CHIA LAGOON WATERSHED MANAGEMENT PROJECT

FINAL REPORT: OCTOBER 2004 TO DECEMBER 2007

Volume I: Technical and Financial Report

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EXECUTIVE SUMMARY

Background, Approach and Objectives

The Chia Lagoon Watershed Management Project was supported by USAID's Global Development Alliance initiative under a partner alliance led by Washington State University and Total LandCare with the Nkhotakota District Assembly. The goal is to improve the livelihoods of rural households through interventions involving a demand-driven participatory approach with the following objectives:

1. Increase farm productivity, food security, nutrition, and incomes through sustainable low-cost systems of crop diversification and irrigation linked to good markets.
2. Improve the sustainable use and management of natural resources.
3. Identify opportunities for developing rural enterprises for producing and marketing agricultural and natural resource products.
4. Increase capacity to monitor impacts and environmental change.

Highlights of Achievements

Improved Natural Resource Management

Three natural resource management associations were formed with constitutions and bye-laws involving co-management agreements with the Department of Forestry, Department of Fisheries and Department of National Parks and Wildlife. A total of 733 households from 45 villages are involved in these associations.

Improved Management of the Chia Lagoon Fisheries

The Chia Lagoon Fisheries Management Association was strengthened through changes in the constitution, establishment of bye-laws and stronger representation by Beach Village Committees (BVCs). The Association involves the 12 BVCs with 831 members, and 143 fish vendors from 17 villages. Fish catches and sales from the Chia Lagoon are increasing based on an improved management plan developed with the Fisheries Association.

Forestry

Over the life of project, 2.3 million tree and bamboo seedlings were raised in nurseries by 283 villages and 6700 households. Villagers planted 1.9 million of these seedlings. In addition, 68 Village Forest Areas involving 4277 households were demarcated with management plans to promote regeneration for sustainable use.

Crop Diversification

Three farmer associations with 2986 members were formed with constitutions and bye-laws for the production and marketing of improved rice, beans and paprika.

Diversification efforts focused on high value, high yielding, disease resistant varieties of rice, beans, paprika, maize, cassava, bananas, and various vegetables. Cultivation of these crops has grown tremendously since the start of the project. In 2007/08, production and sales involved 1.3 million tons and MK 52 million for Kilombero rice; 175 tons and MK 13 million for beans; 443 tons and MK 10.5 million for irrigated crops; 900 tons and MK 107 million for cassava; and 1000 banana bunches and MK 0.36 million.

Enterprise Development

Based on market assessments, enterprise development activities (separate from farming per se as discussed above) focused on bee keeping, mushroom production and fish farming. Although production levels remain low, all 3 show promising results that can be increased significantly by efforts to enhance the transfer of technical, management and business skills.

1. INTRODUCTION

The Chia Lagoon Watershed Management Project was supported by USAID through its Global Development Alliance initiative over the period October 2004 to December 2007. Project activities were implemented through an alliance of partners led by Washington State University and Total LandCare with the Nkhotakota District Assembly (KKDA).

Although USAID expressed strong interest to extend the life of the project based on the results produced, current funding limitations precluded this possibility. However, with support from officers at the USAID Malawi Mission, new funding was secured from the Royal Norwegian Embassy to build on the successes achieved to date, and to use the Chia project as a model for expanding and scaling up impacts over a larger region.

This document is the project final report which consolidates information, results and findings across the entire period of the project. It comprises 2 volumes:

Volume I: Technical Report

Volume II: Annexes of Studies and Success Stories

Volume I is organized in distinct sections as follows:

1. Introduction
2. Description of Watershed and Target Communities
3. Project Goal, Objectives and Approach
4. Implementation Plan
5. Results by Intervention Area
6. Overall Conclusions on the Project
7. Financial Report

2. DESCRIPTION OF THE WATERSHED AND TARGET COMMUNITIES

2.1 Physical, Biological and Population Characteristics

Chia Lagoon Watershed covers a total area of 989 km^2, of which 611 km^2 forms the project area. It falls between latitudes $13^o0'$ and $13^o30'S$, and longitudes $33^o50'$ and $42^o20'E$, encompassing parts of Nkhotakota and Ntchisi Districts in Central Malawi (see **Figure 1**). The watershed includes Ntchisi Forest Reserve in the southwest, and part of Nkhotakota Game Reserve to the northwest. The area is drained by the Lifuliza, Likoa and Bambara river systems, which originate in the Ntchisi hills through deeply incised gorges and valleys before winding through the lowland plains and entering Chia lagoon.

The watershed has vast natural resources vital to the livelihoods of its 55,000 human inhabitants. The uplands are characterized by *Brachystegia-Julbernardia* savanna and woodland interspersed with intensively cultivated areas of maize, groundnuts, cassava and small areas of tobacco. The lowland plains support *Acacia-Bauhinia* woodland with paddy rice, cassava and maize as dominant crops. The Chia Lagoon, which has an outlet into Lake Malawi to the east, is an important fishery resource for communities living around its borders with a body surface area of 17 km^2. The lagoon's fringes are heavily colonized by marsh reeds (*Phragmites* spp.) and shrubs that thrive under waterlogged conditions (e.g., *Aeschynomene, Mimosa* and *Sesbania* spp.).

