the main contribution has been through normative ideas, such as the critical reflection of the role of professionals and the ability of poorer peoples be in control of their own future.
- Applied anthropology has had participant observation as a central method since the beginning of the twentieth century. Ideas from social anthropology that have permeated the PRA model are the flexibility needed in field learning and the importance of social structures, attitudes, behaviour and local knowledge.
- Farming Systems Research; a systemised method for investigating, understanding and prescribing for complex, diverse and risk-prone farming. Field research contributed especially to the role of the knowledge and the experimental mindset of the farmers.
- Rapid Rural Appraisal. This evolved in the 1970s as a way for outsiders to learn more about rural life and conditions. This was a response to the "bias of professionals" (Chambers, 1983), which could hide the worst of poverty and degradation, as well as to the limitations of questionnaire

surveys in terms of both results obtained, and the time and costs involved.

- Agro-ecosystem analysis, which has much in common with Rapid Rural Appraisal and has contributed many of the tools used in PRA such as, visual representations, transects, diagramming and innovation assessment.

The concepts, tools and techniques from these five approaches have come together to form a continuously evolving school of thought and action known as PRA or PLA. This is a process whereby outsiders act only as facilitators, providing, through a range of techniques, a backdrop to which beneficiaries can analyse their own problems and procure solutions through group discussions with all interested parties within an area (Pretty *et al*, 1995). PRA (and RRA) have been distinguished as an approach rather than a method (Chambers, 1997). Although participation within development is not solely based on PRA, it is widely publicised and has a broad literature base (IIED, 1988 -;). The principles of empowerment of the disempowered, the rethinking of the role of the professionals and locals in the development process and the use of a new range of methods and tools, are a common theme in any form of participatory development.

7.4. Paradoxes in the Participatory Process

When examining the role of participation in the development process there are several recurring themes or paradoxes, identified earlier, which must be examined.

There are four that are directly relevant to the use of participation within PROSCARP and are as follows;

1. Participation as a means or as an end
2. The setting of goals for a development project
3. Participatory processes in a large-scale project

4. The shifts in power relationships between the development agents and the beneficiaries

This list does not represent all the problems within the participatory process. It does however relate to the problems found in pre-formed larger scale projects that are trying to incorporate participation into their project cycle. More specific implementation problems are examined later in the chapter.

7.4.1. Participation as a means or as an end.

Participation as an end is a process in which a community is directly involved in determining priorities and implementing activities for rural development. Oakley (1987) sees the critical elements of this process as awareness creation and organisation building. Outsiders can act merely as facilitators to help villages or communities to learn about their environment and act on that information to improve or develop themselves. This process is very much based on the villagers identifying their own priorities and planning and implementing strategies to respond to these priorities. This analysis and action does not start with any preconceived targets or objectives. It is suggested that this form of participation is identified more strongly with development efforts outside the formal or government sector due to the generation of influence and involvement from the grass roots level (Oakley, 1987; Backhaus and Wagachchi, 1995; Farrington, 1998).

This contrasts quite strongly with the situation found in the PROSCARP project and other similar projects where the goals and targets of a development project are pre-set by a funding authority or implementing agency. This is a theme that comes through strongly in recent literature (Lane, 1995; Nelson and Wright, 1995a; Chambers, 1997). In this instance the use of participatory development or popular participation is to increase beneficiary awareness and adoption and is distinctly the use of participation as a means. In some cases it can be a requirement of a funding authority to incorporate participatory approaches or methods in the development process (Chambers, 1995). Oakley (1987) considers the use of participation as a means as a managerial technique and "*essentially a static, passive and ultimately controllable form of participation*". He argues that development projects would benefit from more direct participation of the local people but that it is equally important that participation is not just a facilitating technique to attain the project objectives. The introduction of a more participatory approach by PROSCARP in its documentation raises the question of how and for what purpose is this occurring. The results of the empirical research in the three project villages are used to identify any positive or negative results of a participatory approach. One of the main questions is whether it is possible to move from a position of passive participation or participation for material incentives to self mobilisation under the conditions of a large scale project operating with pre-defined objectives.

7.4.2. The setting of goals for a development project

Participation as the means to achieve a pre-set goal, often by an external development agency, leads to a different set of problems. This will be based on whether the goals set are appropriate, how much responsibility or power the community involved will have, and how the community will be encouraged to carry out the work. This use of participation is seen by some (Chambers, 1983; Oakley, 1987) as not the true use of participation. However, many development projects have been running for longer periods of time and already have pre-set goals. The question is then whether a more participatory process would increase the success (as perceived by the beneficiary or the donor) of the project. Again, this is most noticeable in projects that are tackling longer term goals. Natural resource management, and specifically soil conservation, are long-term strategies in implementation and in benefits received, for example, agroforestry. More immediate problems will often be more of a priority within a community. Understanding of the different priorities of different actors (farmers, NGOs, development agencies and national government) in the development arena becomes an essential part of the participatory process.

7.4.3. Participatory processes in a large-scale project

The third paradox is that PRA is the use of participatory techniques to "mobilise" the community to act for themselves. This appears to be on a smaller scale or community based level (Oakley, 1987; Backhaus and Wagachchi, 1995). The main question here is should the concept, which has shown some successes within this arena, be transferred to larger scale projects, which by the nature of funding bodies and development agencies must have some pre-defined objectives. Short-term objectives that are often beneficial to the community, such as the provision of a protected water source, are often an obvious problem within a community. Larger scale and often much longer term objectives such as soil conservation, although essential for the long term production potential of a community, can be overlooked in the pursuit of more immediate goals, such as the production of food. It is this theme that is examined in the PROSCARP project where the aims and objectives of the project are pre-set by the funding body, in collaboration with the National Government departments. The participation of the farmers in this instance is slowly coming into focus within the project as a way of increasing the potential benefits and success of the project. However it is necessary to ascertain how realistic it is to expect the beneficiaries of PROSCARP to invest time and resources to achieve the objectives of the project.

7.4.4. Shifts in Power Relationships

The final paradox examined here is the potential shift in power relationships between the development agents and the beneficiaries. A lack of empowerment amongst displaced populations in particular has been identified as an important constraint to successful development (Scudder, 1993). Nelson and Wright (1995a) argue that if " *participation, if it is to be more than a palliative, involves shifts in power*" (p 1). This can occur between communities, between people and policy-making or resource holding institutions, and within the structure of these organisations.

Nelson and Wright (1995a) identify two models in the empowerment debate. The first is described as "power to", and the second as "power over" (p. 8). Rowlands (1992, cited by Nelson and Wright, 1995) defines three levels in the "Power to" debate. The first is the development of confidence and abilities. The second is the development of an ability to negotiate, and the third is the ability to work collectively to have a greater impact than individuals. "Power over" is a progression of "power to" as it involves a previously marginalized group reaching the point where they are treated as equal partners in the development process. This should provide long-term access to resources and decision-making.

Within these models the role of participatory development, specifically PRA, can be seen as the transferral of "power to", or empowerment of, the beneficiaries of development. The ultimate goal is for the people to have "power over" their developmental needs and their futures".

Power relationships are influenced by the previous three paradoxes examined. Participation as an end is based strongly on empowerment, whereby the individuals or community determines the priorities and activities for development. This is "power to" the community. It can be argued that participation as a means does not involve any shifts in power, merely another technique whereby the objectives of the project are met. The potential for individual or community empowerment through a large-scale development project such as PROSCARP does raise a number of fundamental questions related to the goals and objectives of the project in comparison to the needs and priorities of the community. The following sections assess the role of participation in the PROSCARP project, taking full account of the paradoxes raised here.

7.5. PROSCARP: Farmer Priorities and Project Objectives

PROSCARP is inherently a top down project from its inception in 1989. It is now in its third phase and has introduced aspects of participation as a means. To understand more fully the role of participation within PROSCARP the project is divided into phases within the project cycle and the role of the beneficiaries in each part of the project cycle is examined.

The priorities of the farming community are vital to the understanding of how participation can be incorporated into the project. Chapter 5 examines in detail the problems within each of the villages and how the ranking of the problems in terms of their priority within the villages. The ranked and weighted scores from the project villages are repeated in Table 7.2 for clarity.

Problems	Mbatamila	Chigoneka I	Chigoneka II	Overall Priority Rank
Food scarcity	4	1	1	1
Water supply	2		3	2
Disease	1	4		3
Lack of cash for inputs	3	3		4
Soil fertility	5	2		5
Access to hospital			2	6
Access to markets			4	7
Pests	6			8
Soil erosion	7			9

Table 7.2 Farmers priorities within the three project villages and the overall ranking of priorities in order of severity of problem (Source; Problem ranking exercises).

From this table it can be seen that within the three project villages, food scarcity is the most serious problem. Water supply is the next most serious. Soil erosion ranked lowest in importance of problems mentioned. If the results of the problem ranking exercise are compared with the objectives of the PROSCARP project there are several points to be understood. PROSCARP targets agricultural production in a number of ways. The control of soil erosion and the provision of a clean drinking water supply are identified in Chapter 5 as the two most successful issues tackled by the project. However, soil erosion is the least important priority in the ranking exercise and was only highlighted in one of the three villages, Mbatamila.

The provision of clean water is a major benefit of PROSCARP, despite problems of wells drying up during the dry season and pumps breaking down. This equates well with the priorities of the villagers.

Food scarcity ranks as the problem of prime importance. There are a number of factors influencing the production of food as shown in Figure 5.6. There are three areas of PROSCARP intervention that target the factors identified in Figure 5.6. The first is the availability of labour through the health, water, sanitation and nutrition components of the project. Soil erosion has already been mentioned and is the second area of intervention. The third, and perhaps the most important agricultural initiative is the agroforestry component of PROSCARP aimed at increasing soil fertility. The lack of artificial fertilisers or alternatives is identified as a major constraint to agricultural production. The alleycropping component of PROSCARP has had many problems with very few of the farmers realising appreciable benefits in terms of enhanced soil fertility. However, the benefits of alleycropping are well understood by the farmers and overall there was considerable enthusiasm for this strategy, tempered by the need for immediate benefits on soil fertility.

Although PROSCARP does not respond to every priority within the villages it does tackle several major issues. However, increased food production has not, to date, been achieved to any appreciable degree. There is a strong willingness by the majority of farmers to invest time and inputs into PROSCARP technologies. Although it was not possible to ascertain the farmers reactions to the newer technologies such as minimum tillage and the "trees on farms" strategies, and despite major problems encountered in the alleycropping program, the PROSCARP project seems to be a best bet option for a majority of farmers struggling to feed his or her family. The potential for the increased participation of the farmers on the basis of how relevant the project goals are to their situation seems to be positive. However, the problem ranking exercise shows a generalised picture of the priorities within the villages, reached by consensus at each of the village meetings. Chapter 5 and 6 highlight the fact that individual households operate under very differing circumstances within the villages. There is no difference in PROSCARP strategies in terms of individual household requirements or priorities. Households most likely to suffer food insecurity are those with smaller land holdings. There is scope for much more in-depth research into individual household or household member's willingness to participate in agricultural development efforts. This echoes the need highlighted in Chapter 6 to have a broader range of technologies or scope for adaptation with techniques implemented to allow farmers to choose which agricultural strategies are most suited to their circumstances.

7.6. Participation Within the Project Cycle

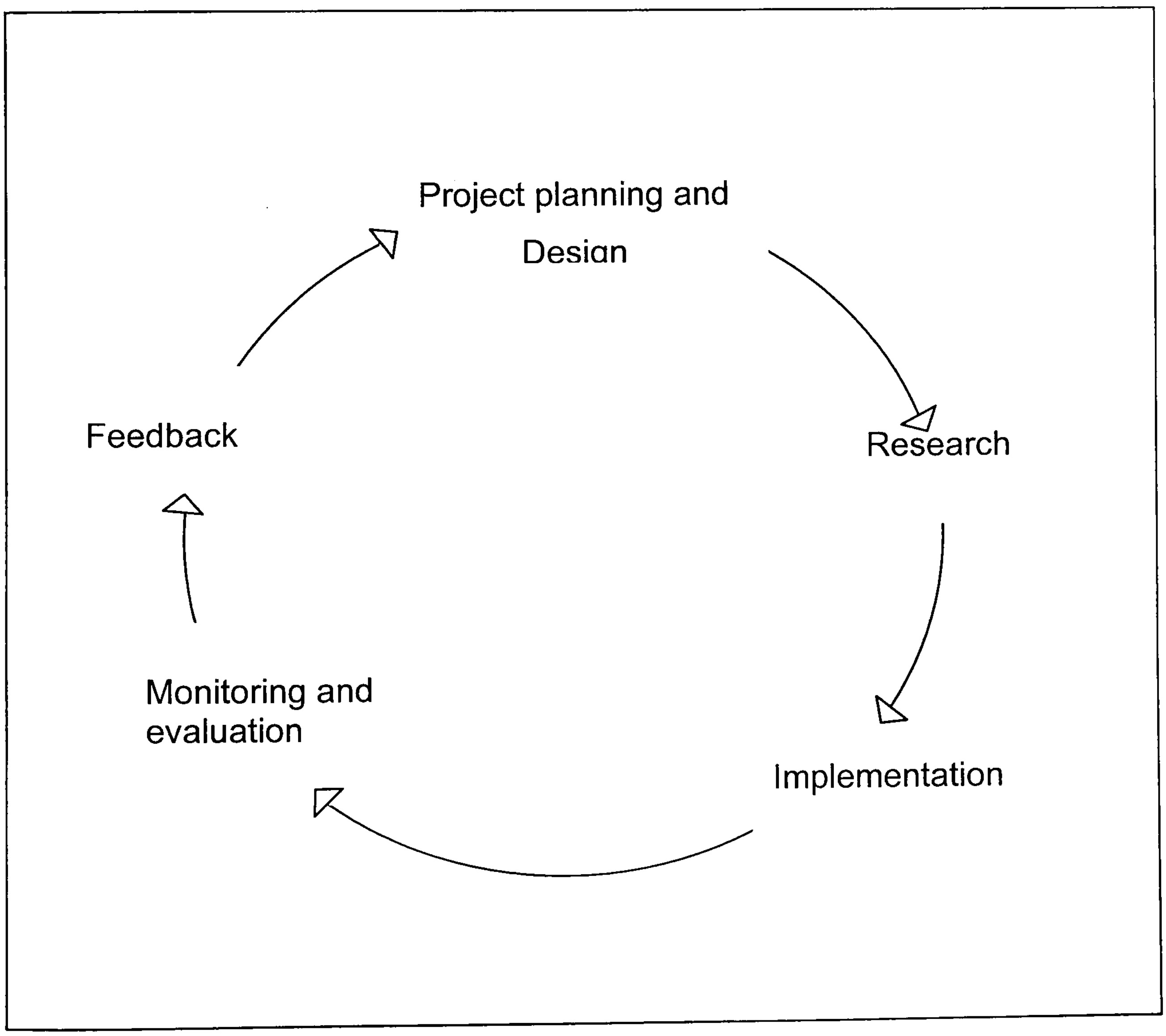

Figure 7.1: The project cycle

The use and concept of participation has several meanings in different parts of the project cycle. A holistic view of participatory development would involve the beneficiaries at all stages of the development process. In theory the beneficiaries themselves would be the initiators of the development process as outlined above. However, to more fully understand the benefits, opportunities and problems encountered in the development process the different parts of the project cycle must be examined.

7.6.1. Project Planning

Chapter 4 summarises the history and strategies of the EU funded project currently in the PROSCARP phase. It can be seen that the goals and objectives of this project are pre-defined by project staff, in conjunction with the Ministry of Agriculture, and approved by the funding body at the EU. This project, although responding to problems within smallholder farming communities, is defined by people external to the communities in which it operates.

The choice of catchment area[4] in which the project operates is very much determined by the information available to the Management Unit and does not directly involve the village members before the decision is made. The Management Unit runs PROSCARP nationally from the project headquarters in Lilongwe.