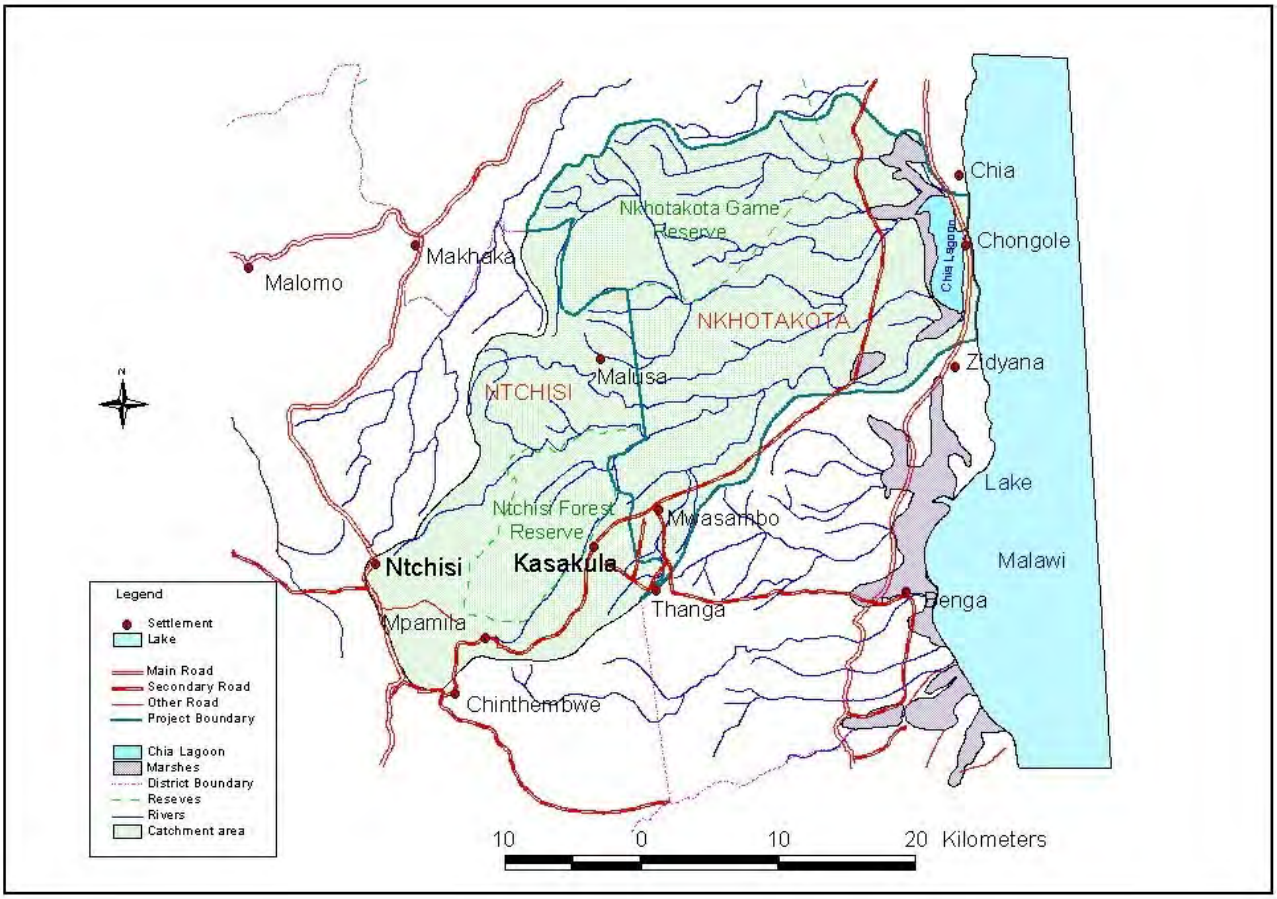
2.2 Challenges Being Addressed

Participatory rural appraisals of the area identified major problems of natural resource degradation in the Chia Lagoon watershed from poor land-use practices over the past 20 years. Major causal factors include opening new land for agriculture, cultivation on steep slopes and stream banks, poor farming practices, felling of trees for wood, and setting bush fires which destroy or degrade valuable vegetative cover. The results have led serious problems of water runoff and loss of top soil, especially in the upper reaches of the watershed, which has led to sedimentation of the lagoon. This in turn has negatively affected the lagoon's rich biodiversity and the livelihoods of its local communities. A contributing factor in this degradation includes conflicts among special interest groups over the use of the watershed's natural resources. The situation is exacerbated by short-term interests of survival, social prestige, and material gain among the communities involved.

Impacts on the watershed's natural resources include:

1. **Soil degradation:** There is evidence of severe soil degradation in terms of physical, chemical and biological properties due to over-cultivation and loss of topsoil from surface run-off and erosion. The result is a major constraint in maintaining the area's agricultural productivity.
2. **Degradation of natural vegetation:** Loss of vegetation cover in the watershed (due to reasons specified above) has led to a steady decline in wood supplies on customary land. To help compensate for the deficit, communities are encroaching into the forest and game reserves, a situation which is only aggravating degradation of the watershed with rising conflicts between different user groups.
3. **Reduced abundance and diversity of fish resources in the Lagoon:** There has been a drastic reduction in fish stocks in the lagoon. The Fisheries Department (1999) reported a decline in catches from over 500 tons between 1992 and 1995 to less than 300 tons in recent years. This has been accompanied by changes in the species composition of fish. Several factors have contributed to this problem. The most notable are as follows:
    - ◊ *Little or no control of fishing by the communities:* Includes use of inappropriate fishing gear and poisonous plants to kill fish, depletion of breeding stocks, non-observance of closed seasons, and concentration of fishers in the lagoon when fishing in Lake Malawi is hampered by bad weather.
    - ◊ *Decline in water quality and quantity* due to siltation and chemical pollution from poor or inappropriate cultivation practices upstream (see details below).
    - ◊ *Invasion of water hyacinth:* This not only impedes navigation of fishing vessels but it also affects light conditions for aquatic animal and plant life in the lagoon.
4. **Declining water quality and quantity in the Lagoon:** Although there were no previous hydrographical surveys and water quality assessments, it is clear that the water quality and quantity of the lagoon have been severely degraded. There is high siltation as evidenced by the sediment loads in the lagoon and its rivers, and shallow water depths at the mouths of rivers as well as the lagoon fringes. Invasion of the water hyacinth in the lagoon, and undesirable shrub species on its fringes, are results of adverse changes in the ecosystem caused largely by improper land-use practices in the upland areas of the watershed.
5. **Declining human health:** The health condition of people in the watershed is declining from a combination of social and environmental factors. Major problems include cholera and diarrhoea/dysentery due to poor standards of hygiene and use of contaminated water. Other common diseases include malaria, bilharzia, HIV/AIDS, sleeping sickness, trachoma, skin infections and respiratory ailments. Much could be done to reduce the incidence of these diseases through simple preventive and treatment measures.

Figure 1: Catchment Area of Chia Lagoon Watershed



3. PROJECT GOAL, OBJECTIVES AND STRUCTURE

The overall goal is to improve the livelihoods of rural communities within the Chia Lagoon Watershed through a community-based approach that involves sustained economic use of the watershed's natural resources of land, water, flora and fauna. This goal is consistent with the economic growth results framework of the USAID's Malawi Mission under ***Strategic Objective No. 6: Sustainable Increases in Rural Incomes*****.**

The inter-relationships among the many challenges in the Chia watershed were clearly articulated. They demonstrated the urgent need for an integrated approach to produce more effective and lasting results as opposed to mechanistic or sectoral approaches that treat the problems in isolation.

Interventions implemented with communities fell under the following objectives:

1. **Decentralization:** Based on a thorough needs assessment, support and strengthen the district decentralization process of capacity building by providing services and resources in policy, technical training, business/marketing skills, extension and training materials, environmental monitoring, and overall human development focusing on organization, leadership, communications, planning, targeting, monitoring and reporting.
2. **Improved Community-Based Natural Resource Management** involves empowering communities to sustainably use and manage forests, soils, water, fisheries, and wildlife within the watershed by transferring knowledge, skills and resources.

3. **Sustainable Agricultural Practices:** Promote sustainable farm production through sound land and water management practices with a focus on crop diversification, low cost systems of irrigation, crop rotations, intercropping, conservation agriculture, agroforestry, soil conservation measures, use of organic manure, and increased tree planting. A key aim is to diversify and stabilize crop yields to reduce risk and vulnerability with better food security, nutrition, and opportunities to market surplus production.
4. **Enterprise Development:** Identify and develop practical and profitable enterprises for rural households and groups to produce and market agricultural and natural resource products. This includes opportunities to add value through basic processing for increased efficiency and competitiveness. It also leverages opportunities to gain access to micro-finance with a stronger vertical integration in the market. This will be facilitated by helping to establish links with other producer groups and private firms, including small medium entrepreneurs (SMEs) engaged in marketing and processing.
5. **Monitoring and Evaluating Impacts and Ecosystem Change:** Increased local capacity to monitor and evaluate impacts of targeted interventions on communities within the watershed, including assessments of changes in land cover in relation to changes in land and water use. Capabilities will include the use of GIS systems and satellite imagery to map the physical, biological and population characteristics of the watershed, as well as the location of interventions introduced during the project's life.

4. IMPLEMENTATION PLAN

4.1 Partner Alliance Team and Related Activities

The aim of this alliance was to offer diverse skills and experiences to implement a broad range of interventions to generate synergy for greater impact.

The alliance team and respective partner responsibilities are summarized in the box below.

The Alliance Team and Associated Responsibilities

Washington State University: Lead institution with responsibility for Project Oversight, Financial Management, Market and Ecosystem Surveys, Monitoring and Reporting.

Nkhotakota District Assembly: Community Mobilization, Information and Extension Services, Field Implementation and Coordination with other partners and stakeholders.

Total LandCare Malawi: CBNRM, Agroforestry, Soil Conservation, Irrigation and Water Harvesting, GIS Mapping, Training and Extension Services, Coordination of Field Programs.

Cooperation for the Development of Emerging Countries: Community Mobilization and Empowerment, Agro-processing, Formation & Management of Cooperatives/Associations.

AgriCane Malawi: Assessments of landuse & cover, irrigation potential, alternative crops, introduction of value-added processing, GIS support services.

Wildlife & Environmental Society of Malawi: Wildlife & Environmental Conservation and Education; Community Environmental Action Plans, Eco-Tourism.

Business Consult Africa: Business Management and Training, Feasibility and Market Assessments, Product Development, Agro-processing, Private Sector Linkages.

4.2 Support from USAID Malawi

USAID Malawi was the principal funding agency, although there was a significant cost share from each implementing partner. Initial meetings were held with representatives from USAID to explain and define its policies, accounting procedures and reporting requirements. Quarterly meetings were also held with USAID Officers to document progress in terms of financial expenditures and field results.