7.6.2. Research

Research for the PROSCARP project is carried out both on farm and off farm. The research carried out off farm is explained in Chapter 4. The beneficiaries of the project are not involved in this area at all. Visits are sometimes arranged for the farmers to see the crops and so on at the research stations or sites. They are not, however, involved at all in the design or implementation of the research.

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[4] See Chapter 4 for details of catchment definition and choice within PROSCARP

7.6.2.1. On-Farm Research.

This is divided into

- On-farm researcher managed trials; and
- On-farm farmer managed trials (Government of Malawi/ European Union, 1995).

The on-farm researcher managed trials include research into alleycropping on farms, relay and intercropping (Government of Malawi/ European Union, 1995; Hoekstra *et al*, 1995) as well as the new research and demonstration trials for reduced tillage, agroforestry and legumes (MAFE/PROSCARP, 1998). The participatory element of these trials was non-existent in the villages surveyed. A minimum tillage trial had been set up in accordance with the project specifications in Mbatamila village in the 1996/97 growing season. The use and importance of this was raised both in the general village meeting and in a focus group meeting with the catchment committee. Nobody in either meeting could explain why the trials were set up or how minimum tillage could be useful for soil conservation or soil fertility. These meetings were held at the end of the 1996/97 growing season, after the trial had been running for several months.

There was no evidence of on-farm farmer managed trials in the villages surveyed.

7.6.3. Implementation

There are three aspects to project implementation:

- Choice of techniques
- Extension methods
- Longer term decrease or withdrawal of extension staff as farmers become more independent.

7.6.3.1. Choice of techniques

"The risk of implementing without flexibility a single national strategy is reduced significantly by offering a basket of technologies and leaving it to

the farmers to determine the level and speed of adoption, and by the introduction of the participatory extension methodology in the MoALD" (Government of Malawi/ European Union, 1995).

This is the theory behind the choice of techniques available to the farmers. Farmers can choose the techniques that suit their requirements or abilities. Unfortunately, the practical aspects of following this course appear to be difficult. Farmers are all expected to build marker ridges and re-align the field to the contour. Apart from the problems encountered in training the farmers to use the A-frame, this component of the project is well understood and, once the marker ridges are marked, does not appear to cause problems.

Choice of planting materials in both Mbatamila and Chigoneka I and II appeared to be determined by what seeds were available at the time. Failures encountered in the use of agroforestry species such as *Leucaena leucocephala* have led to the wide-scale promotion of Vetiver grass (*Vetiveria zizanioides*) for planting on marker ridges by the project. During village meetings in all three project villages the farmers did not see any choice available in the project techniques. The results of this research show that there was a good understanding of the uses and benefits of agroforestry species grown in the village. However, there was little or no awareness of the alternatives. This appears to be very much a product of practical problems such as the availability of seeds / seedlings for planting.

7.6.3.2. Extension Methods

PROSCARP operates within the extension system of the MoALD. The project funds Ministry of Agriculture field workers (extension agents) for the actual extension work. As set out in Chapter 4, the project is implemented on a catchment basis. Each village under PROSCARP is supposed to have a Catchment Committee, which helps develop and implement a Catchment Area Development Plan, to increase the participation of the farmers in the development process.

Catchment Area Development Committee (CADC)

One of the base concepts in participatory development is the use of community groups or committees. Within PROSCARP each catchment area has a Catchment Area Development Committee (CADC). PROSCARP provides assistance in soil and water conservation and soil fertility improving measures, as well as a sanitation, public health and water component. This process is supposed to allow the farmers to practice and adopt "*sustainable forms of resource conserving technologies*" (Government of Malawi/ European Union, 1995). After 2-3 years the farmers should be independent of regular extension advice in key areas. The CADC will become responsible for organising and co-ordinating the various activities the villagers have chosen to implement. Existing community groups are contacted for inclusion in the project work. Where no such group exists, the villagers will be required to form a committee. The CADC is essentially the link between the community and the project staff. They are responsible for drawing up and revising the CADP, for communicating and assisting co-operating farmers, the community and the project staff. The CADC should comprise at least 40% female members (Government of Malawi/ European Union, 1995). On the basis of the limited number staff and time available in the nation-wide expansion of PROSCARP, it can be seen that the CADC must play a vital role in helping the farmers within a CA become self-sufficient and effective at the project technologies. If extension agents are required to put in further time and effort in one of the CAs then expansion to other sites is not possible or as effective.

All three of the PROSCARP villages surveyed had a Catchment Area Development Committee. A focus group meeting was held in each of the project villages with the members of the CADC to determine their roles, responsibilities and the potential for the CADC to become a focal point for the organisation and implementation of PROSCARP technologies.

The CADC in Chigoneka I has ten members of whom four members including the chairman are male and six members are female. The CADC was set up with the help of the District Officer from Salima RDP and the ten members were elected in 1995, with re-elections every three years. The male members of the CADC were more vocal but the female members did contribute to the meeting.

The first responsibility stated by the members was the maintenance of the block garden. This relates back to the extension methods practised by PROSCARP and the Ministry of Agriculture. A block garden is used to demonstrate various agricultural techniques. Other responsibilities of the CADC were stated to be:

- Acting as the contact point between the farmers and the FA for the PROSCARP project,
- Helping farmers with such things as correct pegging of marker ridges,
- Helping with the distribution of inputs arriving in the village from PROSCARP such as Vetiver and crop seeds.

When asked if they were often approached by other farmers for requests for the FA or higher management they said that it was more common for the farmers to ask the FA directly during a site visit by the FA. None of the farmers in an earlier meeting, which included some members of the CADC, had indicated that they were confident of using the A-frame without the FA present. When questioned about this none of the members of the CADC felt able to adequately help the farmer peg their marker ridges but said that once they had received more training they would be able to do this.

In Chigoneka I a focus group meeting was organised with the CADC but only two men turned up. They said that there were ten members but could not remember when the CADC was set up exactly. When asked what the responsibilities or tasks of the CADC were, they mentioned helping with the distribution of inputs in the village. Overall they did not appear to be very sure of their role and did not seem to meet up as a committee regularly or be aware of any specific purpose of the CADC.

Ten people, eight men and two women, attended the focus group meeting with the members of the CADC in Mbatamila village. The CADC was set up by ADDFOOD in 1989 with the members elected by the villagers. There was a farmers club active in Mbatamila before this for the purpose of gaining credit. All of the members of the CADC were members of the farmers' club. No elections had taken place since 1989. Although the people present said they consisted of the committee they also stated that the committee had six men and four women. PROSCARP encourages equal representation by both male and female farmers. This issue was not very clear but it appeared that two women were not active therefore two other men had taken over their positions but not through an elective process.

The committee had a chairman, vice chairman, secretary and treasurer. ADDFOOD had trained them for these positions. The members said that their main role was to organise meetings and to act as a go between for the farmers and the PROSCARP staff (FA and LHA). The only other responsibility mentioned was that of a general organisational role within the village, such as helping to distribute seeds and other inputs arriving in the village from PROSCARP.

Overall, none of the CADCs appear to have much responsibility or power outside of general organisational duties. The CADC in Chigoneka I did not appear be in any way effective. The CADCs in Mbatamila and Chigoneka II were quite well organised with roles for each of the members and appeared to have active female representation. They were both asked if they felt that they could assume more responsibility for the day to day running of POSCARP interventions. In both cases the members said if they received further training from PROSCARP this could be achieved. The eventual goal is for the CADC to help the village to become self sufficient and capable of carrying out all the PROSCARP interventions. Although there are CADCs in the three villages there is at present little evidence of the members of the CADCs assuming more power or knowledge necessary to direct future agricultural development efforts.

Catchment Area Development Plan (CADP)

"*Field staff will receive training in participatory extension methodology*" (Government of Malawi/ European Union, 1995). The introduction of the project at a chosen site is recommended as follows; a small team carries out a PRA exercise to "*obtain an in-depth understanding both of the general situation, the potentials, constraints and main needs of the villagers, as well as land husbandry and soil fertility issues*" (Government of Malawi/ European Union, 1995). This will utilise a basic PRA approach. The purpose of this is to involve the beneficiaries from the very beginning in assessing their situation and selecting technologies. Through this process a Catchment Area Development Plan (CADP) is formulated, consisting of the activities and technologies, as well as the sequence of their implementation and quantities of inputs required. Participatory evaluation of the technologies should be conducted, with PROSCARP evaluation team as facilitators, as well as an analysis of the overall performance of the CADP at appropriate intervals or at the end of the growing season. This will allow revisions to be made to the CADP.

However, the reality of this proved to be very different. None of the CADCs were aware of the existence of, or had been part of the formulation of a CADP. The members of the CADCs in Mbatamila and Chigoneka II were aware of the concept of a CADP but said that when this happens the FA would come and tell them what to do. This defeats the purpose of the CADC and the CADP as it should be formulated by the villagers to identify priority development areas, under PROSCARP, and be dependant on the CADC to help implement the CADP. Although there might be a commitment at project level to increase farmer participation at village level, the practical results are committees that are unaware of any purpose other than basic organisational duties and possibly farmer training, but only if the committee members become proficient at the skills they need to impart.

7.6.3.3. Longer Term Decrease Or Withdrawal Of Extension Staff As Farmers Become More Independent

From the preceding discussion on the role of the catchment committees within the villages and the lack of a CADP within any of the villages it is not possible to determine if or when the project may be able to scale down the level of intervention in the villages. This points strongly to the need for PROSCARP to invest time and effort in trying to implement the strategies set out in their reports whereby the participation of the farmers and the organisation of the villagers through the Catchment Committees leads to a situation whereby the project can withdraw gradually from the villages. There are a number of issues that need to be addressed before this situation is likely to occur. The first of these is concerned specifically with the agroforestry component. The alleycropping strategies in use in the study villages are showing minimal benefits at the time of this research. If PROSCARP aims to decrease support to these villages over time then efforts must be made to consolidate the agroforestry component. It is obvious that unless benefits are felt by the farmers from a particular strategy then they are unlikely to continue to pursue this strategy. Even if the agroforestry and other components currently implemented in the villages became self supporting in the eyes of the farmers, the introduction of new technologies or farming strategies such as minimal tillage, will require intensive efforts from both the extension agents and the farmers. Also, there is a considerable reliance on inputs from PROSCARP for planting materials, and inputs for the water and sanitation components that are currently required for the farmers to continue with the PROSCARP interventions. As identified in Chapter 6 there is a strong impression of dependence on PROSCARP. As well a a need for the inputs that the project supplies, there was a general lack of initiative within the villages. All of these factors combine to give a lack of confidence about the long-term potential of project benefits to be felt after the withdrawal or decrease in activities within the villages. To overcome this, there is a vital need to consolidate project activities in current sites of intervention.

7.6.3.4. Sequence of implementation of project activities.

Overall, within PROSCARP sites nation-wide, it has been found that water provision is the priority need in each community. This finding is backed up by this research. The provision of safe water first to establish credibility and support for PROSCARP is suggested (Government of Malawi/ European Union, 1995). However, as the main thrust of the project is related to agricultural production, there seems to be a need to establish principles for the most successful approach to implementation.

7.6.4. Monitoring and Evaluation

Within the Management Unit there is a monitoring and evaluation programme. In 1993 the programme was extended to include a qualitative Beneficiary Assessment Study concentrating on farmers responses to ADDFOOD interventions (Ministry of Agriculture, 1993; Leach and Marsland, 1994; Leach and Kamangira, 1996). The 1994 and 1996 surveys used participatory methods of data collection. The results of the Beneficiary Assessment Studies are investigated in Chapter 4. Each of the studies concluded that village level participatory planning and follow up discussion were necessary to identify appropriate interventions within the villages, retain the interest of the farmers and solve problems currently felt by the villagers and the project staff in the implementation of project activities.

The project has responded to the results of these surveys. The issue of free maize and fertilisers as an incentive was phased out. The training of FAs and farmers in soil and water activities responds to the problems of a sense of project ownership among the farmers (Ministry of Agriculture, 1993). Education and farm visits to successful sites are used to convince the farmers that current investments in land and labour will pay off in the longer term. Some farmers from Mbatamila had been on a farm visit to see agroforestry interventions. The farmers involved in that visit were very enthusiastic about the benefits that could be felt from agroforestry and soil conservation technologies. In the project literature there is a definite movement towards the integration of the beneficiaries in the development process. However, at the time of this research at least, there seemed to be a lack of implementation of these policies at ground level.

7.7. Discussion

The need to uphold participatory rhetoric can prevent an organisation from carefully assessing when and in what activities functional participation or radical empowerment is appropriate.

The long-term success of a project such as the PROSCARP project must depend on a process of education for the better understanding of the problem being addressed. Once the reasons for the problem are understood and accepted by the community as being of immediate concern then the choice of technologies, techniques used to combat the problem must be decided upon. This requires input of the knowledge and abilities of the community to carry out certain techniques and to be able to do it within their own resources. The final part of this is to enable the villagers to be both conversant with the techniques used and also with the reasons and purposes for using them so that, without any major help from the project, they may continue to use and benefit from the introduced techniques of the project. This then raises the question "who should determine the priorities within a community?" The priorities of the community members are more likely to be concerned with water supply, income generation, food production and so on. If soil erosion in an area is recognised as being a serious problem, by whom should it be recognised? Would the purist form of participation not rule out the suggestion of problems to be tackled by outsiders?

The potential for farmers to participate is strongest in the implementation of the project activities, under current project policy. The opportunities provided by the Catchment Committees are numerous. Theoretically the Catchment Committees should become self-sufficient and act as a base for the village to manage its own development. This requires the empowerment of the Catchment Committee to decide the future of the project. To select

what fits their needs and to reject what is not suitable. Unless the basis of the project is to fill the needs and priorities of the villages the decrease and withdrawal of extension staff will just lead to the collapse of the project within the village.
The current potential for project villages to continue to use PROSCARP technologies without PROSCARP intervention is low. There seems to be two future options for the PROSCARP project. The first is to strengthen dramatically the participatory side of the project, concentrating on farmers' priorities, and focusing on the role of the Catchment Committees and the preparation of a Catchment Area Development Plan. This would involve a very major change in both the policies and practices of the project. However, this could lead to a situation whereby the farmers are in charge of agricultural development within their villages.

The second option is to continue on under the current interventions but with the realisation that the use and implementation of the PROSCARP technologies is strongly reliant on both the knowledge and inputs provided by PROSCARP. This will allow innovations such as minimum tillage to be tested and, if successful, brought into general usage within the project villages. This approach will be unlikely to lead to the goal stated by PROSCARP, of project villages becoming independent and self-sufficient after a three year intervention period. This seems only likely to occur if agricultural interventions are immediately successful and adopted willingly by the farmers.

The implications of this are quite serious. At the moment it would not be possible to withdraw PROSCARP support from the villages without jeopardising the current achievements within the villages. PROSCARP is spread increasingly thinly, and if the anticipated rate of expansion is achieved, this situation will worsen. This makes it progressively less likely that PROSCARP will be able to increase the success rates of interventions within the villages, or indeed replicate current successes in new sites.

Chapter 8 Indigenous Knowledge

8.1. Introduction

The previous chapter analyses the role of participation in the development process. The change of emphasis to a "bottom up" approach has led to the need for solutions that are acceptable to the farmers involved and suitable for local conditions. The recognition that the land users themselves have valuable environmental knowledge (Chambers *et al*, 1989; Critchley *et al*, 1994; Scoones and Thompson, 1994) leads to a need to study and appreciate the approaches and strategies of the local land users themselves. Local knowledge has the potential to be an important factor in development projects, both in acknowledging local knowledge and in the use of local knowledge as a starting point for development projects (Critchley *et al*, 1994). The basis for this assumption is historical evidence that shows the sustained productivity of indigenous systems, sometimes for thousands of years (IUCN Inter-Commission Task Force on Indigenous Peoples, 1997). However, despite this growing recognition of the potential value of indigenous knowledge there is little evidence of development projects making use of local knowledge systems (Critchley *et al*, 1994; Mathias, 1996).