USAID's Agricultural and Natural Resource Office, led by Mark Visocky and Autman Tembo, actively contributed to the project in terms of technical and management issues, including information to explore potentials for producing and marketing different products. USAID was also instrumental in identifying other sources of funding to expand the program, and for encouraging and developing collaboration with other organizations, including micro-finance institutions.

A key element of USAID's participation included regular field visits with project partners. Field visits included the American Ambassador for Malawi, Alan Eastham, the Mission Director, Curt Reintsma, and several Multi-Disciplinary Teams from USAID Washington DC. These activities enabled USAID to monitor many aspects of the project, and to explore new opportunities that emerged from a good understanding of the program. In addition, the re-activation of USAID's Synergy Meetings in March 2006 provided a useful tool to exchange information with other USAID–funded projects and to establish common areas of interest for collaboration.

4.3 Collaboration with Partners, Key Stakeholders and Other Organizations

A major aim of the Project is to coordinate its programs with other interested parties and organizations active in the watershed and with those who wish to share their experience and knowledge in the targeted sectors of intervention. In order to identify potential collaborators, several group and individual meetings were held to determine common areas of interest and to define the specific roles and activities appropriate for each organization to maximize the resources available, human and physical. Highlights of collaboration are provided below:

Alliance Partners

During the initiation of the project in October, meetings were held with the alliance partners to introduce each party, to explain their roles within the project, and to define an effective management structure for collaboration and implementation to produce results. All alliance partner members were present as well as representatives from each of the district sector departments, i.e., fisheries, agriculture, water, forestry, environmental affairs, parks and wildlife. An annual workplan and budget was produced with the participation of all partners.

Follow-up meetings were held during the year to assist with the following:

- Clarification of the project setup and partner roles and responsibilities for different project components.
- Inter-partner communications and linkages.
- Disbursement of funds, equipment and other resources.
- Financial and technical management and reporting requirements.
- Planning, prioritizing and implementing field activities.
- Collaboration with other parties / organizations operating in the area.
- Developing workplans and budgets for each partner.
- Disbursing funds and equipment to partners according to agreed plans and budgets.
- Mobilizing communities through awareness and sensitization meetings and exchange visits involving traditional authorities and villagers.

- Collection of baseline information on the human, socio-economic and natural resource base within the watershed:
    - People, villages and infrastructure
    - Land cover and land-use
    - Natural Resources: Water; Fisheries; Vegetation; Soils; Wildlife
- Developing plans and actions for implementing field programs to:
    - Strengthen community structures and interest groups.
    - Form and strengthen clubs for specific interventions/activities.
    - Protect riverine habitats and streambanks.
    - Establish nurseries for trees, bamboo and vetiver grass.
    - Diversify crop production by introducing and multiplying improved germplasm with a focus on rice, beans, cassava, bananas, vegetables, maize and paprika.
    - Investigate the potential of different irrigation systems: treadle pump irrigation; drip irrigation; stream diversion and water harvesting, including the rehabilitation and re-organization of large gravity-fed irrigation schemes.
    - Constructing fish ponds and organizing the supply of fingerlings.
- Documenting, monitoring and evaluating results.

Collaboration with Other Organizations

- **IITA/SARRNET** to expand the multiplication and production of improved varieties, and to assess financial and market potentials for establishing processing plants for cassava starch, flour and chips (see Annex of the 2nd Annual Report).
- **COMPASS II** to promote a) consistency in approaches/technical messages in CBNRM activities related to co-management and resource-use agreements, forestry, wildlife, and fisheries, b) to share information on NR-based enterprises focused on fish, honey, mushrooms, timber and other forest products, and c) to harmonize approaches to reduce duplication and conflicts.
- **CIMMYT** to expand the adoption of Conservation Agriculture using the model of TLC as a means 1) to stabilize yields in the face of variable rainfall, 2) to reduce water runoff and loss of valuable top soil, and 3) to save labor which can be re-directed toward more productive activities.
- **Bunda College and the Bean-Cowpea CRSP Project** to establish linkages to promote the multiplication and marketing of improved varieties of bananas and beans as viable smallholder enterprises.
- **Norwegian Aid** to collaborate with Norwegian Fishery Specialists at Nkhotakota District Assembly on technical matters to assist in managing the capture fisheries in the lagoon.
- **World Fish Center** to promote aquaculture based on sound management principles and market analyses with a focus on addressing the challenges to increase the sustainable production of fingerlings in Malawi, and to enhance growth and production of fish.
- **NASFAM** to establish groups/associations linked to the production, processing and marketing of high value crops through NASFAM, including rice, bird's eye chilies, groundnuts, and cotton.
- **Chitedze Agricultural Research Station** to provide assistance in identifying and modifying appropriate low cost technologies for processing agricultural produce, specifically cassava flour and chips; groundnut flour, oil and peanut-butter, and fruit / tomato products (juices, puree and dried fruits).

- **Cheetah Ltd.** to initiate the production of paprika under winter irrigation for sale to Cheetah by targeted farmer clubs using treadle pumps and stream diversion.
- **Eco-Products Ltd**., to provide potential market linkages with support on production/processing of honey from local bee-keeping clubs; the firm was contracted by the project to provide hands-on training and extension support to honey farmers in the Chia area with the expectation of mass purchases of honey.
- **ATTIGA (Appropriate Technology and Training for Income Generating Activities)** in the Ministry of Gender has been contracted to provide follow-up training to organized groups of farmers on the production and marketing of mushrooms (including spawn), fish, honey, bamboo, and thatching grass. Work in this regard will start in April 2006.
- **Lakeside Resorts** to establish linkages with local resorts in the area to increase awareness and opportunities for eco-tourism and to purchase local produce from farmers in the area, notably mushrooms, honey, fish, leafy vegetables, tomatoes, onions, rice, and beans.
- **Farmer's World** to promote the production, supply of inputs, and marketing of improved varieties of crops to develop income-earning capabilities and self-sufficiency in the district. One example is sugar beans for export to S Africa. Discussions are exploring the potential to stock a variety of farm inputs through outlets in the area – including treadle pumps, fertilizer, improved seeds, tree nursery supplies, and other items.
- **Opportunity International Bank of Malawi** to provide loans for promising small-scale enterprises. Strong interest was expressed in many different enterprises, particularly honey, mushrooms and irrigated produce. The potential on the ground is being assessed next quarter to explore micro-credit opportunities for organized groups.
- **Other projects and NGOs** such as Save the Children USA, WorldVision International, ActionAid, Concern Universal and the EU projects to reduce duplication and conflicts by harmonizing approaches and messages with farmers and KKDA.

4.4 Start-up Activities

Briefing Meeting with Nkhotakota District Assembly

The Project was presented to the full District Assembly in December 2004. All members gave full approval to the project to facilitate its implementation and success.

Stakeholder Meeting

A stakeholders meeting was held at the Capital Hotel in early February 2005 to officially announce and explain the Chia Lagoon Watershed Management Project to all interested parties. The meeting was attended by over 70 representatives from the District Offices, Line Ministries, Government Agencies, Non-Government Organizations, National and International Programs, Donors and the Private Sector. Comments, suggestions and the sharing of experiences and exploration of mutual areas of interest were promoted and examined. The outcome reflected strong interest and support for the project from all sectors.

Launching Ceremony

On February 16, 2005 the official launch of the Chia Lagoon Watershed Management Project was conducted at the Chia Primary School in Nkhotakota District. The Vice-President the Honorable Dr. Cassim Chilumpha was the keynote speaker. Several thousand people attended the launch from the surrounding communities, local government, national ministries, NGOs and the private sector. The proceedings attracted great interest from all parties, and especially from the communities in the watershed. The event was well covered by local and national media.

Financial Management and Procurement

The project set up a designated bank account to manage USAID funds. Disbursements were made into accounts established by each partner based on approved workplans and budgets. Monthly financial reports were prepared by TLC accounts department for consolidation by WSU which submitted quarterly reports to USAID. The financial report is presented in Volume II of this report. **Table 1** shows key equipment procured with USAID funds during the year.