The purpose of this chapter is to examine the basis behind the interest in indigenous knowledge systems (IKS). This focuses on two specific issues; indigenous soil and water conservation (ISWC) and knowledge and uses of trees within farming systems. Information on IKS and ISWC and the uses of local knowledge in development projects are investigated. Finally, local knowledge of agricultural techniques and trees in the research area gathered by the author are presented, and the potential for incorporation into the PROSCARP project is explored.

8.2. Indigenous: Problems of Definition

Local knowledge systems, practices and their role in development have received much attention. It appears necessary to identify what is the basis of indigenous knowledge. Agrawal (1996) reasons that the focus on indigenous knowledge within development has led to a dichotomy, creating two categories of knowledge, indigenous/traditional versus western/scientific knowledge. He argues that this dichotomy is not supported by the realities of elements of both knowledge systems. There are similarities across the categories of knowledge as well as differences between them. He also argues that it is not possible for any piece of knowledge to be fixed in time or context as indigenous or western. Howes and Chambers, (undated) assert that Indigenous technical knowledge (ITK) can be evaluated and contrasted according to three criteria;

- as systems of classification,
- as systems of explanation and prediction, and
- in terms of speed of accumulation.

Howes and Chambers, (undated) argue that ITK relies almost exclusively on intuition and evidence related directly to the senses and that it is a closed system is characterised by a lack of awareness that there are other ways of regarding the world. However Howes and Chambers (undated) do put forward two reservations. The first is that the division of knowledge into indigenous versus scientific implies an old/new distinction, which ignores the concept of knowledge as the outcome of processes of transmission and generation occurring within and external to the local environment. The second is the notion that knowledge is a static stock as opposed to a dynamic generating process, which is subtly implied by the division of knowledge into indigenous or scientific. Warren and McKiernan (1995) define indigenous knowledge as "local knowledge, unique to a given culture or society" (p426)

The use of the word indigenous when referring to knowledge or agricultural techniques in developing countries can therefore be misleading. Knowledge is acquired over years or generations. Similarly agricultural techniques evolve over a long period of time and can be adapted to cope with environmental or social change. The other factor is external influences that can alter knowledge or techniques. This is especially true in the case of Malawi as with other colonised countries. In the case of soil conservation techniques the British colonial administrators in Malawi introduced remedial measures to combat soil erosion as far back as 1946 (Ngoleka Mlia, undated). It is therefore difficult, if not impossible to establish what are indigenous techniques and what is due to external influences.

Scoones *et al* (1996) reject a static notion of indigenous knowledge in favour of a focus on a more dynamic interpretation of the concept of indigenous. This encompasses the dynamics of technical change, the adoption and transformation of innovation and the evolution of incremental adaptations and the resulting current practices that are the result of change due to a range of influence over time. The changing nature of agricultural practices over time in Malawi leads to the same conclusions for this research. The use of the word "indigenous" in this text is therefore not identifying the knowledge or techniques as Malawian knowledge or techniques, but as knowledge or techniques that were in place before the introduction of the PROSCARP project. This realises that what is referred to as indigenous is in a constant state of change. The word indigenous could be replaced by the term "local".

8.3. Indigenous Knowledge for Development

There is a strong link between the concepts involved in indigenous knowledge and that of participation. This research is concerned with the change of emphasis in agricultural development away from a top down approach conceived in the context of the developed world, to a people centred development paradigm. This encompasses strategies that are sensitive to the problems of smallholder farmers, incorporating the active participation of the farmers. This requires technologies that are locally relevant and within the resource and environmental capacity of an area. The focus on ITK and ISWC within this framework is a response to the need to learn from the land users (Warren, 1991; Critchley *et al*, 1994; Pretty and Shah, 1994). Central to this new approach is the prerequisite for active participation of the land users with the development agents.

The call for recognition of indigenous knowledge was strengthened during the Earth Summit at Rio de Janeiro. Chapter 26 of Agenda 21, the programme for sustainable development adopted at the conference, called for the

"*Involvement of indigenous people and their communities at the national and local levels in resource management and conservation strategies and other relevant programmes established to support and review sustainable development strategies*" (IUCN Inter-Commission Task Force on Indigenous Peoples, 1997).

Indigenous knowledge and practices have been seen in a variety of roles. At one extreme is the belief that indigenous peoples mismanage their environments and can provide no examples or lessons and are in fact, an obstacle to development (Scoones *et al*, 1996).

In contrast, proponents of indigenous knowledge consider it has a pivotal role in the development process to a point where Brokensha *et al* (1980) feel that "*to ignore peoples' knowledge is almost to ensure failure in development*" (P7-8). The IUCN Inter-Commission Task Force on Indigenous Peoples (1997) states that "the concept of sustainability is embodied in indigenous agricultural systems". One of the principles espoused by the IUCN Inter-Commission Task Force on Indigenous Peoples (1997) is the right to self-determination of indigenous Peoples. This allows the recognition that when striving to achieve sustainability it is necessary to learn from indigenous peoples as their knowledge systems embody the principles of sustainability. This is a very strong viewpoint that gives the assumption that all indigenous agricultural systems are producing in a sustainable fashion.

Several authors provide a caution against the over estimation of the usefulness of ITK (Blaikie and Brookfield, 1987; Reij, 1991: Reijintjes *et al*, 1992; Reij, 1993; Critchley *et al*, 1994). Critchley *et al* (1994) suggest that indigenous knowledge, rather than providing the answer to sustainable agricultural development, could be used as the most suitable starting point for the development of appropriate and sustainable technologies and programmes. Reij *et al* (1996) have brought together a number of case studies of indigenous soil and water conservation techniques in use throughout Africa. Many of these case studies are based on farmer innovation and adaptation to local conditions. There are also examples of indigenous soil and water conservation techniques adapted and promoted by development projects. Another feature of the use of soil and water conservation techniques is the potential to transfer the technology. An example of this is the *Projet Agro-Forestier* in the Yatenga region of Burkina Faso, which has achieved some successes based on the use of stone bunds, an indigenous technology imported from the Negev Desert in Israel (Atampugre, 1993).

Research on indigenous agricultural techniques has been focussed mainly on indigenous soil and water conservation (Pawluk *et al*, 1992; Critchley *et al* 1994; Reij *et al*, 1996). However, the widescale introduction of agroforestry into development projects leads to a need to study more closely the role of trees within farming systems.

8.4. Indigenous Soil and Water Conservation

Soil and water conservation as a subject area shows examples of successful ISWC practices. There are several examples in the literature of the existence and benefits of soil and water conservation methods that have been in use for thousands of years, as well as more recent innovations

(Critchley *at al*, 1994; Reij *et al*, 1996; Scoones *et al*, 1996). Some of these have fallen into disrepair, whilst others are still in use. Scoones *et al* (1996) divides ISWC into two broad categories according to its main function. The first is soil and water conservation, the second is water harvesting, although each of these may have several functions. Water harvesting is found mainly in drylands and has less relevance to Malawian agricultural conditions, although the increasingly erratic rainfall recorded in Malawi might call for the introduction of water or runoff management, including water harvesting if appropriate.

Critchley *et al* (1994), in a review of available knowledge on ISWC, concluded that ISWC evolves and is maintained under particular sets of circumstances.
These are;

- ISWC appears to evolve where moisture limits production. This attaches a high priority to capture of rainfall and has the added benefit of improved plant performance.
- Hillside cultivation leads to a need to preserve limited soil reserves. The choice of materials for conservation is often stones, readily available on sloping lands.
- Population pressure can lead to land degradation or conversely may stimulate conservation.
- Land tenure is the final factor. The link, however, between security of tenure and investment in soil conservation is not proven.

In a Malawian context moisture is not the limiting factor. Although rainfall has become less reliable over the more recent past, it is still sufficient for rainfed agriculture most years. Although soil erosion is recognised by the farmers within the case study area, it is not ranked as a very important issue. Loss of soil fertility is identified as a major limiting factor in agricultural production. Although some of this is attributed to physical soil loss, it is much more strongly associated with decreasing land available for agricultural production. The farmers identified continuous cropping without fallowing as the primary cause of a reduction over time in the soil nutrient status. This is strongly exacerbated by the inability of the majority of farmers to purchase artificial fertilisers.

Due to the varying topography within the case study area (and nationally) some of the farmers are cultivating land on steep slopes. In these situations the erosion of the soil is more pronounced and becomes more of a priority for the farmers involved. However, soil fertility is still a primary concern. Security of land tenure was not seen by any of the farmers as a problem.

If the criteria identified by Critchley *et al* (1994) are correct then it could be expected that it would be unlikely that any ISWC would have evolved under the set of circumstances found within the study area. However, as the farmers identify loss of soil fertility as a major limiting factor it could be expected that some soil conservation measures aimed specifically at maintaining or enhancing soil nutrient levels would evolve. Section 8.6 examines local knowledge within the case study area to determine the levels, if any, of ISWC.

8.5. Local Knowledge and Use of Tree Resources

Many timber and non-timber forest products (NTFPs) were historically obtained from nearby areas of forest or woodland that were used as common property (Michael Arnold and Dewees, 1997). The availability of these resources were often critical to farming communities, providing energy supplies for cooking as well as supplementary inputs such as food, fodder and income. Chambers and Leach (1987) see these common property resources as providing an environmental and economic buffer, whose usage increases if agricultural production falls or unexpected expenses occur.

The availability of forestry or woodland resources is declining rapidly throughout Africa due to political, economic and physical changes. Michael Arnold (1997) sees this reduction in available forest and NTFPs as a result of state assertion of control over forest resources and land, as well as privatisation, encroachment and government approbation. Population pressure on the remaining wood reserves accelerates the degradation.

In areas, such as the research site in Malawi, access to forest or woodland is either restricted or no longer available. Private tree resources become of prime importance. The following model (Figure 8.1) derives from an examination of the potential shifts to private tree resources suggested by Michael Arnold and Dewees (1997).

Forest Cover Locally	Population Pressures	Tree Management	Management Strategies
Abundant	**Low**	Passive:	Removal of tree based products is offset by natural regeneration Possibly planting of fruit trees or non removal of a few valuable species during land clearance
Increasingly scarce		More intensive	May leave more trees during land clearance. Increased production through copicing, pollarding and pruning etc.
Access to woodland resources reducing, desired trees no longer available Intensive agricultural land use			Measures taken to stimulate tree regeneration, protection, transplanting and cultivating naturally germinating seedlings
Negligible	**High**	Active Management Intensive Agricultural Land Use	Planting and farming of trees within the farm landscape. Evolution of intensively managed home gardens. Layered vertical structure of trees, shrubs and ground cover

Figure 8.1: The evolution of private tree growth and management in response to changes in population density and availability of tree and woodland resources (source: adapted from Michael Arnold, 1997).

The role of trees and tree management strategies within the case study area are examined in depth in the following sections.

The use of agroforestry in development projects is widespread. Agroforestry tends to concentrate on the uses of tree or shrub species for soil conservation. Conservation includes control of erosion, maintenance of organic matter, maintenance of soil physical properties, maintenance of nutrients, avoidance of toxicity (Young, 1989). For example, trees such as *Leucaena leucocephala* (used in the PROSCARP project) have several functions. It is a nitrogen fixing species, used extensively for green manure and also for animal fodder. There appears to be a gap however, between the introduction of agroforestry species for soil conservation and the requirements of farmers that were previously being met by the use of woodland or NTFPs. The PROSCARP project is introducing new tree species (see Chapter 4) with a more general "trees on farms" approach. The knowledge and use of tree species within the research site is examined and presented to allow comparisons between the model in Figure 8.1 and the situation in an area of seriously depleted forest reserves. The results of this research are then compared to the PROSCARP "trees on farms" and agroforestry strategies.

8.6. Farmers Knowledge Within the Research Sites

This research identified three main areas for information gathering, control of soil erosion, soil fertility, and the use of trees on farms. This is to reflect the main impetus of the PROSCARP project, planting on the contour, agroforestry, and more general trees on farms.

These issues were raised with the farmers, during the participatory data collection exercises, and later, through the questionnaire surveys in the five research sites (both project and non-project villages). The main focus of this research during the group meetings was soil conservation measures other than those promoted by the project.

The role of trees within the villages was highlighted initially through the transect walks. As each of the walks moved through the villages it was noted that a wide variety of trees were found both within the cultivated plots and on the field boundaries. During group meetings in each of the study villages the types and uses of trees remaining in the villages and their uses revealed a substantial knowledge. This was followed up in the questionnaire surveys to determine the types and uses of trees on the land holding of each household surveyed. Despite the lack of firewood in the vicinity of the villages, trees were retained for a wide variety of purposes. PROSCARP is strongly promoting the use of tree species. The initial focus on agroforestry species, specifically for alley cropping has broadened out to encompass more uses of trees on farms. Therefore the role, uses and importance of various tree species within the villages provided a useful measure of the appropriateness of the PROSCARP approach.

8.6.1. Agriculture

To investigate local agricultural techniques and any soil and water conservation measures a number of methods were used. During the transect walks, farmers demonstrated any areas suffering from soil erosion and showed examples of the methods of control outlined below. The problem ranking exercise highlighted the differing priorities of soil erosion and loss of soil fertility within each of the villages. More specific information about various agricultural practices was discussed in the group meetings that followed. The farmers were questioned about any methods they used for the control of soil erosion or for increasing soil fertility. The questionnaire survey was used to then determine what proportion of the village carried out measures for the control of soil erosion highlighted during the previous sessions.

A major finding of this research is that there is almost a total lack of any local soil and water conservation techniques in use now or previously, apart from any benefits derived indirectly from techniques used for maintenance of soil fertility. This appears to strengthen the criterion identified by Critchley *et al* (1994) as discussed in section 8.4.

The following section shows the results of the main discussion from each of the villages.

Chigoneka I and Chigoneka II

Both villages were set up in 1974 when the people were relocated from the more fertile Lilongwe plains to make way for the building of the Capital City. These two neighbouring villages are on the Rift Valley escarpment with a high proportion of sloping land. Soil erosion has been recognised by the villagers as a problem since their relocation. Chigoneka I and II have the highest slope of the five villages and have areas of quite severe erosion. The villagers use box ridging learned from their parents. This technique is suitable for the fertile Lilongwe plains where one of the main limiting factors of production was moisture. Tying and boxing of ridges is still used under the contour planting regime introduced by PROSCARP, mainly for moisture retention. Long term fallowing was used for maintenance of soil fertility until recently. This is no longer a possibility as there is insufficient land available, although some farmers still practice short term fallows. The only land not currently cultivated in the villages either has poor soils or is too steep. However, discussions with the village chiefs, responsible for land allocation, revealed that this land will have to be used as more families set up homes in the village.

Sanga

Sanga village is not involved in the PROSCARP project. It is close to Chigoneka I and II. The results of village meetings and semi-structured interviews (see Chapter 5) show a strong awareness in this village of soil erosion. Many of the farmers quoted the removal of trees as playing a role in the loss of soil. Fallowing of land was suggested as being the most effective method of ensuring soil fertility but shortage of land in this village has meant that this has not been practised for a number of years. Three-quarters of the land in the village is cultivated but the rest is too steep. Some of the villagers said that they had started to cultivate land that is too steep to grow crops properly but are hoping that they can get some return in yield from this land, if only in the short term due to the resultant loss of soil. The farmers in this village do not carry out any agricultural techniques specifically for the purposes of controlling soil erosion, despite the high level of interest and knowledge shown about the causes and effects of soil erosion. Again, soil fertility has a much higher priority for crop production.

Mbatamila

This village, along with Chifuwa village, is on the lakeshore plains and is quite flat with a predominance of sandy or sandy loam soils. The problems of erosion are really only felt by villagers living along the river edge or at the end of the village at the start of the escarpment. For this reason there was not as much interest in the problems of soil erosion. Soil fertility was seen as the most pressing concern. Fallowing has always been the accepted method. In the past, land could be fallowed for up to 15 years. The amount of time available to leave land fallow gradually reduced as the numbers in the village grew. It is now no longer an option.