Table 1: Procurement of Vehicles and Equipment with USAID Funds

	Item	Source	Unit	Quantity		Remarks
				Planned	Actual	
1	**Vehicles**					Vehicles were timely procured.
	Ford 4x4 Pick Ups	Local	#	3	3	
	Yamaha Motor Cycles	Local	#	9	9	
2	**Office/Field Equipment**					Procurement completed in Years 1 and 2
	Computers	WSU	#	2	2	
	Office Furniture	WSU	Sets	2	2	
	Printers	Local	#	2	2	
	UPS	WSU	#	2	1	
	GIS Software					
	ArcView GIS Version 3.3	WSU	Set	1	1	
	ArcView Version 9.0	WSU	Set	1	1	
	MapInfo Professional Version 7.8	WSU	Set	1	1	
	GIS Hardware			1		
	Scan Plus IV Scanner	WSU	Set	1	1	
	Global Positioning System (GPS)	WSU	Set	6	3	
	Dell Precision Desktop	WSU	#	1	1	
	Remote Sensing Data/Images	WSU	Set	4	4	
	Computer consumables	Local	#	2	2	
	Fax Machines	Local	#	1	1	

Establishment of Project Field Office and Staff Recruitment

A project field office was set up within the KKDA premises to provide effective management and communication support with District and project staff, as well as other collaborating organizations. Project staff placed within the district included the following positions:

- **Project Manager** – supervision of field staff and collaboration with KKDA staff and other relevant projects/NGOs.
- **Agronomist/Marketing Specialist** – managing agronomic aspects of all agricultural based interventions/enterprises, farmer organization and marketing.
- **Field Coordinator (Agriculture/NRM)** – coordination of sustainable agricultural practices, agroforestry, soil and water conservation.
- **Field Coordinator (Fisheries)** – coordination of capture fisheries in the lagoon, fish farming and marketing with government field collaborators in co-management of fishery resources, community mobilization and fish farming.

- **Field Coordinator (Forestry)** – coordination of activities related to forest resources including community organization, bye-law formulation, co-management of natural resources, establishment of village forest areas and all forms of tree planting.
- **Field Coordinator (Enterprise Development)** – coordination, promotion, training and extension support for rural enterprises such as bee keeping, mushroom production and other promising enterprises with assessments of markets and market linkages.

4.5 Project Organization and Management

The organizational structure and management of the project in **Figure 2** shows the responsibilities and inter-relationships of each partner within the alliance as well as with the intended beneficiaries of communities in the watershed.

As the lead institution, WSU and it's Project Director had overall responsibility for managing and administering the project. All technical, logistical and financial matters were handled through this unit, including the production of technical and financial reports with contributions from each alliance partner. Field programs were coordinated at the partner level by the Director of Total LandCare through the District Coordinating Officer at KKDA and the Project Manager. Partner activities were coordinated by the COSPE Country Representative who liaised directly with all partners and project field staff for planning activities in the field. Line management at the field level was directed through the District Environmental Officer at the KKDA Headquarters, with the Project Manager as the executive secretary.

Three bodies were set up to support the administration of this management structure:

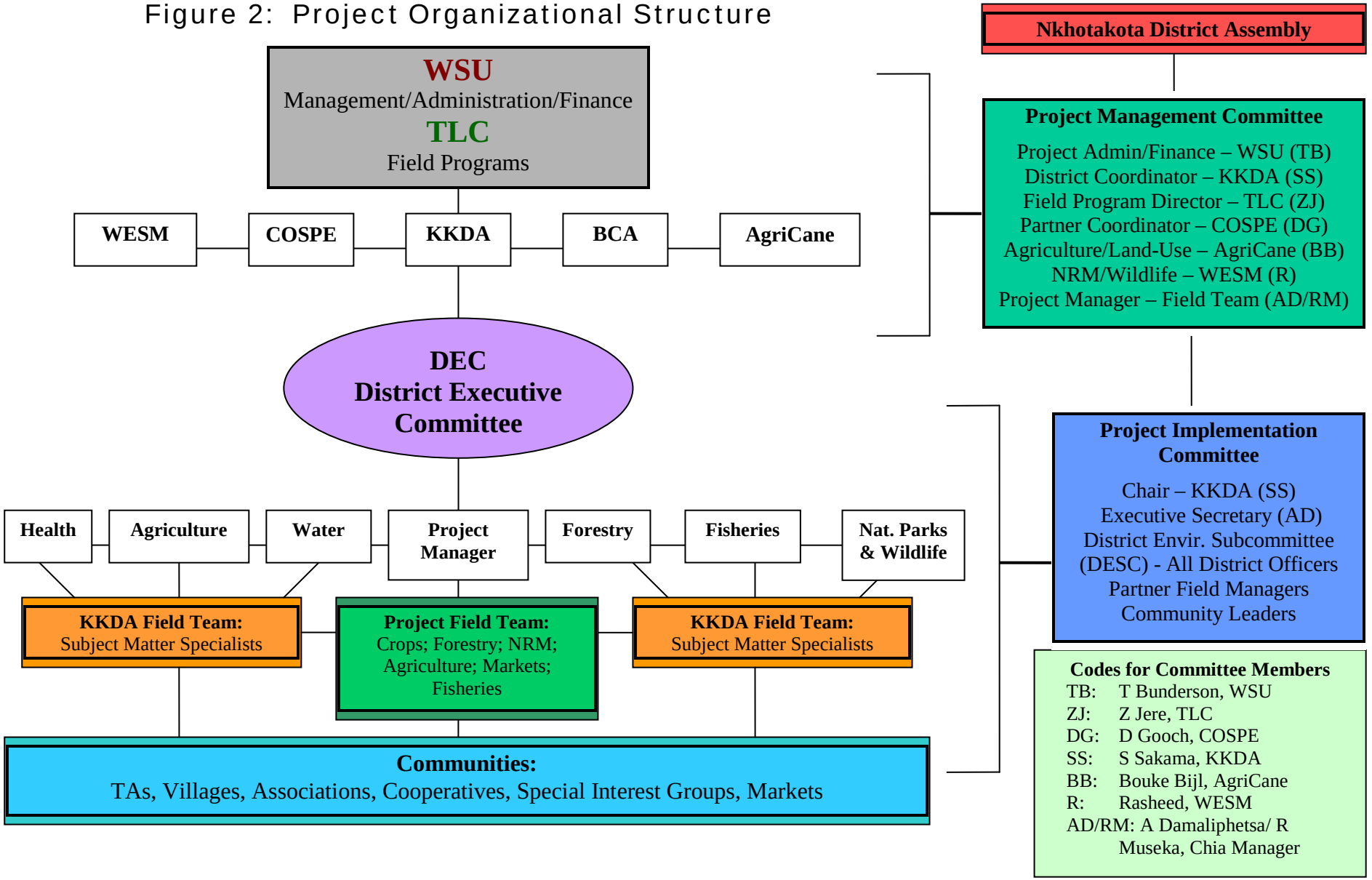
1. Project Management Committee
2. Project Implementation Committee, and
3. Community Committees

Project Management Committee (PMC)

The PMC comprised representatives from the partner alliance and project management to lead initiatives in their areas of specialization (see composition, **Figure 2**). The Project Director, WT Bunderson (WSU) served as the chair, with ZD Jere (TLC) in charge of Field Programs, and D Gooch (COSPE) as the Communications Coordinator. For the first year, the committee met on the first Thursday and Friday of each month, and thereafter bi-monthly under the following agenda:

- Overall coordination of partner activities across their given areas of expertise.
- Carrying out sector-specific activities as agreed upon in the annual workplan.
- Overseeing the execution of the proposed activities in a timely and effective manner.
- Resolving any issues of communication or conflict among the partners.
- Timely and proper disbursement of funds to each partner as per partner budgets.
- Coordinating timely contributions from each partner regarding project financial and technical reports, workplans, budgets, workshops and field days.
- Communication between the partners, the Project Implementation Committee, the District Executive Committee, the full District Assembly and the community leaders.
- Initiating and/or maintaining contact with other stakeholders and organizations that could provide potential support to any component of the project.
- Disseminating and sharing experiences, information and results with all partners.
- Making site visits with a theme focus for that month.