Chifuwa

Erosion is recognised as a problem. However, there was no recognition of ways to control it. Fallowing of land was recognised as a good way of maintaining soil fertility but, in common with the other villages, there is not enough land now to practice fallowing. In this village there was a strong feeling that the yields from their crops were getting less every year due to two main factors;

1. Rainfall, each year gets less dependable (too much or too little)
2. Soil fertility is falling.

Discussion

Farmer priorities, discussed in detail in Chapter 5 (summarised in Table 5.2), have shown that soil erosion is not a high priority issue. This is reflected strongly in the discussions about agricultural techniques. Soil erosion is one of a number of factors affecting production but not the first or second limiting factor. These are soil fertility and uncertain rainfall, followed by pests. There were no farmers at the meetings that had used any techniques specifically for the control of soil erosion before the PROSCARP project intervention. Transect walks through the non-project villages showed some efforts to repair gully erosion with vegetative barriers and planting of banana trees (*Musa* spp).

The twin concerns of uncertain rainfall and loss of soil fertility was a strong theme in Chifuwa village, but was echoed in all of the villages surveyed. The problems of rainfall for the crops was only really addressed in Chigoneka 1 and II by the use of box ridges for moisture retention, due to experience gained on more fertile land. Moisture retention was not a topic of concern at any of the other village meetings. The response from the farmers during discussions on this subject was that water available for crop growth was not in the control of the farmers. Most people seemed aware of the potential benefits from irrigation schemes (mostly from rice production in the surrounding areas) but did not consider either irrigation or other forms of water management to be within the means of their finances or abilities.

The second concern is the reduction of soil fertility over time. In each of the villages it can be seen that fallowing is the traditional and preferred method for the retention of soil fertility. Due to population pressures there were no farmers within the study area that had the option of leaving their land fallow for any appreciable length of time. Some efforts at fallowing were recorded in the questionnaire survey but follow up interviews with these farmers showed that the timescales were very short, varying from a few months to a season or two at most. The decline of fallowing appears to have happened quite slowly during the lifetime of the current generation of farmers. Soil fertility has decreased alongside the decline in fallowing. Lack of access to credit for the purchase of artificial fertilisers, due to a change in the credit facilities in 1994, has exacerbated the problem. The response to this problem within the villages seems to be more based on trying to find ways to buy artificial fertiliser.

Figure 8.2 shows the proportion of households in each village that use the six techniques suggested during the village meeting that are used for controlling soil erosion or enhancing soil fertility. All of these methods are strongly oriented towards increasing soil fertility but can have the added benefit of controlling soil erosion, predominantly because of the effect of soil cover.

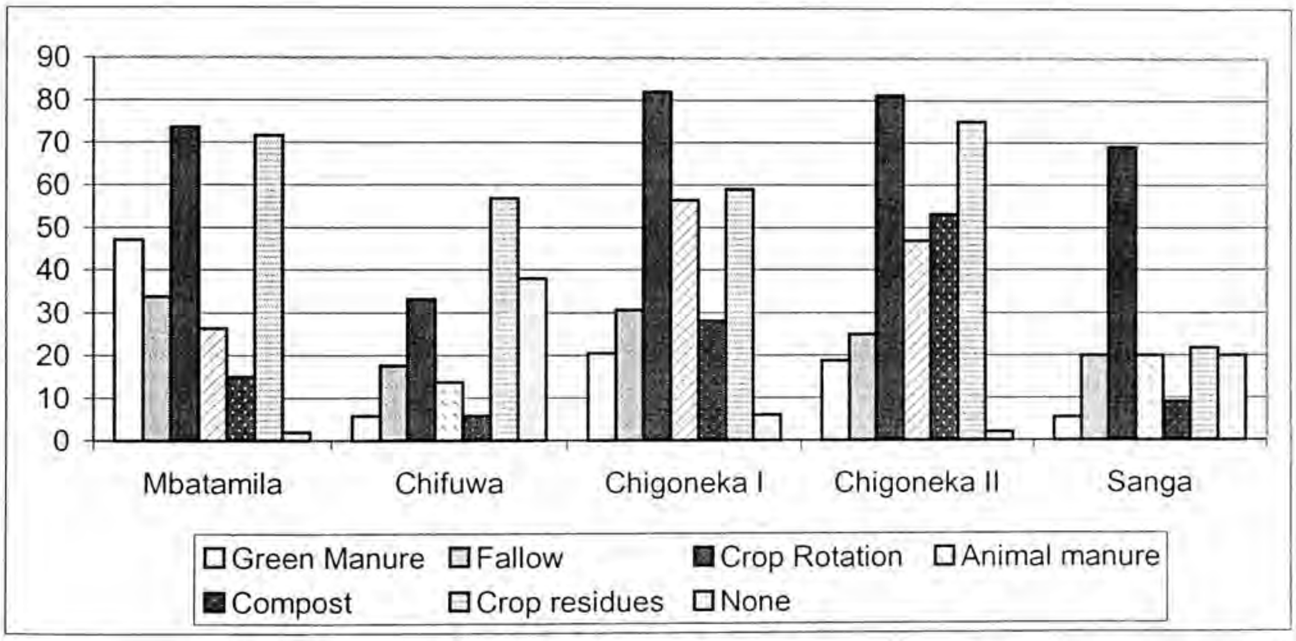

Figure 8.2: The percentage of households using soil improvement methods identified by the farmers (Source: Questionnaire Survey)

The survey results show that crop rotation and the integration of crop residues are the two most widely used soil-improving techniques. It was not possible to determine how long these techniques have been in use in the study area. The villagers said that they had to rely more on these alternatives. Animal manure was seen as the best alternative to artificial fertilisers but was only available to owners of livestock.

The research results obtained are not supposed to represent agricultural practices found throughout Malawi. In the study area maize is the main food crop, and cotton and tobacco are the main cash crops. Each of these is planted in ridges. Different agricultural practices are found in other areas. Further up the coast in the Nkhotakota RDP (Salima ADD) area cassava is widely planted. This crop is planted in mounds rather than the ridge cultivation used within the case study area (source: Nkomaula, pers com and site visits). Research carried out in Blantyre ADD on indigenous agricultural techniques highlighted a different set of techniques used to those of Salima ADD (Mangasoni and Phiri, 1996). The PROSCARP project implements similar techniques country wide, regardless of the wide variety in altitude, rainfall and soil type. This echoes the issue that was raised in Chapter 6 where variations between individual; land holdings strongly influenced farmer adoption rates and opinion of techniques promoted by PROSCARP. Overall, there seems to be a need for agricultural techniques introduced into an area to reflect accurately the needs and priorities of both the community and the individuals within a community. PROSCARP does not currently meet this need.

8.6.2. Forestry

The PROSCARP project uses agroforestry as a main factor in its soil conservation program. Changes within the PROSCARP project have moved the emphasis from agroforestry to a more general "trees on farms" approach, incorporating agroforestry. One of the aspects of the research was to identify local knowledge of tree species and their use to determine the basic available knowledge for the introduction of trees as a soil conservation measure.

Transect walks identified several tree species that are already recognised as being useful that the project is trying to promote. In group meetings and also in the questionnaire people were asked to identify trees that they either retain or plant and the uses of these trees. This (extensive) list is a good indication of the recognition by the villagers of the many uses of tree species. All of the trees identified by the villagers were identified by their local name (Chichewa or other local languages). Extensive efforts have been made to identify the correct botanical names (Williamson, 1955; Palgrave, 1977; Kitchin and Pullinger, 1982; Shorter, 1989; Forestry Commission Staff, pers com, ADD Staff, pers com). However, it was not possible to identify the botanical name for every tree species named in the villages.

The majority of trees retained or planted within the villages are multipurpose, although most provide a source of firewood. From Table 8.1 it can be seen that Mbatamila and Sanga recorded a much lower variety of different tree species (10 and 18 respectively) than Chigoneka I (41), Chigoneka II (35) and Sanga (27). It was difficult to differentiate between trees planted by the farmers or trees growing naturally that had been retained. However, most of the farmers indicated that they had planted trees or would be willing to do so if they felt that the trees were of benefit. During focus group discussion with the female members of each village the issues of firewood collection were discussed. This is examined in detail in Chapter 5, however, it is worth noting here that the majority of women expressed strong levels of interest in planting trees within the villages for fuelwood to reduce the time spent collecting firewood.

Farmers in Chifuwa, Chigoneka II and Sanga were all very positive in their attitude towards the Forestry Department which has an extension programme whereby Forest Officers periodically visit the villages and encourage the planting of various tree species, including Msangu (*Faidherbia albida*) and Bluegums (*Eucalyptus* spp.). They provide both seeds and advice on nursery management and planting.

Tree Species													
Chichewan name	Botanical name	Villages[6]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Bwabwa		3			✓								
Bwemba	Tamarindus indica	3,4,5	✓			✓							
Chimphakasa		2,3,5		✓	✓	✓				✓	✓		Hoe handles
Chitimbe	Bauhinia thonningii	1,4,5			✓	✓				✓			
Chiwumbu		4,5			✓	✓						✓	
Kachere	Ficus natalensis	4,5	✓		✓	✓							
Kadale		1,2,3,4,5		✓	✓	✓			✓	✓		✓	Hoe handles, Charcoal,
Kafupa		2							✓	✓			
Kakunguni	Combretum molle	3											House construction
Kalama		3				✓				✓	✓		
Kamphonje		4						✓					Carvings
Kangaluche		3,5							✓	✓		✓	
Kangangowe		4				✓							Weaving mats
Kaphoni		4			✓								Wind break
Khobo		3,4				✓					✓		
M'bawa	Khaya anthotheca	3,4,5				✓			✓				
Masawo	Zizyphus mauritania	2	✓			✓							
Matowo	Azanza garckeana	2	✓							✓			
Mbongozi		3,5			✓	✓			✓				
Mfula	Sclerocarya birrea	1,3,5		✓	✓	✓		✓	✓				leaves ripen bananas
Mgoza		3,4,5			✓	✓	✓	✓	✓	✓			Multi purpose
Mgwebe	Hyphaene crinata	2	✓						✓	✓			
Mkalankhanga	Burtdavya nyasica	2,3,4,5		✓	✓	✓							Granaries, Charcoal

Table 8.1: Trees and shrubs and their uses identified by farmers in each of the villages

[6] 1=Mbatamila / 2=Chifuwa / 3=Chigoneka I / 4= Chigoneka II / 5= Sanga

Tree Species		Villages[2]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Chichewan name	**Botanical name**												
Mkhuthe	Podocarpus species	2,3,4		✓	✓	✓			✓			✓	Fibres, Charcoal
Mkhuwo/Mkhulo	Pterocarpus stolzii	3,4,5	✓		✓	✓			✓	✓			
Mkhwankhwa		5			✓								
Mkuyu	Fiscus capensis	1,2,4,5	✓		✓	✓						✓	Medicine for ringworm
Mlambe	Adonsonia digitata	1,2	✓										Food and Fibres
Mlembere		3,4				✓				✓		✓	Fibres
Mlombwa	Pterocarpus angolensis	1,3,4,5	✓		✓	✓			✓				Charcoal
Mnjenjeti		3,4		✓		✓						✓	
Mnyanyaui		5				✓							
Mombo	Brachstegia hoelimii	4,5			✓	✓							Fibres
Mphando	Bauhinia petersiana	2,3,4,5			✓	✓		✓		✓		✓	Fibres, Granaries
Mphemphe		5											Fibres
Mphoka		3,4			✓	✓			✓	✓		✓	
Msambamfumu	Afzelia quanzesis	4				✓			✓				Charcoal
Msangu	Faidherbia albida	1,2,3,4,5		✓		✓	✓		✓				
Msekese		1,2,5	✓			✓	✓						Charcoal, Hoe handles
Mshawa		3										✓	Toothache
Mshumwa	Diosypros mesipiliforminis	3				✓			✓				
Msolo		3			✓							✓	
Mtandangoli		3											Hoe handles

Table 8.1 continued: Trees and shrubs and their uses identified by farmers in each of the villages

Tree Species		Villages[2]	Fruits	Soil Fertility	Shade	Fire wood	Canoe Making	Mortar Pestles	Timber	Roofing Material	Fencing Materials	Medicinal	Other
Chichewan name	Botanical name												
Mtangatanga	Albizia lebbeck	2,3,5						✓	✓				Charcoal
Mthethe	Acacia polyacantha	1,2,3,4,5		✓	✓	✓				✓			
Mthuthu	Tephrosia vogelii												
Mtondo	Covddyla africana	1,2,3,4,5		✓		✓		✓	✓			✓	
Mtongongoli		3				✓							
Mtsewa	Sclerocarya coffra	3			✓	✓				✓			Hoe handles
Mtumbu	Kirikia acuminata	2,3,4				✓			✓		✓	✓	
Muwale	Erythrina abyssinica	3,4				✓						✓	
Muwawani		3,4,5				✓						✓	
Mvunguti	Kugolia africana	2,3,4			✓	✓		✓	✓	✓			Wind break
Naphini	Sclerocarya coffra	3,4				✓			✓	✓		✓	Wind break
Nsewa	Sclerocarya coffra	3,5				✓				✓			Fibres
Nswaswa		3,4			✓	✓							
Ntawa		4								✓			Fibres, Hoe handles
Nyungo	Rauvolfia cafera	5		✓	✓								
Phopho		3				✓						✓	
Sanga	Faidherbia albida	3,4			✓	✓				✓			Charcoal, Fibres
Shisale		3,4	✓			✓						✓	Hoe handles
Thombozi		3,4			✓	✓			✓	✓		✓	Granaries

Table 8.1 continued: Trees and shrubs their uses identified by farmers in each of the villages

Chapter 6 examines the attitude of the farmers within the project villages towards the systematic interplanting of the Msangu tree (*Faidherbia albida*). The results of this showed that the farmers were very positive about the benefits of Msangu. Table 8.2 shows that Msangu is found in all five villages. The questionnaire survey was used to identify the percentage of households that have Msangu growing on their holdings. Table 8.4 shows the results of this. These figures represent households that have planted Msangu on their land, either with the help of the PROSCARP project, the help of the Forestry Department, or independently. It also represents trees growing naturally that were retained by the farmers for their soil fertility enhancing properties. Farmers may have one or more trees.

Msangu (*Faidherbia albida*)	Percentage of Households
Mbatamila	83.0%
Chifuwa	84.3%
Chigoneka I	33.3%
Chigoneka II	31.3%
Sanga	45.5%

Table 8.2: The percentage of households in each village that have at least one Msangu (Faidherbia albida) tree on their land holding (Source: Questionnaire survey)

It can be seen that there are many more households within the villages in Mbatamila catchment retaining or planting Msangu than in Naluva catchment. Despite discussions with the farmers and the FA for the village, it was not possible to ascertain exactly why this was so. It cannot be attributed to either the influence of either PROSCARP or the Forestry Department as the villages with the highest percentage of households with Msangu trees do not correspond with the intervention of either or both organisations. Msangu is suited to a broad range of soils and terrain (Bunderson *et al*, 1995) and therefore the difference cannot be attributed to location. The higher densities of Msangu within Mbatamila and Chifuwa might be directly attributable to the length of time that these villages have been established. Farmers in Chigoneka I and II were asked if there were Msangu trees in their previous village on the Lilongwe plains. Some farmers thought that they remembered Msangu trees but did not think that there were very many and were not sure when they became aware of the benefits of Msangu for soil fertility.

All the farmers did attach a value to Msangu trees on their land. The benefits have already been felt or seen. The results of this research argue strongly for expanding the systematic interplanting of the Msangu tree, both by PROSCARP and by the Forestry department or the Land Husbandry Department of the Ministry of Agriculture and Livestock Development.