Figure 2: Project Organizational Structure



Project Implementation Committee (PIC)

The PIC operated at the field level. Its members include the District Environmental Sub-Committee (DESC), the Project Manager, partner field representatives and the government and project field coordinators. The District Environmental Officer (S Sakama) chaired the PIC, with the Project Manager as executive secretary. All meetings were held at sites within the watershed to enhance the exchange of information and understanding among all parties about the diverse range of interventions and the implementing partners involved.

The PIC met on monthly basis to coordinate all project activities at the field level as follows:

- Identifying priority sites, "hotspots" and actions in consultation with the PMC.
- Reviewing previous month's activities and planning for the following month.
- Conducting joint supervisory visits/spot checks to project sites.
- Verifying the effective implementation of the proposed activities.
- Reporting to the PMC on activities and progress within the project areas.
- Exchange of information with the communities and the community leaders.
- Overseeing information sharing of events and activities between the communities, community leaders, the District authorities and the field staff;
- Clarifying issues and resolving conflicts among the project and district field staff.
- Guiding awareness and sensitization campaigns for communities in the watershed.

Community Committees (CCs)

CCs were formed to provide designated focal groups at the community level to carry out and administer specific activities as indicated in the project workplan. Some Community Based Natural Resource Management Committees and Beach Village Community Committees already existed in the watershed, but many were non-functional with limited leadership and direction. The project assisted communities to elect respected leaders to represent the community's concerns and issues, and to assist with the planning, implementation, and management of proposed actions.

The committees have responsibility for the following:

- Overseeing the development and enforcement of regulations to better manage the resources utilized by the community.
- Assisting in the dissemination of information and the introduction of sustainable and improved resource management technologies.
- Coordinating activities and trainings of the community with the district and project field coordinators.
- Developing bye-laws to control the economic utilization of natural resources in a sustainable fashion.
- Representing the needs and interests of community members.

Community committees are vital in supporting economic initiatives for producing, processing and marketing agricultural and natural resource based products. The project strengthened the functions of these committees by supporting the development of constitutions and bye-laws under legally registered associations to represent and promote their management plans.

These Community-based entities have elected leaders fulfilling organizational/managerial roles with responsibility for:

- Financial management of funds with full transparency on all monetary transactions.
- Accurate and up-to-date bookkeeping and regular reports on accounts.
- Dissemination of technical information to the members.
- Coordination of activities and trainings with members and project/partner field staff.
- Sharing information with other interested parties or communities.
- Management of market linkages and sales for both inputs and outputs.
- Over-all business administration in a transparent and conscientious manner.

4.6 Extension Strategy and Approach

Broad stakeholder participation and community mobilization are key elements of responsive and effective project implementation. This provides opportunities for all stakeholders to participate including government, the private sector, communities, and NGOs. The alliance is working closely with all parties through a tested and proven community mobilization process that uses and strengthens existing structures and legal frameworks. This process involves a holistic watershed approach as a means to address the diverse nature of the problems identified, with a range of services to ensure sustainability and continuity. Emphasis is being placed on decentralization and capacity building at the District level, which includes all relevant government departments, the district assembly, NGOs and donor projects working in the district, and communities/special interest groups.

The adoption of a truly integrated approach, which involves collaboration with other institutions, NGOs, private sector firms and donor-funded projects such as NASFAM and COMPASS II, is designed to enhance, expand and maximize targeted results and impacts on rural livelihoods in the Chia Lagoon Watershed.

Key features of the project's approach to ensure impact and sustainability:

- Empower people to become self sufficient in managing their natural resources through participation and education using existing structures and legal frameworks. The mode of operation is demand-driven with a focus on transferring knowledge, skills and tools to improve increase food security, nutrition, health and incomes of rural communities.
- Build on local knowledge to identify points of impact through experience-based interventions to ensure sustainability with reduced dependence on external support.
- Provide equipment, materials and inputs on a cost-recovery basis under the premise that free handouts are not valued and are not sustainable.
- Promote the transition from aid-dependent subsistence to market-based livelihoods by building capacity for vertical integration in the market. Livelihoods will be improved by incorporating business and marketing skills to support adoption and sustainability of environmentally sound resource management and production practices.
- Facilitate positive change in the watershed by leveraging the strengths and capabilities of different partners to transfer skills, knowledge and resources to communities.

Emphasis will be placed on decentralization and capacity building at the District and local levels with a focus on the following activities:

1. Provide training in the relevant technical disciplines, business and financial management, and marketing, with linkages to relevant support groups and information centers.

2. Provide, produce and upgrade user-friendly extension and training materials as needed on all components of the project based on results and lessons learned. These materials will provide the tools and knowledge for strengthening extension delivery and training.

3. Implement an extension strategy to expand outreach efforts by leveraging the limited human, financial and physical resources available:
   - ◊ Focus on Interventions that generate high impacts.
   - ◊ Placement of field coordinators within the watershed to work with District staff and communities to support key components of the project.
   - ◊ Target villages for each coordinator in clustered concentrations to facilitate logistics, training and extension services.
   - ◊ Intensive support will be provided for 1-2 years per village, which will thereafter be scaled down as communities become self-sufficient in maintaining the program.
   - ◊ Enhance impacts from the synergistic effects of involving collaboration of many villages and traditional leaders under a coordinated program with common goals.
   - ◊ Publicize results to attract interest in participation from other service providers as well as neighboring communities.
   - ◊ Provide access to improved seed, inputs, materials and equipment through direct cash payments or signed loan agreements with TLC or finance institutions under the policy to instill a sense of ownership and value for the goods and services offered to ensure sustainability and impact (i.e., no free hand-outs).

4. Support marketing initiatives as follows:
   - ◊ Evaluate existing markets and potentials for specific crops and products.
   - ◊ Facilitate linkages between producers, processors and industrial consumers.
   - ◊ Expand opportunities for value-added activities by developing and disseminating appropriate processing equipment and technologies to meet market standards.
   - ◊ Increase opportunities for potential private sector investors about the profitability and competitiveness of local processing for products promoted.
   - ◊ Increase market opportunity for high value crops and products through market research and other promotional activities.
   - ◊ Organize promotional campaigns using mass-media to popularize new crops and products among household and industrial consumers.

5. Target measures to address cross-cutting social issues of gender inequality and HIV/AIDS.

4.7 Monitoring and Evaluation

A project monitoring and evaluation (M&E) plan was developed and revised in response to comments and suggestions from the Malawi USAID mission. It includes input, output, and impact monitoring based on the development and execution of studies, surveys and questionnaires at specified periods with project partners and collaborators. The plan formed an integral part of the project implementation designed to ensure performance and timely detection and correction of implementation weaknesses and inefficiencies.

Strategic elements of the M&E Plan included the use of a computerized database, satellite imagery, and GIS applications with mapping capabilities to monitor and update the following attributes over time:

- Profiles of each village to characterize human, socio-economic and bio-physical features.
- Key indicators for each intervention area of the project to monitor activities and impacts, disaggregated by gender where possible, to match targeted outputs.
- Input indicators including trainings, provision of extension and other project materials, village/community exchange visits, meetings with communities and their leaders, demonstrations, field days, workshops, etc. as specified in the plan of activities.
- Natural resource indicators to monitor the abundance and quality of water, vegetation, fisheries and wildlife in relation to land use practices over the entire watershed.
- Output indicators that include the effectiveness in achieving the objectives of the project. Successes and challenges will be reported to understand the efficiency of implementation to ensure that any problems that arise are fixed swiftly, and that best practices can be fostered and advanced; reports will consist of both narrative and quantitative verification and auditing
- Information gathered will meet the needs of donors, project managers, staff and beneficiaries; a key to data collection is that it must be understood to be valued and utilized fully.
- Understanding among project staff and beneficiaries to create sustainability beyond the lifespan of the project with a clear appreciation of responsibilities.
- Participation by project staff with communities to ensure greater buy-in and active involvement in monitoring activities with feedback overtime for improvements.

The means of monitoring was through household and market surveys, GIS surveys, and profiling as integral elements of internal monitoring and evaluation reports. Field staff and project beneficiaries maintained accurate, up to date records of inputs, outputs and outcomes of their activities. Monthly reporting by all field staff were internally monitored by the project manager. Mid and end year evaluations were carried out throughout the project lifespan.