8.7. Conclusions

Chapter 5 analyses the rural livelihoods and agricultural practices of the farmers within the case study area. The result shows a continuous downward spiral of reducing yields. This is a reflection of the loss of soil fertility, lack of ability to purchase artificial fertilisers, uncertain rainfall, pest attack and, in certain villages, soil erosion. It can be argued that, at least in this case, the traditional forms of agriculture are now carried out without the necessary conditions, low population densities and sufficient land for fallow and natural regeneration. This is leading to an agricultural system that is unproductive, energy inefficient and resource degrading. This disproves the assumption that all indigenous agricultural systems are producing in a sustainable fashion.

The farmers in the five study villages had used a system of fallowing for the preservation of soil fertility for as long as anybody could remember. In all of the villages there is now not enough land available to be able to fallow land. There are no ready alternatives. Figure 8.2 shows strategies employed by some of the villagers to increase soil fertility. The use of artificial fertilisers is the only other alternative, if cash or credit can be found. There is no evidence of alternative strategies devised by the farmers for the control of soil erosion.

Planting of crops on ridges has been practised in the region for several decades. Therefore the PROSCARP strategy of introducing contour planting in ridges is not a great change in the farming system and seems readily acceptable to farmers.

The investigation into the role and uses of tree species within the villages reveals the in-depth knowledge of the uses and the value of trees to the farmers. The PROSCARP project is strongly focused on various uses of tree and shrub species and the transferring of these technologies can only be helped by an understanding of the knowledge available in the villages, of tree management and uses. The systematic interplanting of Msangu within the villages could arguably be seen as the most successful biological strategy used by PROSCARP as it is really a continuation (in terms of planting rather than retaining naturally regenerating trees) of a strategy already employed by the farmers themselves.

The lack of apparent adaptations of the farmers to the growing problems of agricultural production, in conjunction with the relative success of contour planting and systematic interplanting of trees, as a slight change from farmers own practices would back up the conclusions of those authors who see indigenous or local knowledge as the most suitable starting point for the development of appropriate and sustainable technologies and programmes, rather than providing the answer to sustainable agricultural development

However, this would raise the question of whether this approach can exist alongside totally new innovations, such as the introduction of minimum tillage, a total change in farming practices within the study area.

Chapter 9 Discussion

As the population of sub-Saharan Africa continues to increase at an alarming rate, the problems of food security, agricultural productive potential and land degradation, are of immense importance both to African nations and the development community. Heavy reliance on agriculture in African economies has produced decades of investment, research and policies aimed at increasing food production, while trying to combat land degradation. However, despite considerable investments in human and financial resources in the name of rural development there has been little improvement in rural poverty, food insecurity and environmental degradation. Chapter 1 explored the major changes that have occurred in approaches to development policies and practices during this time. A new school of thought, or development paradigm, has come into focus over the last twenty years based on the possibility of supporting and ultimately building on the knowledge and abilities of the African farmers themselves. The basis of this thesis is the developmental needs of the rural poor and the developmental processes to achieve these. This thesis has evaluated the concepts of, and the requirements for achieving sustainable rural livelihoods. This research has identified the complexities and diversity in problems and opportunities in smallholder farming systems. The results of the livelihood analysis were used as a base to critically evaluate policies and practices of land husbandry interventions. Finally, the potential contribution of participatory development and indigenous knowledge systems to a large-scale project were assessed.

This research has identified and brought together many strands of this new development paradigm. Problems and opportunities in rural livelihood issues and the role of project intervention were assessed in conjunction with issues of sustainability, participation, empowerment and indigenous knowledge. This thesis has focused on land degradation, and, working within the new development paradigm, analyses problems of land degradation within the wider context of rural livelihoods. Large-scale development intervention, in the form of the PROSCARP project, was assessed to ascertain its impact on smallholder systems, both in terms of the technologies promoted and the management policies.

This Chapter summarises and discusses the findings and the implications of this research. in the context of the literature. The results of the research are discussed under the two main foci. The first is the analyses of rural livelihoods. This provides an in-depth understanding of the many influences on smallholder farming systems in Malawi, expanding the limited information available in the literature. The second focus is an investigation of rural development initiatives through project intervention. This analysis identifies the potential and actual role of large-scale development projects promoting soil conservation and increased rural production through a variety of technologies. This also provides an opportunity for greater understanding of the potential role of participatory development and local knowledge systems in large-scale development projects. The scope of this research required a multidisciplinary approach, encompassing a variety of primary and secondary data sources. The following section evaluates the methods used to reinforce the sound empirical basis on which this discussion chapter is based.

9.1. Review of Methods

The history and changing nature of development theory and practice were introduced in Chapter 1. The nature of the new development paradigm, in terms of its focus on bottom-up, locally appropriate development requires an understanding of local realitites.

This study set out to address the complexities of the local environmental, social and economic factors within which both the farming community and the development project must operate. Previous approaches to data collection tend to emphasise a particular method. In the social sciences this has been dominated by the questionnaire method, emphasising quantitative data. In a critique of this "survey slavery" Chambers (1983) argues that the concepts and categories defined by the outsiders in the construction of a questionnaire are unlikely to represent the concepts and realities of the rural poor. One of the challenges of this research was to find a combination of methods and approaches that provided a balance between the need for academic rigour, while identifying local realities and priorities. This necessitated the avoidance of importing preconceived issues as a researcher from a very different culture and background. A wide range of individuals and organisations (indicated in the acknowledgements) were consulted in the development of the most appropriate methodologies. A combination of qualitative data were collected through many visual as well as verbal methods. Quantitative data collection was carried out at the end of the fieldwork, based on the results of the qualitative data. This combination of data collection methods, and the sequence in which they occurred, provided results based on the farmers' own priorities and realities.

There is currently a wide range of participatory methods in use. These have evolved from an equally wide range of sources, discussed in detail in Chapter 7. Concerns have been raised in the literature about the methodological soundness of these data collection methods. Chambers (1994c) and Pretty (1993) proposed several methods of verification of the data. In order to address these concerns the data were verified by the use of a number of checks, explained in detail in Chapter 3. The qualitative data collection methods used rely on people's own analysis and understanding. The majority of the qualitative techniques used were very successful in procuring in-depth, verifiable data. All of the meetings in the village had large numbers of people attending and the levels of interest and enthusiasm in the research were very high. The villagers proved more than capable of analysing their situations. The flexibility of the qualitative data collection methods enabled the villagers to identify issues and priorities within the villages. These were followed up in subsequent sessions, utilising the most appropriate techniques for each issue.

Two main issues related to the use of participatory methods were identified through this research. The first was the care needed to ensure that a particular method was appropriate. For example, attempts to construct time lines, identifying important events and changing trends over time proved very difficult to apply, as people did not seem to be able to identify reasonably accurate timescales beyond about ten years. Also, a well-being analysis or wealth ranking exercise was not appropriate as the villagers were not willing to discuss other families' circumstances, explaining that it was not acceptable. As a result, certain data that could not be verified were discarded. The second issue was the inherent flexibility of the participatory methods. It seems vital that this flexibility is not confused with ease of use in all situations.

At the end of the qualitative research period, a questionnaire survey was carried out. The results of this survey contributed to an understanding of the socio-economic circumstances in the region. This responded to the limited empirical research available on most aspects of rural livelihoods in Malawi. The survey also allowed issues raised by the qualitative data collection to be explored further and in certain cases allowed verification of data collected using participatory techniques. This combination of techniques, in conjunction with the final checking and correcting of the data with the farmers in each village, is intended to provide the balance required between the need for academic rigour, and the necessity to be based on the complexities of local realities and priorities.

There is increasing recognition throughout the development community of the need to incorporate social, environmental, cultural, political and economic factors into more specific technical research. This research has shown that methods from a range of different disciplines can be successfully combined to analyse potentially very complex realities, thereby providing much more focused results on potentials and constraints to beneficiary adoption of development interventions. This should allow development planners to allocate resources more efficiently for the benefit of the rural producers.

9.2. Rural Livelihoods and Sustainability

An analysis of rural livelihoods was carried out to identify problems and perceptions of land degradation. This involved an examination of the diversity of factors influencing land use, encompassing wider social and economic needs and priorities, as well as identifying perceptions of, and requirements to achieve sustainable rural livelihoods.

An evaluation of the concepts behind sustainability and sustainable agriculture led to the view that sustainable agriculture is a dynamic process, encompassing the broad concept of human needs, as well as production, conservation, social and economic factors. The initial focus of this research was to analyse rural livelihoods to allow an understanding of the basis of rural poverty and land degradation. In response to the concepts inherent in sustainability, this encompassed a holistic view of rural issues, rather than a focus on poverty in terms of income or a focus on sustainability in terms of physical soil conservation. An understanding of the basis and influences on rural poverty are crucial to developing an understanding of where interventions can most effectively be made

A review of the literature evaluated the political and social climate of Malawi and the development issues it faces. This places the research in the broader context within which the smallholder producers, and development projects, operate. Malawi is one of the poorest countries in sub-Saharan Africa. Government policies are strongly oriented towards increasing food production for local and national food self-sufficiency. Intensification of agricultural production has changed local agricultural practices and government statements show that land degradation is now seen as a major problem in maintaining the long term productive potential of land available for agriculture. Nationally, levels of poverty, malnourishment, illiteracy, access to clean water and sanitation, health and child mortality are all issues of great concern. The economy is strongly dependent on agriculture for food production and export crops. The population density of Malawi is high and increasing. 90 per cent of the population are smallholder farmers. At a national level one of the critical issues of agricultural and rural development in Malawi, is the limited land area available for agricultural expansion. Secondary evidence suggests that much marginal land is already being cultivated and forest cover is decreasing. There has been no average increase in yields of maize per hectare in the last thirty years, but the potential yields under better management practices are much higher than current levels. Macroeconomic adjustment in Malawi, driven by structural adjustment lending, has three impacts that directly affect smallholders: a fourfold increase in fertiliser prices, changes in the credit systems, and the liberalisation of the tobacco industry. The Government of Malawi development policy for rural areas is focused on increased farm income. This is to be achieved by increasing crop production, diversifying crops grown to include export crops, and through the conservation of natural resources. Government policies include the promotion of agroforestry for production and conservation. The government extension services are not able to adequately promote agroforestry due to financial limitations. This review of national development issues points to the reliance on increasing agricultural production as the limiting factor for development. The government's focus on food self-sufficiency assumes that it is possible to raise agricultural production beyond its current levels and that production can keep pace with the demands of a growing population, while still conserving the natural resource base on which production is dependant. In this model of rural development the role of the smallholder or subsistence farmer is the production of the national staple food, maize, production of cash crops, the maintenance of the natural resource base, as well as the ability to provide the human needs of his or her family. This reflects the situation found in many countries in sub-Saharan Africa and the potential and constraints to increase production, discussed in the following sections, is then used to assess the appropriateness of agriculture as the answer to rural poverty. The key points raised in this review of issues of national importance in Malawi are: 1) The problems faced by smallholder farmers are immense, 2) the government is pursuing a policy of increased agricultural production for rural development that, due to the limitations faced by smallholder farmers, is not meeting the development needs of the rural poor, and 3) Structural adjustment programs introduced by the World Bank are exacerbating the problems faced by the rural smallholder farmers

The results of the analysis of rural livelihoods and agricultural practices within the study villages revealed a wide diversity of interlinked problems or constraints, both to increasing agricultural production and in meeting basic human needs. A central issue in each village was food scarcity or food insecurity, directly related to insufficient crop production. This included problems of soil fertility, pests, the size of land holdings, and the lack of access to cash or credit for inputs. The problem ranking exercise also identified non-agricultural issues such as access to water, healthcare and markets. The problems that were included in this exercise were identified by the villagers and cover a broad spectrum of issues. The linkages between the issues identified point to the complexities inherent in trying to quantify or understand rural poverty. An improvement in standards of living in these villages does not just require increased crop production but a wide range of development activities to overcome the problems highlighted in each village. This finding argues strongly that a single issue, such as soil conservation, cannot be separated from other aspects of sustainable rural livelihoods.

The empirical evidence collected for this study demonstrates that the two main constraints to increasing agricultural production identified in the villages were the fertility of the soil and the reliability of rainfall. The use of fertiliser and pesticides within the villages was very low. A major issue was the ability to earn cash. This enabled the farmers to fulfil needs within the household as well as provide inputs for agricultural production. Credit is an alternative method of obtaining inputs for agricultural production. Credit facilities are provided nationally but very few of the farmers were eligible, mainly because of loan defaults by themselves or other members of farming clubs with the previous credit organisation, SACA, or because they could not pay the initial instalments to become members of the organisation. This led to an overall distrust of the MRFC credit corporation. Increases in agricultural production will require increased inputs to maintain soil fertility and to benefit from improved maize varieties, specifically fertilisers and seeds. The two main ways of achieving this would be to find alternatives to artificial fertilisers, such as the agroforestry interventions of PROSCARP, or an improvement in uptake or availability of credit facilities. The problems of access to credit, highlighted in this research, show a need for further research to identify potential changes in the credit system to allow equitable access to inputs for subsistence farmers.

Unreliable rainfall, and drought, is a major factor in agricultural production. The problem of unreliable rainfall was not ranked in the villages, as the farmers saw no solution to this problem. The reliance on crops for food and cash leaves the farmers vulnerable to rainfall variation. The farmers saw diversification of crops and owning livestock as reducing the risks associated with drought but "only the lucky own cattle". Water management strategies were not mentioned in any of the villages, or by PROSCARP. There is a strong argument for incorporating water management strategies, in terms of increasing water infiltration in the soil to increase moisture available to the growing crop. Again these findings point to the requirement to assess village priorities carefully. Some of the PROSCARP technologies for land husbandry have the benefit of increasing the water infiltration, such as contour planting. Many of the farmers did not seem to be aware of this. If increased moisture retention was understood as a further benefit of contour planting or minimum tillage it might provide an added incentive to adopt the technology. Logically, the closer the development interventions are to the needs and priorities of the beneficiaries, the higher the potential for the technologies to be adopted. Changes in weather patterns in Malawi reflect changes in other countries throughout Africa. An increased focus on water conservation and management as part of land husbandry interventions could safeguard crop production in years of low or erratic rainfall. However, in years of severe drought or excessive rainfall it is likely that smallholder farmers will encounter decreased food security, unless non-agricultural income, or food aid is available.

The prioritisation of problems within the villages differed but in general food scarcity was the most important issue in Naluva catchment and disease and water supply the prominent issues in Mbatamila catchment. Soil fertility was only ranked as a major problem by two villages and soil erosion was only mentioned in Mbatamila, as the problem of least importance. These findings highlight the need to respond to local community needs, which would question the effectiveness of strategies implemented on a blanket-coverage basis nationwide. This is a particular concern when a development project operating nationally covers a wide diversity of climatic, environmental, social and economic factors. The planning and design phase of a project must take account of local or regional differences to effectively address community priorities.

The above findings are the results of research at village level. However, more in depth research with focus groups and with individual households revealed the problems of relying on a consensus opinion at village level. The problem ranking exercise, although useful for identifying major problems within the villages did not accurately represent the problems of individual households. For example the issues of soil erosion were important to farmers on marginal or steeper land, mainly at the outskirts of the village. More marginalized households, particularly female-headed households, older farmers with no children to help, and farmers with very small holdings had different opportunities and constraints, for example, in terms of labour, access to inputs and potential income sources. This emphasises that problems, such as soil erosion, can be overlooked if they are usually confined to, or only perceived by, farmers on more marginal land, farmed by more marginal households struggling to be heard within a community. Again this points to the extreme care needed to ensure that development meets the needs of the whole community. The previous discussion highlighted the need to respond to differing priorities of communities of villages. The findings of this research on differences between households in a community show that priorities can vary dramatically. This argues for the promotion of a number of technologies suited to different environmental, economic or social circumstances of particular households or groups of households based on their requirements.

Food security was the issue of highest priority within the villages. The issue of food insecurity was examined in terms of the causes as well as an identification of the most susceptible households. This thesis identified locally relevant indicators of food security and used these to evaluate factors contributing to food insecure households. The first indicator of food security, identified by the farmers, was the number of months that food produced from their own land lasted. This is not a measure of the actual maize produced. This incorporates the issue of how many people the land area must support as well as base production levels. Farmers in the 0–0.5 ha category of land holding size were the most susceptible to food insecurity using this indicator. Farmers in the 0.5-1.0 and 1.0-1.5 ha categories are also more susceptible to food insecurities than farmers with holdings greater than 1.5 ha. The age of the farmer was also found to influence food production, with younger farmers appearing to produce less than their older counterparts. This seems to be related to the size of a farm. The survey found that there is a direct relationship between the age of the head of household and the size of his or her land holding, with younger farmers allocated smaller land holdings. There was also a strong issue of geographical location. Naluva catchment was more susceptible to food insecurity than Mbatamila, measured in crop production at the household level. This again appears to be a reflection of smaller average land holdings in Naluva Catchment. No significant difference in food security using this indicator was found between project and non-project villages. Therefore, the results of this research show that the amount of land available to a household can be the primary indicator of household food security, in terms of own food production. Logically this also reflects the increasing problems of a growing population on a finite land area, which can be expected to worsen over time with more and more farmers allocated insufficient land to feed their family. These results would make a case for a higher emphasis on farmers with land holdings of less than one hectare. The project under review in this research found targeting specific households within a community caused problems. However, targeting interventions specifically for very small smallholders may help to respond to their specific problems.

However, this does not fully reflect the issue of food security in the villages. The number of meals eaten per day (as the second indicator of food security identified by the villagers) throughout the year is not influenced by the farm size or the age of the head of household, but does differ significantly between the two catchments. This rather surprising result could be related to non-agricultural food and income sources. This research identified a wide range of income outside of crop production, differing between villages and catchments depending on availability of resources and local opportunities. Naluva catchment had fewer opportunities for earning food or cash. The majority of households in Naluva catchment depended on the earnings from Ganyu labour by at least one member of the household to supplement food supplies. The proximity of Mbatamila catchment to the lake, and the main road, led to earning opportunities for fishing, and production of goods (woven mats, carvings and so on) to sell to travellers on the main road. Alternative sources of income act as a safety net for households that are unable to produce sufficient food from their own land. There is a strong basis for further investigation of the opportunities and limitations of non-agricultural income sources and the motivations for households and individuals to undertake them.

These findings are important when related to the government policy for increased crop production on smallholder farms, discussed in Chapter 2. The problems of crop production on farms of less than 0.5 hectares would support the Government statements that targeted income transfers are necessary for this group of farm households. How these targeted income transfers would be achieved is not apparent. Increased levels of production and agricultural practices that maintain the natural resource base on smallholdings greater than 0.5 hectares have, according to the same Government Statement (Government of Malawi, 1990), the potential to achieve food self sufficiency. Although this may be true there are serious problems to be overcome to increase agricultural productivity. A focus on increased agricultural production for household or national food self-sufficiency seems to have three major failings, based on the results of this research discussed above. The first is that it fails to address other needs within the villages, such as access to water, healthcare, wood and education. The second, and possibly the most important, is that a dependency on agricultural production still leaves a farmers productivity susceptible to rainfall variability. The final constraint is the current problems of increasing productivity in a smallholder sector, specifically the requirement for methods to maintain and increase soil fertility and the use of improved crop varieties, both currently very problematic for smallholders due to lack of access to inputs. Unless the Malawian Government or development projects, such as PROSCARP, can overcome or minimise these constraints, it seems unlikely that national or household food self-sufficiency can be achieved. If this is the basis of development in Malawi, as it is at the present time, then it also seems unlikely that major advances will be made in achieving sustainable rural development.

The discussion of the literature on sustainable development earlier showed that a vital component of the concept of sustainability is that of intergenerational equity. This research shows that current livelihood needs are not being met in the villages. An understanding of the evolution of village priorities over time and the perception of the future were important to understand the influence of these changes within the villages. The first issue of major importance, influencing agricultural production was the effect of land shortages on farming practices. Analysis of the primary data clearly shows that fallowing, for the maintenance of soil fertility, is no longer possible to any appreciable extent. This appears to be the cornerstone of the problem. The evidence shows that the farmers are aware that this reduction in fallowing has a negative impact on the soils and thus on their crop production. However, they have no option in this respect. It was not possible to leave land fallow, despite the potential for land to be badly degraded. The second is the perception of the farmers that yields are decreasing in line with decreasing soil fertility, influenced by the change away from traditional soil fertility enhancing practices. The third important factor is the increasing unpredictability of rainfall. Therefore, the overall impression of the farmers is that they are worse off than previous generations of farmers. Unless development strategies overcome the problems caused by these trends in rural communities the future of these rural communities and the resources on which they depend is threatened. The farmers felt that the best option for their children was education, enabling them to work outside of the village setting and possibly the agricultural sector. Stock (1995) identifies potential problems and benefits of out migration from rural communities. Reduced population pressures and the infusion of remittances may benefit rural communities. However, he also identifies potentially significant costs, for example, lost labour for agricultural production that can change agricultural practices, and increased burdens on women left behind. This would indicate that sustainable rural livelihoods cannot be achieved solely through economic growth in urban centres.

The broad parameters for rural development in these villages, based on the results of the empirical research discussed above, encompass nearly all aspects of rural livelihoods. The basic human needs in these villages in most cases are not being met on a continuous basis. A distillation of the concepts behind the many definitions of sustainable agriculture in Chapter 1 identified the following broad conditions for sustainability at farm level:

- Provision of adequate returns to maintain or increase living standards;
- Maintenance of the social fabric of the village or community;
- Protection and conservation of the natural resource base;
- Maintenance or increases in long term production potential.

Each of these is a vital component and must be addressed. The results of this research show that all of the issues identified in each of the villages and individual households must be addressed to move towards sustainable rural livelihoods. Sustainable rural development, whether related specifically to agriculture or in more general terms, has become the ultimate objective of rural development projects. The IUCN (1997) warn of the potential for sustainability to be "*ethnocentric or culture laden*" (p 34), possibly leading to the situation where local peoples can become victims of the dominant societies' definitions and criteria for sustainability. This can be demonstrated by the initial development interventions from the project evaluated by this research. Soil erosion was identified as a problem and interventions were based on "food for work" as an incentive to carry out the construction of physical measures for the prevention of soil erosion. Monitoring of the project identified the failures of this approach to respond to the immediate needs of the farmers, and the project had to change its emphasis towards land husbandry, with increasing production as an integral component. This raises the issues, first highlighted in Chapter 7, of setting the goals of development and how these relate to the priorities and needs within rural communities. One of the main problems identified here seems to be the sheer magnitude of the development needs in the villages, potentially becoming worse over time due to increasing population. The potential entry levels or points of intervention for a development project are very wide but individual donors can reasonably only be expected to focus on a limited number of development issues. The identification of these issues must be an area of concern. The farmers are aware that the agricultural practices they are currently using are not beneficial to soil resources, but fallowing is not an option as the limited amount of land available to the farmers requires land to be continuously cultivated. The priorities of the community are focused on their short-term needs and requirements. The farmers are more than aware of the limitations of their lifestyle for the next generation but cannot be expected to give up farming their land, even on marginal land very prone to degradation, because the developed world has decided that African lands must be protected. Unless these short term needs, specifically food security, are met, the potential for the longer term broad requirements of sustainable development, especially in terms of natural resource management and conservation, could be more difficult to implement. Rather than tackling specific issues in isolation this could be addressed by a sequential approach to development whereby donor support initially responds to needs and opportunities within a community and then expands areas of intervention. This expansion could be initiated by the donor or through a combination of donors. This calls for muti-sectoral or inter-organisation linkages. This seems appropriate as the evidence suggests that, in this case at least, the issues highlighted within the villages have complex interactions. For example, agricultural production depends on labour, which can be severely affected by ill health, which can be caused by water borne disease from an unprotected water source. Government departments work on a sectoral basis, for example the Ministry of Ministry of Irrigation and Water Development dealing with boreholes and the Ministry of Health and Population dealing with health, and disease. Development projects, at least in the past were very specialised in their fields of intervention. The participatory development process that PROSCARP claims to have adopted, discussed later, would ideally have empowered the local people to a point where it is they who initiate the further development process, or identify the development needs within the community and recruit external help to target each issue.

The final point in the debate on achieving sustainable development is whether increasing agricultural production, the policy of the Government of Malawi, as well as PROSCARP, will provide secure livelihoods in rural areas. The previous discussions have highlighted the need to improve the productivity of the soil resource, alongside the lack of access to inputs. This, in conjunction with an ever-growing population, leads to the conclusion that major improvements in agricultural management might increase agricultural production to a level that produces sufficient returns on farms of greater than one hectare. However, smaller farmers are unlikely to become self-sufficient and are already dependent on alternative sources of food. Increased agricultural production through changes in agricultural management will improve the food security of very small smallholders. However, it seems uncertain, at best, as to whether this will be sufficient to raise the standards of living of these farmers to an acceptable level.

The following section discusses the results obtained in evaluating the impact of PROSCARP within these villages. One of the aims of the research was to analyse the agricultural systems in the villages, identifying problems and opportunities for agricultural production. This allows the technologies and policies of the PROSCARP project to be evaluated against the needs and priorities of the villagers.

9.3. Development Projects: Technologies and Policies

The conclusions reached in this thesis following a review of project documentation and staff interviews shows flexibility in the project approach. The project has changed both the technologies implemented and the policies of intervention. There has been a strong change away from the initial "food for work" approach to a focus on land husbandry as the basis of a sustainable farming system. This aims to help resource poor farmers to tackle problems of food insecurity due to declining soil fertility. These changes reflect the willingness of the project to accept mistakes and to redefine project interventions in light of problems encountered.

PROSCARP interventions are directly in line with government policies and extension workers within the various ministries are funded by PROSCARP to promote PROSCARP technologies within rural communities. The project also has close connections with MAFE, the USAID funded agroforestry extension project. The earlier discussions concluded that multi-sectoral and/or multi agency approaches are more likely to be successful. The benefits of collaboration between several sectors (within the government and with other non-government organisations) should broaden the impact or success of the PROSCARP project.

The research then evaluated the impact of PROSCARP in three villages receiving intervention and two villages not receiving any direct intervention from PROSCARP. This targeted opportunities and limitations of the PRSOACRP technologies, as well as the perception of the farmers as to the benefits of adopting these technologies and the potential for project benefits to be felt outside the direct area of intervention.

The earlier evaluation of PROSCARP evaluated the points of entry of the project in the rural development requirements of the villages. To appreciate the relevance of PROSCARP objectives within the villages, the priorities and needs of the villagers were compared with the aims and objectives of PROSCARP. A model was developed to compare and contrast the priorities and needs of the villagers with the techniques implemented by PROSCARP. The results of this are shown in Figure 9.1. This shows that PROSCARP directly tackles five major issues within the communities, the details of these interventions are analysed in Chapter 4 and 6. For example, food scarcity, as the overall issue of highest importance is tackled indirectly through some of the contributing factors, soil fertility, erosion and lack of cash for inputs. Figure 9.1 identifies areas tackled directly by PROSCARP, and the linkages between the issues relate these interventions to indirect issues tackled. The previous section identified the problems of tackling issues, such as soil erosion, in isolation from other related problems, whilst acknowledging that an individual donor can only reasonably be expected to focus on a limited number of interventions. Within each of the areas of intervention there are a number of techniques or technologies promoted by the project (indicated in Figure 9.1 by darker shaded issues). This comparative exercise indicates that PROSCARP appears to be responding to village needs and priorities as well as any individual donor could be expected to.

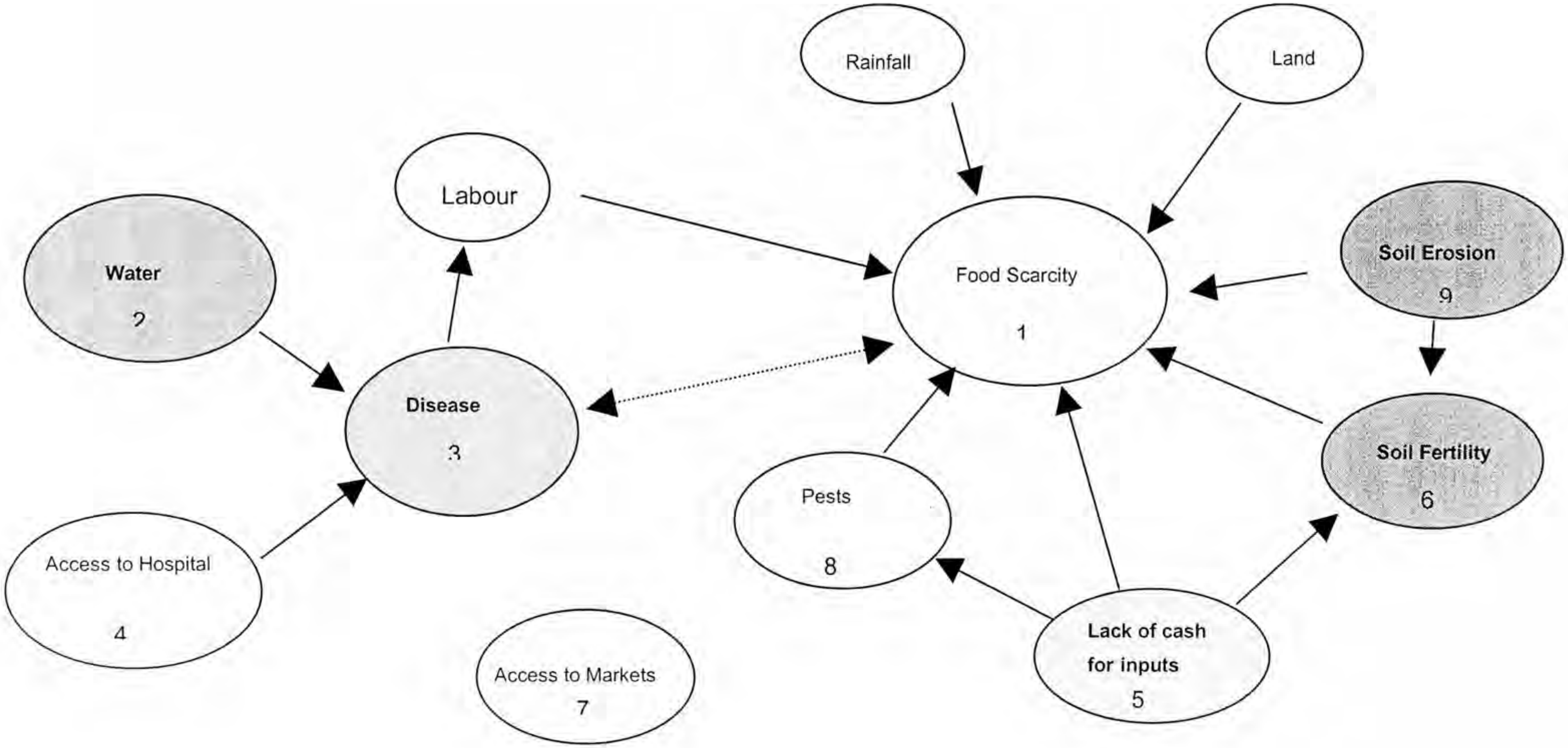

Figure 9.1: Diagram of the relationships between problems or issues identified in the villages showing which issues are tackled by PROSCARP.
* Darker circles represent higher levels of intervention or issue talked by more than one intervention.
** The numbers represent the ranking of the issue by the villagers.
◄ ► Dashed line represents link not drawn in during this exercise but highlighted later in discussions during follow up group meetings

The actual uptake of these technologies, and the current or potential benefits accrued by the farmers were then analysed. This section specifically investigated the more practical aspects of PROSCARP technologies in terms of the benefits and problems encountered by the farmers adopting these technologies. For example, contour planting is a major component of PROSCARP interventions and the uptake of this technique by the farmers provides a useful insight into the issues of introducing new farming techniques. All the crops are traditionally planted in ridges in this area. Therefore, the realignment of the ridges to the contour is not a major change in farming techniques. The benefits of contour planting are easily demonstrated and understood, both for the control of soil erosion and for water retention and increased infiltration. In all of the villages the empirical research found a high level of enthusiasm for contour planting and farmers were well able to explain the benefits of the technology. The marker ridges are constructed in the dry season and, therefore, the labour requirements are not prohibitive even to households with labour shortages. This positive perception of contour planting has resulted in reasonably high levels of uptake. Reasons for non-adoption of contour planting were directly related to the ability of the farmer to mark the contours and the perception of soil erosion as a problem in individual households. One of the limitations of contour planting was its effectiveness on steeper slopes, for which there is currently no alternative methods. Farmers in the villages not covered by PROSCARP were also keen to learn about and implement the technology, having heard of it through the FA and from other farmers. In this respect it can be seen that this technology, despite its long term focus (the control of soil erosion) and the need for farmers to master the use of the A-frame, has become well established within the project villages and has high potential, in terms of expressed interest, to be more widely adopted. The lessons learned from this particular example show that the farmers are willing to invest time and labour for the control of soil erosion because the technology is appropriate to their needs and the benefits are well understood. The results of this survey identified that contour planting could become a normal accepted farming practice in both project and non-project villages, assuming that the problems of farmer confidence and ability in using the A-frame or similar is overcome. This issue is discussed in more detail in section in the discussion of the role of participation and local knowledge systems later.