Basic elements of the M&E plan are outlined in **Table 2**.

Table 2: Monitoring and Evaluation Plan

Program Component	Survey Method	Indicator	Frequency
Community-Based NRM	Community Based Monitoring & Evaluation - with verification sample surveys of clubs and households	**Customary Lands** 1. No. of participating villages/households 2. No. of village resource assessments conducted 3. Area demarcated for conservation & management 4. No. of management plans developed 5. Harvestable products and their levels 6. Use, sales and income **Forest & Wildlife Reserves** 1. No. of participating villages/households 2. No. of associations formed & registered 3. Co-management agreements developed 4. Enforcement of bye laws 5. Harvestable products and their levels 6. Use, sales and income **Fishery Resources** 1. No. of participating villages/households 2. No. of associations formed & registered 3. Co-management agreements developed 4. Enforcement of bye laws 5. Fish catches by species 6. Consumption, sales and income	Once/year Once/year Once/year
Forestry	CBM&E with verification sample surveys of clubs and households	**Tree Planting Program** 1. No. of participating clubs and households 2. No. of nurseries established 3. No. of tree & bamboo seedlings raised and planted 4. No. of tree and bamboo seedlings surviving **Sustainable Management of Natural Woodlands** 1. Cultivated Lands a. No. of trees retained on farms b. Area with regenerating trees on farms 2. Natural Woodland Conservation a. Area of mature woodlands b. Area of regenerating woodlands c. Tree density & standing biomass **Improved Kitchen Wood Stoves** 1. No. of improved stoves built and in use 2. No. of participating households	Once/year Once/year Once/year
Sustainable Land and Water Management	Sample Household Surveys	**By Practice and Crop** 1. No. of participating clubs/households 2. Area/Production 3. Yields of produce per household a. Quantity for home consumption b. Sales and prices c. Average household and total income	Seasonal – 2 times/ year; 1. Rainfed Crops 2. Irrigated crops

Table 2: Monitoring and Evaluation Plan (Continued)

Enterprise Development	Sample Household Surveys	**By Enterprise (Mushrooms Production, Bee Keeping, Aquaculture etc.)** 1. No. of participating clubs/households 2. Area/Production 3. Yields of produce per household a. Quantity for home consumption b. Sales and prices c. Average household and total income **Eco-Tourism** 1. No. of participating villages/households 2. Development of Features & Infrastructure 3. No. of Visitors by Activity 4. Average household income and total	Seasonal depending on enterprise production cycle
Program Impacts	Sample household surveys Satellite image analysis	**Improved Livelihoods** 1. Average income/year 2. % Households food secure year-round 3. % Households self-sufficient in wood **Land Cover:** Change in land use/cover in relation to land-use practices and climate change	Bench line in Year 1; Thereafter every 2 years

5. RESULTS BY INTERVENTION AREA

This section consolidates key results over the life of the project under specific result areas.

5.1 Decentralization / Devolution of the Nkhotakota District Assembly

A major objective of the project is to build local capacity at the district, community and household levels to support rural development initiatives with leadership from the district assembly, traditional leaders and government departments. This process involved conducting awareness meetings and trainings on many subjects across hundreds of villages with thousands of participants. Although these efforts were important to the objective, it was the day to day implementation of the project that provided the real opportunity to learn - from hands-on participation not only in the technical matters of a particular practice or intervention, but on the 'how' element.

Key factors that assisted the project's success included strong collaboration and support from the District Government Departments and staff, as well as the trust established with targeted communities. The latter took time to build, especially after rumors at the start of the project that the objective was to seize Chia land and resources from the community. This created difficulties during the first year, but once the 'myth' about the project's intentions was dispelled, confidence in the project and its staff paved the way for good collaboration and support from the communities. Toward the close of the project, strong public appeals to continue the project were widespread among community leaders and villages throughout the watershed.

Table 3A presents a consolidation of results by intervention. As explained in the notes beneath the table, summation across interventions was not usually possible due to differences in units, involvement of villages and households in more than one intervention, and implementation of more than one intervention on the same unit of land.

Table 3A: COMMUNITY PARTICIPATION IN DIFFERENT INTERVENTIONS AND RELATED RESULTS SUMMED ACROSS THE LIFE OF THE PROJECT, 2004-07

Intervention	Unit of Production	# Villages	# Clubs	No. of Participating Households			Production		Sales		Total Income (MK)	Avg Income/ HH (MK)
				# Men	# Women	# Total	Total	Per HH	Total	Per HH		
Community Based Associations												
NRM /Co-Management	NA	45	76	507	226	733	NA - Established for non-destructive collection of forest products [5]					
Chia Fisheries Management [1]												
Fishers (catch & sales at the beach)	Kg	17	12	831	0	831	410,045	493	328,036	395	33,720,829	40,579
Vendors [2]	Kg	17	1	143	0	143	NA		328,036	2,294	98,410,800	688,187
Crops/Farming [3]	Kg	74	142	1,640	524	2,164	2,606,631	1,205	2,306,784	1,066	121,546,747	56,168
Total [4]	**NA**	**153**	**231**	**3,121**	**750**	**3,871**	**3,016,676**	**779**	**2,962,856**	**765**	**253,678,376**	**65,533**
CBNRM [4]												
Tree/Bamboo Nurseries	#	283	283	3,310	3,395	6,705	736	NA	NA - Established for household and village needs; self sufficiency not yet realized for commercial sales			
Seedlings Raised							2,282,194	340				
Survival of Planted Seedlings							1,887,494	282				
Village Forest Areas Established	Ha	68	68	2,317	1,960	4,277	875	0.2				
Improved Wood Stoves	#	30	30	0	320	320	320	1				
Sustainable Agricultural Practices [4]												
Agroforestry	Ha	322	215	1,916	1,184	3,100	302	0.10	NA - Established for conservation and food security purposes to meet household needs. Surpluses for sale are expected with time.			
Compost & Animal Manure	Ha	75	15	604	289	893	106	0.12				
Soil & Water Conservation Measures [6]	Ha	280	71	1,633	456	2,089	315	0.15				
Conservation Agriculture	Ha	75	52	169	57	226	98	0.43				
Crop Diversification & Irrigation [4]												
Irrigated Cereals & Vegetables	Kg	122	122	602	122	724	1,451,287	2,005	665,765	920	25,471,389	35,181
Paprika	Kg	28	28	78	11	89	11,280	127	11,280	127	1,266,367	14,229
Rice & Beans	Kg	46	114	1,290	474	1,764	2,595,351	1,471	2,295,504	1,301	120,280,380	68,186
Cassava	Kg Tubers	58	48	1,058	422	1,480	901,199	609	338,090	228	2,324,079	1,570
	Stick Bundles	58	48	1,058	422	1,480	38,623	26	38,623	26	12,822,204	8,664
Bananas	Bunches	7	7	112	43	155	1,013	7	908	6	355,650	2,295
Total [4]	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**162,520,069**	**21,687**
Enterprise Development												
Fish Farming [8]	Kg	8	8	50	54	104	3,962	38	3,676	35	557,607	5,362
Fingerling Production [8]	#	8	8	50	54	104	70,905	682	70,905	682	524,141	5,040
Bee Keeping [9]	Kg	51	51	554	344	898	547	1.6	539	1.6	124,250	361
Mushroom Production [10]	Kg	7	7	15	7	22	1,259	57	1,134	52	567,000	25,773
Total [4]	**NA**	**74**	**74**	**669**	**459**	**1,128**	**NA**	**NA**	**NA**	**NA**	**1,772,998**	**1,572**

Notes NA = Not Applicable

[1] Fishers 831, vendors 143. Includes fish catches & sales from Dec 2006 to March 2008 only because earlier data collection was not complete. Vendors sell fish at a conservative MK 300/kg

[2] Vendors buy all fish landed at the beach after the fishers take what they need for home consumption. Price per kg varies from MK 300-700. Even the Mk 300 used here distorts the overall picture.