Problems of soil fertility and lack of cash for inputs (specifically fertilisers) have been targeted through the agroforestry component of the project, based on contour planting. The empirical research found that the potential benefits from agroforestry are again very well understood by all of the farmers present at the meetings in the three project villages. As artificial fertiliser is very difficult to get, the potential for agroforestry to increase the fertility of the soil is paramount. However, the results of this research suggest that constraints to adoption and problems of adoption in this component are high. These are mainly of a practical nature, particularly problems of establishment of the alleycropping species and loss of the species due to pests. The empirical evidence demonstrates that the main obstacle to alleycropping as an alternative to artificial fertilisers is the yield of biomass from the various species. Few farmers had harvested sufficient biomass to noticeably increase crop yields. Maintaining or increasing soil fertility is a crucial issue if crop yield increases are to be obtained. Although the focus of PROSCARP is moving away from alleycropping, there is still a strong emphasis (and expectations) among the farmers on maintaining or increasing the levels of soil fertility enhancing species on their land to increase agricultural productivity. This is supported by the project, although Vetiver grass is now the species of choice for planting on the marker ridges. Despite the limitations of the alleycropping component the results of this research indicate that the farmers were willing to persevere because there was no better option due to lack of credit to purchase fertilisers. This does appear to be one of the motivating factors for adopting introduced technologies. It raises the question of whether the introduction of accessible credit facilities would decrease the number of farmers involved in PROSCARP. Earlier discussions of credit facilities highlighted the major problems faced by farmers in gaining access to credit, which seem unlikely to be solved in the short term. However, it does emphasise the importance of awareness by a development project of motivating factors for adoption. This is also important if motivational factors change over time, as this could impact on the long-term success of the interventions.

There are some major issues raised in this evaluation of project technologies specifically related to agricultural production. The first is the level of inputs required in each of the villages to implement these technologies. This is echoed in nearly all PROSCARP interventions. Logically the withdrawal or decrease of project support will lead to a collapse of technologies requiring inputs. If a development project is promoting technologies requiring levels of inputs there must be a clear commitment to ensuring that the beneficiaries are not disadvantaged by the withdrawal of the project. This could be overcome by ensuring an explicit gradual run-down in project support, allowing the farmers to move over to self-sufficiency, such as the vetiver nurseries set up in some of the villages. Alternatively, to maintain support of such improvements as wells (pumps) and so on might require other organisations to provide backup when required. However, this approach is essentially passing along the cost of project support to other sources. This requires organisations that have the resources to accept this responsibility. This factor should be incorporated into project design and planning to ensure that there are long term benefits from their interventions.

A second issue raised in the evaluation of PROSCARP activities is the suitability of the technologies promoted for all households. Due to land shortages some farmers are cultivating marginal land, specifically very steep land. Current PROSCARP technologies do not cater for these farmers, leading to a situation where some farmers have implemented contour planting but under conditions of heavy rainfall the water is breaking through the ridges, concentrating the runoff and washing away crops in the way of the flow of water. Evidence collected during this study suggests that, in this situation, the traditional method of constructing ridges downhill, although exacerbating the soil erosion problem, can actually increase crop yields. Farmers in this situation, although in the minority, are aware that steeper marginal lands will become barren. Techniques more suited to their needs must be a priority.

The empirical evidence analysed for this study clearly demonstrates that land holding size and gender of the head of household influences the perception of the impact of PROSCARP on food security. The smaller the farm size the less farmers feel that PROSCARP influences their ability to feed their family. Female-headed households were also less likely to think that PROSCARP improved their food security. Again, these findings strengthen one of the main conclusions of this research, the need to identify which interventions are most appropriate to individual households' needs and priorities.

Evidence discussed in Chapter 6 suggests that differences in food self sufficiency are also significant between the catchments studied but not between project and non-project villages. This has two important repercussions for the project. The first is that it is not significantly improving agricultural production, a key component of the project, as well as a major priority in the villages studied. The problems identified by this research in the agroforestry component appear to be the cause of this problem and are discussed in detail later. The second issue is that differences in food self-sufficiency are strongly influenced by geographical location. The results of this research at village level indicate that this is related to non-agricultural income sources. Each village has a certain set of opportunities and limitations, which are not readily apparent in an analysis of land holding size, or other quantifiable factors. This points to two ways to ensure that disadvantaged communities are targeted. The first is preliminary research into alternative income sources and opportunities available to a community at the planning phase of the project. The second is the targeting of strategies at local geographical level rather than a nationwide strategy.

Local opportunities for earning cash or Ganyu labour have a strong influence on food security. For example the main source of income in Naluva catchment is the making and selling of charcoal. Discussions with farmers involved in this activity indicated that the supply of trees for this work is becoming exhausted. Therefore the future earning potential of farmers relying on charcoal making is at risk, potentially exacerbating the problems of food insecurity in the villages. A locally appropriate development solution here may be the planting of trees for future production of charcoal. An understanding of local realities provides a sound basis for designing interventions that directly target the needs of a community by focusing on ways to sustain or improve local income generating opportunities.

The problems encountered by the project related to the implementation of agroforestry interventions have not been solved. The use of vetiver grass on marker ridges as an alternative to alleycropping seemed to be acceptable to the farmers but does not provide any benefits in terms of soil fertility. No completely effective way of providing a short-term alternative to artificial fertilisers is currently provided by PROSCARP and this appears to be the main problem. Over a longer time period the systematic interplanting of *Faidherbia albida* would appear to offer at least a partial solution to this problem. The majority of farmers were enthusiastic about this tree species with the reservation that artificial fertiliser would be needed to bridge the gap between tree planting and tree maturation. The author's observations indicate that many farmers already had one or more Msangu trees growing on their land and interviews with farmers found that they had kept them because of their soil improving capabilities. This concept of partial solutions appears to have a lot of merit as there does not appear to be one single technique that will solve problems of soil fertility, erosion and moisture retention, thereby increasing agricultural productivity. The "trees on farms" strategy, discussed in Chapter 6, shows potential to provide another partial solution. These two technologies, in conjunction with improved fallows (utilising a nitrogen fixing species) and crop rotations, should provide at least some of the requirements for increasing agricultural production. The project does have a range of technologies. However, the promotion of technologies in a community should not be based on availability of resources, but should reflect the issues raised in the previous arguments by combining the technologies to produce the most appropriate solutions for each household.

Minimum tillage may provide the answer to the above problems. The project was beginning minimum tillage trials in the villages at the time of the research and it was not possible to ascertain the potential benefits to the farmers. However, the evidence from this research, discussed in Chapters 6 and 8 suggest that agricultural innovations based on local practices are more likely to succeed. This research would, therefore, question the potential success of a technology that is a major change away from traditional farming practices. The trials have been introduced with no consultations with the farmers, and do not appear to address potential limitations within the villages in the ability to implement this technology. For example, the farmers suggested the control of pests without access to pesticides in a minimum tillage situation as a potentially serious problem.

Achievements in physical soil conservation have been achieved countrywide, in the catchments targeted by PROSCARP. However, these catchments are scattered all over the country and do not represent watersheds or micro watersheds. Although the project may provide benefits to the villagers involved in the project, this does not necessarily provide the local, regional or national conservation protection necessary. Unless all of the farmers in the country will receive intervention from PROSCARP, which appears unlikely, national conservation protection must rely on non-project villages adopting land husbandry and resource conserving farming techniques. The main conclusion of this assessment was that the majority of PROSCARP technologies require inputs or training that are not easily available to farmers not under the influence of the project.

The previous discussions have been concerned directly with the practices of development in terms of agricultural systems and the impact of various project interventions. This section examines the results of a review of development policies, specifically the role of participatory development processes and local knowledge systems. The policies of the project were evaluated in light of the results of analyses of farmer uptake of project technologies.

This thesis set out to evaluate local or indigenous knowledge systems and practices and the potential to incorporate these into a development project. The analysis of the successes and limitations of technologies introduced by PROSCARP, in conjunction with the examination of local agricultural systems and practices, reveals the benefits to a development project of basing at least some of their interventions of local knowledge systems and practices The results of an evaluation of local knowledge systems did not highlight any indigenous soil and water conservation strategies currently in use. However, two of the most successful techniques introduced by PROSCARP were based directly or indirectly on existing practices. The first is planting on the contour, which involved a realignment of existing ridges. The second was the systematic interplanting of *Faidherbia albida*, a species already retained in farmers fields due to its soil fertility enhancing properties. The results of this research indicate the importance of assessing local farming practices and local knowledge when designing interventions as the potential success of a technique is, in this case at least, improved substantially if the technology is based on existing knowledge and practices.

The investigation into the role and uses of tree species within the villages reveals the in-depth knowledge of the uses and the value of trees to the farmers. One of the main results of this survey was the multipurpose function of trees within the farming and household system. The PROSCARP project and interventions by the forestry department is strongly focused on the promotion of tree and shrub species. Traditional or local tree management is currently quite passive, with naturally regenerating trees retained on a farmers land. The substantial knowledge base of tree species and their uses within the villages should act as a strong basis for extending the variety of tree species and their active establishment and management. These findings back up the increasing concern in the literature, discussed in

Chapter 8, for greater recognition of local knowledge systems and the potential for development efforts to use local knowledge as a basis for interventions. However, the successes achieved based on local knowledge and technologies would question the success of the introduction of very different farming strategies, such as minimum tillage. The results of this research would indicate a need for much more in-depth research into the acceptability and appropriateness of minimum tillage, as well as its potential to improve soil resources.

A main objective of this research was to identify the potential to incorporate participatory development into large-scale projects, such as PROSCARP. A critical evaluation of the concepts of participatory development highlighted four potential problems, the purpose of participation, setting the goals of development, incorporating participatory processes into a large-scale project, and the role of power shifts in such an approach. The typology of participation proposed by Pretty (1994) in Table 7.1 provides a useful tool for analysing the form of participation achieved. The use of PRA or PLA should involve interactive participation and ideally lead to self-mobilisation. In a project such as PROSCARP it is easy to see that the initial policies were at the level of passive participation, or participation for material incentives, a top down or blueprint approach to development. The question that this research sought to answer was whether it was possible, or appropriate to move away from this approach.

The comparisons of farmer priorities and project objectives revealed a reasonably high degree of overlap. This does give confidence that the setting of goals for this development project does respond to the needs and priorities of the beneficiaries. The current objectives of PROSCARP have evolved in response to monitoring and evaluation of the impact of the project within the villages. These results highlight the importance of flexibility within a project to respond to problems identified with an initial project design. As shown by the analysis of PROSCARP provided by this thesis, large-scale projects can achieve this flexibility if accurate monitoring and evaluation of the project are carried out and the results incorporated into the project design.

The use of participation, as a means to achieve a preset goal or as an end in itself, is a second potential issue. PROSCARP, as a large-scale project, has, to date, pursued the incorporation of farmer participation as a facilitating technique to attain the project objectives. The type of participation has changed through the life of the project, as discussed in detail in Chapter 7. An analysis of the participation of the farmers within the project cycle identified participation by consultation as the current situation in the villages. The setting up of catchment committees and the formulation of catchment area development plans would indicate that functional participation has been achieved but the lack of power, responsibility and, therefore, the potential to achieve self-dependency by the committees, identified by this thesis, does not back this up. Concentrating on empowering the catchment committees will result in functional participation. The results of this appraisal of the changes in participation achieved by the project shows that it is possible to incorporate and change the type of participation into a pre-existing project. Unless interactive participation or self-mobilisation is achieved there is a strong possibility that introduced technologies will not be sustained and the community may not feel the long-term benefits of the project. These facts would support an argument that introducing participation as a means to achieve a pre set goal can be used as a starting point but unless the project stays active in the long term, it is necessary to move towards interactive participation.

Empowerment of the beneficiaries of development was identified in Chapter 7 as a crucial issue in a participatory process. As discussed in the previous paragraph, pre-existing large scale projects such as PROSCARP seem more likely to start with very low levels of participation, moving towards interactive participation or self mobilisation. This involves a shift in power relationships between the project staff and the beneficiaries. Although the project has set up Catchment Committees in each village, and identified the need for a Catchment Area Development Plan, this has not resulted in the committee or any of the other villagers in becoming responsible for any significant aspects of project intervention. The results of the investigation into power relationships between beneficiaries and the project show that there had been no redistribution of power. The project still has full control of all aspects of project research and design. Participation in project implementation and monitoring is passive, or consultative at best. The extension agent is still the teacher passing on messages from above to, hopefully, compliant farmers. PROSCARP reflects the situation found in many development projects, both governmental and non-governmental, with a centralised management unit and smaller regional centres with the lower echelons of the project dealt with by individual field officers. The empowerment of the beneficiaries would require a complete reversal of the flows of information and decision-making. Although the project literature does deal with issues of passing control to Catchment Committees, this has not occurred in practice. This seems to reflect the contradiction between responding to the individual requirements of communities and individual households within these communities, and the need for technologies that can be implemented through government extension agents nationally.

A further key aspect of the understanding of the impact and likely successes of PROSCARP is related to the sustainability of the achievements. To date PROSCARP has not made any effort to analyse the potential response to withdrawal of project interventions. The overriding recommendation of this research is, therefore, that a firm commitment is needed to assess the potential future sustainability of project interventions. This can be achieved by consolidating existing technologies in villages that have been active in the project since the first season, 1989, and efforts should be made to minimise project interventions. This will require the Catchment Committees to be in full control of project knowledge and technologies. This has the potential to show what will happen, under current project strategies, after final withdrawal. There is a commitment in the project literature to such an approach but this must be translated into practice. Although participation has become the language of development, this project shows that converting participatory rhetoric into practice is more problematic. However, this thesis would indicate that incorporating a more participatory approach to development in a large-scale project is possible.

The question is whether the approach to development and the technologies promoted by PROSCARP and similar projects, will provide an effective long-term solution to problems of rural poverty and the attainment of sustainable livelihoods. Although the results of this research cannot answer this question accurately, PROSCARP has already improved some aspects of rural livelihoods in the villages, specifically in the areas of water and health. There is definitely the potential to increase yields from the crops presently grown, barring drought, and some of the technologies promoted are showing potential to provide long-term benefits in agricultural production and resource conservation. However, the land available to the current generation of farmers is already very limited. If land holdings are further divided for future generations of farmers it is difficult to see how sufficient production can be achieved to meet needs. Unless urban migration (already currently high) absorbs the members of the community that cannot support themselves in the villages, the future of the farming community looks dim. Agricultural development can achieve increased food production on smallholder farms but unless alternative sources of income, such as the promotion of rural enterprises, are found it is difficult to believe that Malawi's smallholder farmers can attain sustainable rural livelihoods, meeting all of their needs. The sustainability of all of these measures could be increased substantially by national measures for healthcare, education and family planning.

This thesis has found that sustainable rural development must be a very broad concept, encompassing all aspects of rural livelihoods. Land husbandry interventions for soil conservation and increased production have the potential to substantially contribute to sustainable rural development but cannot be tackled in isolation. The causes of under development and land degradation, as well as the solutions must be confronted. Development interventions for increasing agricultural production and soil conservation must be locally relevant, and appropriate to the needs and limitations of individual households and communities. The incorporation of local knowledge and practices in the design and implementation of agricultural innovations has the potential to substantially increase the acceptability and relevance of introduced techniques. The long-term success, in terms of benefits to the farmers, of development interventions is unlikely unless the goals of the development project are in line with the requirements of the beneficiaries. Introducing participation as a means to achieve success in a large-scale development project could lead to more active participation by the farmers. This relies on the goals of the project reflecting the needs of the community, requires locally appropriate technologies, and requires a shift in power to the beneficiaries. This empowerment of the local community is the main stumbling block when incorporating participatory development in a large-scale project, as the management structure and approach will need to shift emphasis dramatically to a point where the beneficiary has control over the direction and management of project activities.

Chapter 10 Conclusions

This Chapter sums up the main findings of this research. Finally, in light of the results of this research a number of recommendations are discussed specifically concerning the PROSCARP project.

1. Analyses of rural livelihoods show the diversity of opportunities, needs and influences within the smallholder farming sector, directly related to agricultural but also encompassing wider social and economic needs. Strategies for sustainable rural livelihoods must cater to the current needs and priorities within the villages as well as catering for future changes, especially in relation to population growth and health issues. The linkages between the issues identified point to the complexities inherent in trying to quantify rural poverty. This finding clearly indicates that a single issue, such as soil conservation, cannot be separated from other aspects of sustainable rural livelihoods. This argues for agricultural sustainability to encompass all aspects of rural livelihoods. A focus purely on increasing agricultural production and maintenance of the natural resource base does not necessarily lead to sustainable development in the widest environmental, social, and economic sense.

2. The scope of this research, seeking to address the complexities of rural livelihoods, required an innovative approach, encompassing a wide range of primary and secondary data sources. Primary data collection involved both quantitative and qualitative research methods. Qualitative research methods were based on techniques developed through PRA and associated methods. These provided the flexibility needed to avoid a pre-conceived research agenda, and allowed the farmers themselves to provide the basis for data collection, reflecting issues that were important within the community under study.

3. The project evaluation provided critical insight into the incorporation of new development approaches into development projects working in the field. The development project under review provided valuable lessons

for the potential for large-scale projects to respond to the call for increased participation and the potential to increase project acceptability by the understanding and incorporation of local knowledge and technologies. Potential paradoxes were identified in trying to change a large-scale project away from a blueprint approach to a participatory or bottom up approach. This research found that large-scale projects and participatory development are not incompatible, if the project is reasonably flexible in responding to problems identified with technologies or policies. However, the most important issue to overcome is the problems of empowerment of the beneficiaries. Although PROSCARP has recognised the need to pass control and knowledge of the techniques promoted by the project to the beneficiaries, this has not, to date, happened. The attainment of interactive participation or self-mobilisation of the community seems a necessity to ensure the long-term sustainability of project interventions, unless the project can remain in operation indefinitely. This research identified the need for the project to act on their commitment to attempt to make certain villages self sufficient, under the management of the Catchment Committee, for the continuation of land husbandry and other interventions.

4. This research is based around PROSCARP, a large-scale development project operating nationally in Malawi for the promotion of soil conservation and rural production, mainly through the use of agroforestry. The size of the project was deliberately chosen to allow analysis of the problems and opportunities of a larger scale project. The provision of wells and covered pit latrines through PROSCARP intervention is seen in a very positive light by the farmers in the case study villages and helps to increase the farmers' interest and confidence in the project. These findings clearly indicate that if development interventions respond directly to the needs of the beneficiaries they are much more likely to succeed.

5. Malawian smallholder farmers are the basis of government policies to attain food self-sufficiency. However, these farmers are constrained by national issues of high population growth, with the resulting shortages of land available for expansion of cultivated areas. This drives a vicious circle of ever decreasing land holdings, agricultural intensification, changed agricultural practices away from fallowing, expansion to more marginal land, reduced forest cover and the degradation of the land resource. These issues compound problems of poverty, lack of access to cash or credit, malnourishment, illiteracy, increasing health issues, especially the spread of HIV/AIDS, and child mortality. Households with small land holdings were most susceptible to food insecurity. However, geographical location, in terms of opportunities for non-agricultural income, was also a strong contributing factor. Rural development must halt and reverse the trends in the agricultural sector of decreasing productivity and land degradation to increase food security, a vital component if sustainable rural livelihoods are to be achieved.

6. Analysis of livelihood strategies revealed a wide diversity of income sources within the case study area. Agricultural production is the main focus of both Governmental and non-governmental organisations. However, many of the farmers within the study area were reliant on alternative sources of income to supplement agricultural production. Diversification within the case study area was opportunistic, working on other farms, or using available resources (trees, fish, reeds for weaving) for production of often low value products. There is a strong argument here for further research into identification and development of alternative income generating opportunities.

7. In depth research with focus groups and individual households revealed the problems of relying on a consensus opinion at village level. Individual households or groups may need interventions targeted specifically at their requirements. This finding is particularly important for farmers cultivating marginal land that is prone to land degradation.

The results of this research in the case study villages indicate that if remedial measures are not appropriate then the land may become non-productive over time. The implications of these findings point to the potential for increasing the marginalisation of the farmers who do not directly benefit from development interventions.

8. Of the agricultural technologies promoted by PROSCARP, the two most successful from the point of view of the farmer, are contour planting and systematic interplanting of *Faidherbia albida.* Both of these techniques are directly related to local agricultural practices. Contour planting realigns existing ridges, and naturally growing *Faidherbia albida* is retained by the farmers in their fields as they recognise its beneficial effect on soil fertility. This strongly backs the call for increased recognition of local agricultural practices and local knowledge as a basis for development interventions.

9. The results of this research suggest that serious problems have been encountered with the alleycropping component of the project. These problems were directly related to the success of establishing alleycropping species in sufficient numbers to provide the expected benefits for soil fertility from the harvesting of biomass. Reasons for adoption of this technology were based on the fact that there were no other alternatives for maintaining or increasing soil fertility. Farmers are still investing time and labour in the establishment of soil improving or multipurpose agroforestry crops despite problems encountered, as they understand the potential benefits that can be accrued. However, unless benefits come on stream before the project has to decrease support to the villages, the long-term sustainability of the project interventions is in doubt. This relates to several factors. The first is the level of inputs required by the farmers to implement PROSCARP technologies. Unless the farmers become self sufficient in the need for these inputs, or another supporting organisation takes responsibility, the techniques used are unlikely to persevere. Another, equally important issue is the ability and confidence of the farmers to continue

on with project activities, or to adapt them for their own particular purposes without the direct help of project staff. There is a strong dependency mentality in the villages surveyed, although it was difficult to ascertain whether this is a cultural phenomenon or an attitude endorsed, if unintentionally, by the op down culture that has to date dominated the project.

Recommendations

The following is a list of recommendations, identifying possible applications of the results of this work within the PROSCARP project.

- PROSCARP must make efforts to analyse the potential response to withdrawal of project interventions. Villages that have been active in the project since the first season, 1989, should be assessed to ascertain the level of project activity and efforts should be made to minimise project interventions. This has the potential to show what will happen, under current project strategies, after final withdrawal. There is also the potential for the project activities to be adapted by the farmers. This is more likely to happen after extension agents are less active as there is less potential for the farmers to be told that they are not doing things "correctly".
- The results of this research highlight the necessity to have a clear policy regarding long-term issues, and how beneficiaries can obtain help or advice after project withdrawal. In a large-scale project, such as PROSCARP, dependant on an external donor there is no long-term guarantee of funding. If the beneficiaries of the project become self-sufficient and self reliant (through a participatory approach) the project might move on from these communities to other communities. If, as is currently the case with PROSCARP, current interventions in the villages are dependant on project staff for inputs, information and so on, and there is no evidence of project withdrawal having long term benefits, the introduction of yet more interventions and the expansion of the project to even more villages does not seem a logical approach, unless the project is very sure of long term funding.
- The above recommendation would require substantial consolidation of existing project interventions. The combination of current technologies as well as new interventions such as minimum tillage make it unlikely that project withdrawal will become a reality. A clear policy for future

directions in existing villages is a major requirement due to the variety of new interventions

- The potentially wide variety of technologies available to the farmer should be based on farmers' knowledge and expectations instead of the availability of seeds or extension agents' time. This would require a concentration on the partial solutions approach, whereby a number of technologies, best suited to the farmers situation and environmental conditions. This would help respond to the need of identifying appropriate interventions for individual household needs.
- Current benefits in increased soil fertility from alleycropping are low. Although minimum tillage may provide an alternative, it is a long-term strategy requiring major changes to agricultural practices and is only implemented on a trial basis. Much more work needs to be done to ascertain the potential acceptability of this technique to the farmers
- A clear policy must be out in place to ensure that the level of inputs required for the project must be phased out over the life of the project in each village. This will overcome potential problems obtaining the necessary inputs after the active life of the project.
- If the project cannot fulfil the major problems of the farmers within the funding period available then the responsibility of the project technologies continuing should be passed along to the downstream people (for example, the electricity company, which may minimise the cost of hydroelectric maintenance from silt build-up?).
- The current approach is still very much a top-down approach to development. The full participation of the farmer is an essential component of PROSCARP. The contour planting, alleycropping and other techniques are well understood by the farmers but without the power to decide their own future it is unlikely that any meaningful development will be achieved in the villages.

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Appendix 1

Sample Questionnaire

Number Site Date

1 General

Householder Name________________Tribe ______________Religon ____________
Male / female Age <20 / 20 - 30 / 30 - 40 / >40
Committee member Yes / no Position___________________
Farm size _________ (hectare / acre) Area Tilled ____________________

Number of people in household;

Adults	Age	Education	Children	Age	Education

Number working on farm Full time; M____ F____ ; part time; M_____ F_____
Do you participate in ADDFOOD / PAPPPA Yes / No

2 Agriculture

2.1 Livestock

Cattle	Goats	Pigs	Chickens

Other livestock

____

2.2 Crops

Type	Area Grown	Mono/intercrop	Fert/pest applied	Variety	Use
Maize					
Cotton					
Tobacco					
Groundnuts					
Pigeon pea					
Cowpea					
Beans					
-Other-					

Source of fertiliser (Credit, cash, free)____
Source of credit?____
Where do you store your crops?____

What seeds did you receive from PAPPPA this season?
Maize yes / no Soya yes / no Comwpea yes / no Pigeon pea yes / no
Sorghum yes / no Groundnut yes / no Other ______________________

3. Household

How big is your house?
Is it big enough to accommodate all the family members
Does your house have a pit latrine? Yes/ No With sanplat yes / No
What distance do you have to walk to collect firewood__________________ kms
Do you get water from a shallow well, borehole or other source?
____
Does it have water all year?

4. Land Husbandry

How much land is affected by soil erosion ______________________
How much of your land has the following
Marker ridges pegged __________ % of land Ridges realigned % of land ______
Do you practice alleycropping yes / no
If not why not?
____
What species are your marker ridges planted with (and percentage)
____
____
What tree species grow on your land and use?
____
____
What other soil improving methods do you use?
Fallowing yes / no Green manuring yes / no Crop rotation yes / no
Animal manure yes / no Compost yes / no
crop residue incorporation yes / no Other ______________________

5. Other

Major sources of income

Crop sold	Income

Other sources and income

type of activity (male/female)	which months	income

Last season how long did you have food from your own crops? __________ months
How long do you think this season's crops will feed your family? __________ months
Where do you get extra food from when your crops run out?
____
How many meals do you eat a day?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

What is your usual source of protein? (relish)

6. Project

If you do not participate in PAPPPA, why not?

Does PAPPPA contribute to;

Your ability to produce enough food to feed your family? yes / no

The fertility of your soil? yes / no

The health of your family? yes / no

Access to clean water? yes / no

Appendix 2

<u>The construction and use of the A frame for the marking of ridges along the contour.</u>

Equipment and people needed
2 metres of strong string
1 stone
3 wooden poles with flat ends, two that are 3 metres long and one about two metres
1 knife
Pegs to mark contour lines with an optional carry bag (about 165 pegs/ha for flat and gentle slopes, 250/ha for medium slopes and 330/ha for steep slopes)
1 hammer, rock or large stake for driving pegs into the ground
2 people

Tie the tops of the three meter poles together. Tie the two metre pole across the other two poles about 1 metre from the bottom to form an A shape. Hand a string, with a stone on its end, from the top of the two vertical poles. The stone should hang 5 – 10 cm below the horizontal pole (See diagram).

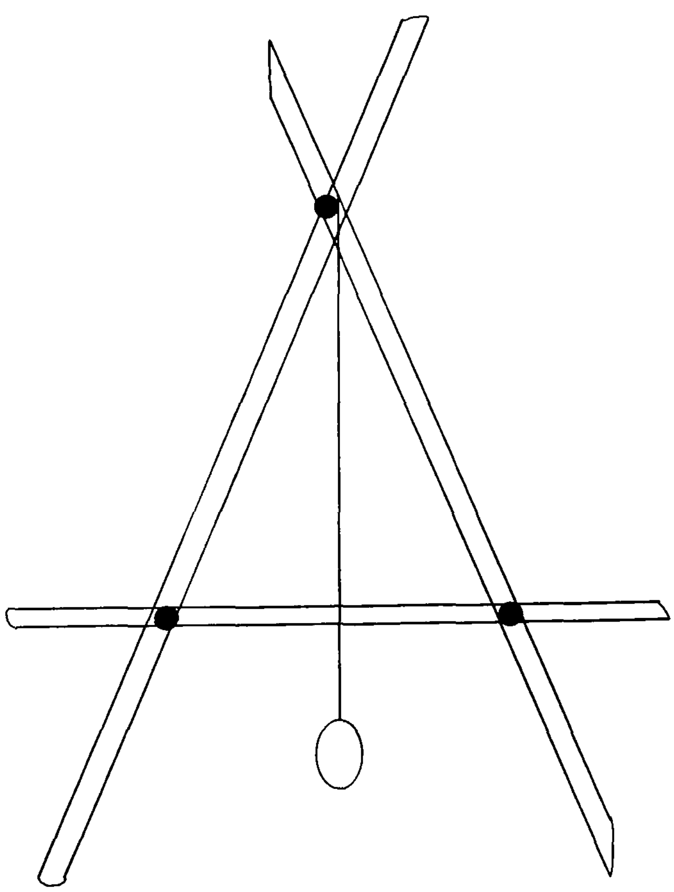

Figure A1 A-frame

Calibrate the A-frame by standing it on a level floor. Then mark the exact spot where the string crosses the horizontal pole. The A-Frame is perfectly level when the string hands precisely over this centre point.

The A-Frame is used in the field by inserting a peg at the starting point of the field. One of the legs of the A-Frame is positioned nest to this peg. Holding this leg in place, the other leg is moved around until the string hangs precisely over the mark on the cross pole. A peg is inserted in this point. The first leg is pivoted around again until the string hangs exactly over the mark and another peg is inserted. This process is repeated until the end of the field is reached. The team then moves downslope to the estimated position of the next contour line where the process is repeated until the field is finished. Ridges are then constructed along the line of pegs.

From: Bunderson et al, 1995.