[3] Involves farmers associations growing rice, beans and paprika only (paprika growers totalled 89 out of 400 members)

[4] Summation across interventions could not be calculated where the interventions are not additive due to a) unit differences b) participation of households in more than one intervention and c) implemenTation of more than 1 intervention on the same area of land. Factors b) and c) could cause double counting

[5] Established for non-destructive collection of forest products - dead wood, thatching grass, honey, mushrooms, fruits, medicinal plants (herbs, roots, bark, leaves & fruits)

[6] Involves gully control, contour / box ridging, vetiver nurseries, vetiver hedgerows and raised footpaths/boundaries

[7] Production and sales are low due to time lag to develop the skills, access to quality feed and fingerlings.

[8] Production and sales are low due to time lag to develop the skills and for colonizing the bee hives. The high number of bee keepers brought average income down

[9] Based on indivdual houses built with loans from TLC (i.e., excludes demonstration phase with 7 houses and 99 participants)

Community Awareness Meetings and Trainings

Details on meetings, trainings, field days and study tours are presented in **Table 3B** with numbers of villages, leaders, and participants. This is only part of the story because capacity was also being developed under each area of intervention, which will be borne out in the presentation of these sections.

Awareness meetings and trainings with communities involved many diverse subjects, including:

1. overviews of project objectives and approaches,
2. group dynamics and leadership,
3. the dangers, risks and impacts associated with poor land-use practices, e.g., cultivation on steep hillsides and stream banks,
4. the nature, purpose and function of different interventions,
5. establishing and managing different interventions, e.g., tree propagation and outplanting, regeneration of natural trees and woodlands, demarcation and management of village forest areas, improved kitchen stoves, low-cost irrigation systems, seed multiplication, crop diversification and related agronomic / NRM practices, conservation agriculture, agroforestry, fish farming, mushroom production, and bee keeping.
6. opportunities for enterprise development and related business/ management skills to produce, process and market agricultural/natural resource products
7. forming or strengthening community based organizations such as Village Beach Committees, Village Natural Resource Management Committees, NRM and Crop Production Associations,
8. development of management plans for specific CBOs or special interest groups,
9. formulating constitutions and bye laws to support these management plans,
10. registering entities with the Ministry of Justice through assistance from qualified lawyers

All training focused on hands-on participation to more effectively transfer knowledge and skills.

Improved CBNRM Structures and Organization

The project is promoting a new approach for the co-management of natural resources at the village/community level. Co-management (CM) is defined as a partnership between two or more relevant social entities, which collectively negotiate, agree upon, guarantee and implement a fair portion of the management functions, benefits and responsibilities for a particular territory, area or set of natural resources.

The approach of the project entails organizing local communities to engage government in co-management agreements for the use of fishery and forest resources. The agreements grant communities the rights, responsibilities and powers to utilize and manage the resources (e.g., wildlife, mushrooms, grass, dead wood) for income and other uses on a sustainable basis. The approach involves formation of a Village Natural Resource Management Association (VNRMA) as the umbrella organization to oversee the management and utilization of all natural resources within a village. The present structure of Village Natural Resource Management Committees (VNRMCs) limits the portfolio of VNRMCs to managing village forest areas only.

Table 3B: Decentralization and Devolution

Subject	October 2004 - September 2005					
	No.	No. Villages	No. Leaders	No. Men	No. Women	Total PP's
Staff Training Courses	14	NA	NA	183	11	194
Community Sensitisation Campaigns						
CBNRM	73	231	223	2,442	1,181	3,623
Sustainable Land & Water Management						
Enterprise Development						
Field Tours	3	24	45	21	6	72
Field Days	2	49	48	359	173	532
Training Courses for Communities						
CBO Structure/Constitutions/Bye-Laws	63	126	107	940	654	1,594
CBNRM / Co-Management						
Sustainable Land & Water Management						
Enterprise Development						

Subject	October 2005 - September 2006					
	No.	No. Villages	No. Leaders	No. Men	No. Women	Total PP's
Staff Training Courses	5	NA	NA	46	3	49
Community Sensitisation Campaigns						
CBNRM	159	619	690	10,666	7,309	0
Sustainable Land & Water Management						
Enterprise Development						
Field Tours	2	6	6	14	6	20
Field Days	14	113	102	430	119	549
Training Courses for Communities						
CBO Structure/Constitutions/Bye-Laws	2	49	48	359	173	532
CBNRM / Co-Management						
Sustainable Land & Water Management						
Enterprise Development	67	82	167	567	452	1,019

Subject	October 2006 - September 2007					
	No.	No. Villages	No. Leaders	No. Men	No. Women	Total PP's
Staff Training Courses	7	NA	NA	51	7	58
Community Sensitisation Campaigns						
CBNRM	143	459	472	5,815	2,695	8,510
Sustainable Land & Water Management						
Enterprise Development						
Field Tours	2	38	5	32	13	45
Field Days	6	71	86	483	172	655
Training Courses for Communities						
CBO Structure/Constitutions/Bye-Laws	169	633	1	4,934	4,194	9,128
CBNRM / Co-Management						
Sustainable Land & Water Management						
Enterprise Development	32	57	0	464	349	813

Good progress has been made towards reaching effective co-management agreements between Government and special interest groups. Results over the life of the project include:

- **Village Natural Resources Management Committees (VNRMCs):** The project facilitated the formation of new VNRMCs where these were needed, and revamped 47 existing VNRMCs that were not functioning effectively. This process involved reorientation on objectives and responsibilities, demarcation of village forest areas (VFAs), and development of management plans for sustained use. The project also assisted in formulating bye-laws and constitutions related to managing the targeted natural resources involved.

- **Group Village Natural Resource Management Associations (GVNRMAs):** A total of 9 GVNRMAs were formed in the project area with 62 villages and 766 participants. Each is responsible for overseeing cross-cutting issues related to the management of village forest areas at the group village head level. The main outcome was the identification and demarcation of 20 village forest areas under this initiative. The project is assisting with the development and signing of co-management agreements with the Department of Forestry by facilitating resource assessment and mapping, formulation of constitutions and bye-laws, and development of management plans.

- **The Chia Lagoon Fisheries Management Association** was strengthened to enhance village solidarity, to increase fish stocks and catches, and to strengthen local capacity to better manage the fishery. Actions to achieve these objectives included:

  1. Re-organization of the Committee and its leadership with representation by the 12 Beach Village Committees with 831 members
  2. Inclusion of 143 fish vendors into the Association from 17 villages around the lagoon.
  3. The management plan of the Association includes a) observation of a closed season, b) restrictions on fishing gear, c) establishment of a breeding sanctuary in the Chia Channel, and d) proposals for two more breeding sanctuaries sites that have already been mapped.
  4. Development of a constitution with bye-laws governing the management of the fishery and enforcement of its bye-laws by the Association with support from the Fisheries Department. This includes penalties for infringements approved by the District Executive Committee. Enforcement by the association has been demonstrated by reported infringements which have incurred penalties. The infringements included fishing during the closed season, fishing with illegal gear, and fishing in the sanctuary. In its Annual General Meeting in December, the Association noted good progress in the enforcement of its rules and regulations with 17 cases involving the confiscation of illegal gear.
  5. Registration of the Association under the Trustees Incorporation Act with the Registrar General's Office.

  A significant point of discussion in the AGM of the Association was agreement that fish catches have increased as a result of the management plan developed and implemented by the association, which has allowed opportunities for fish to breed and multiply.

- **New NRM and Farmer Associations:** 6 new community-based associations were formed to increase production of desired products under a sustainable plan of management, to increase their economies of scale, and to strengthen linkages and bargaining power in the market place. The names, location, purpose, and membership of all associations are shown in **Table 4**.

Table 4: Associations Formed or Strengthened in the Chia Watershed 2004-2007

Association Name	Location	Purpose	Membership					
			Product	Villages	Clubs	Men	Women	Total
Natural Res Management								
Chia Lagoon Fisheries Association + Fish Vendors (Strengthened but formed prior to Project)	Linga & Zidyana EPAs	To sustainably manage and use the fishery resources from the lagoon under a legally registered association with a constitution, bye-laws and management plan.	Fish	17	12	974	0	974
Champutsi NRM Association (2005/06)	Linga EPA	To gain access to and to sustainably manage and use natural resources from village forest and protected areas. Products include honey, mushrooms, fish, dead wood, thatching grass, bamboo, medicinal herbs, timber.	Nat. Products	5	6	73	48	121
Mtaya NRM Association (2007/08)	Linga EPA		Nat. Products	7	26	109	59	168
Nyenje NRM Association (2007/08)	Mwansambo EPA		Nat. Products	33	44	325	119	444
Farmer Associations								
Mpamantha Farmers Association (2006/07)	Linga EPA	To increase production and marketing of agricultural produce through an organized structure to enhance linkages and bargaining power for improved access to seed and inputs, training, extension support, markets, and fair prices.	Rice	14	40	420	200	620
Zidyana Farmers Association [1] (2007/08)	Zidyana EPA		Rice / Beans	32	74	870	274	1,144
Mwansambo Paprika Growers Association (2005/06)	Mwansambo EPA		Paprika	28	28	350	50	400
Totals	**3**	**NA**	**NA**	**136**	**230**	**3,121**	**750**	**3,871**

[1] Formerly 2 separate Associations, one for rice, and one for beans. The Association has now merged to support the duel interests of growing rice and beans, frequently by the same farmers. The number of bean farmers is growing due to results from last season.

Conclusions

Our overall assessment is that tremendous capacity has been built in many areas, but certain components still need support a) to establish confidence that communities can undertake and sustain interventions with little or no outside assistance, and b) to expand programs in areas and with communities that have not yet been reached.

5.2 Improved Management of Chia Lagoon Fisheries

The fisheries sector carried out the following activities: a) co-management of the lagoon (between the Association and Fisheries Department), b) enforcement of bye law regulations and imposition of penalties, c) protection of sanctuaries, d) observation of the closed season and fishing gear, e) monitoring of fish catch data and fish prices at the beach, f) a pilot initiative to construct and test fish cages in the lagoon to enhance fish production and sales, and g) the construction of a fish market for fish vendors at Chia.

Details about the strengthening of the Association and related co-management agreement, constitution, bye-laws and their enforcement were described in section 5.1 above.

5.2.1 Fish Catches and Sales in the Lagoon

Activities in the lagoon included monitoring fish catches and sales of fish by fishermen as they land at the beach. However, thorough investigations of data collected by the Fisheries Department in Years 1 and 2 revealed that the methods used severely compromised the accuracy and reliability of the data. This resulted in re-organizing the system of data collection,

which included employing a project data collector in December 2006 under the supervision of the project's fishery specialist based in the District. A further problem was encountered with the unfortunate death of the project data collector in October 2007. He was replaced by a new data collector in November 2007. The outcome of this situation is that reliable catch and sales data are available only from December 2006 to September 2007, and from November 2007 to date (March 2008). In its review of fish catch data from areas around the country, the Fisheries Department was very pleased with the quality of the data from Chia.

Results

Results presented in **Tables 5-6B** and **Figures 3-4** demonstrate that the lagoon is capable of supporting the livelihoods of its fishing communities, and that the management plan in place offers good prospects to improve and sustain living standards.

Table 5: Fresh Fish Catches and Sales from Chia Lagoon, December 06 - March 08

Month	Catch (MT)	Food Security * (MT)	Total Sales (MT)	Income and Food Security (FS)				
				Total MK	Total US$	Avg HH FS (kg)	Avg HHI (MK)	Avg HHI US$
Dec-06	10.27	2.05	8.22	709,727	5,069	2.5	854	6
Jan-07	3.64	0.73	2.91	267,879	1,913	0.9	322	2
Feb-07	18.15	3.63	14.52	1,372,480	9,803	4.4	1,652	12
Mar-07	14.61	2.92	11.69	1,201,028	8,579	3.5	1,445	10
Apr-07	13.57	2.71	10.86	735,607	5,254	3.3	885	6
May-07	67.85	13.57	54.28	4,489,921	32,071	16.3	5,403	39
Jun-07	41.27	8.25	33.02	3,858,786	27,563	9.9	4,644	33
Jul-07	12.55	2.51	10.04	1,300,900	9,292	3.0	1,565	11
Aug-07	45.80	9.16	36.64	4,434,291	31,674	11.0	5,336	38
Sep-07	46.15	9.23	36.92	4,957,941	35,414	11.1	5,966	43
Total	**273.86**	**54.77**	**219.09**	**23,328,560**	**166,633**	**65.9**	**28,073**	**201**
Oct-07**	-	-	-	-	-	-	-	-
Nov-07	7.01	1.40	5.61	558,278	3,988	1.7	672	5
Dec-07	20.45	4.09	16.36	1,626,466	11,618	4.9	1,957	14
Jan-08	44.39	8.88	35.51	2,270,379	16,217	10.7	2,732	20
Feb-08	13.19	2.64	10.55	758,313	5,417	3.2	913	7
Mar-08	5.17	1.03	4.14	482,717	3,448	1.2	581	4
Total	**90.21**	**18.04**	**72.17**	**5,696,153**	**40,687**	**21.7**	**6,855**	**49**
Monthly Avg	**24.27**	**4.85**	**19.42**	**1,934,981**	**13,821**	**5.8**	**2,328**	**17**

* Studies revealed that an estimated 20% of the catch is kept for food security

** There were no data for October 2007 due to the untimely death of the project data collector

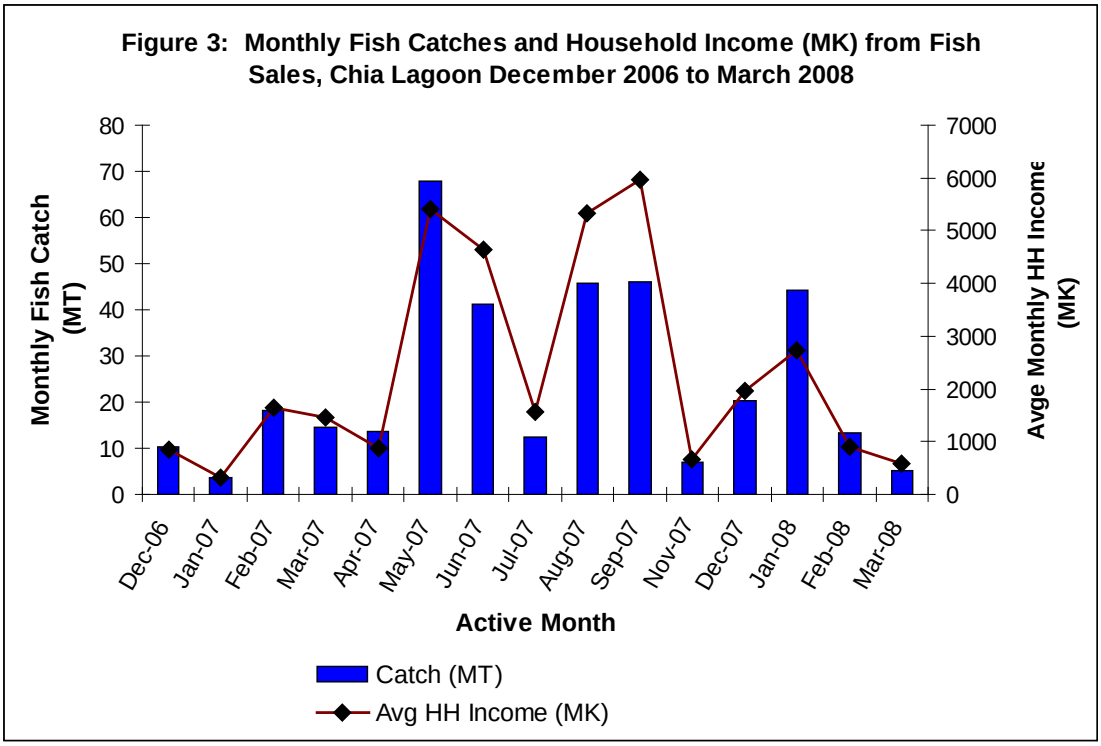
Table 6A: Average Monthly Prices of Fish Sold By Fishers when Landed at the Beach (MK)

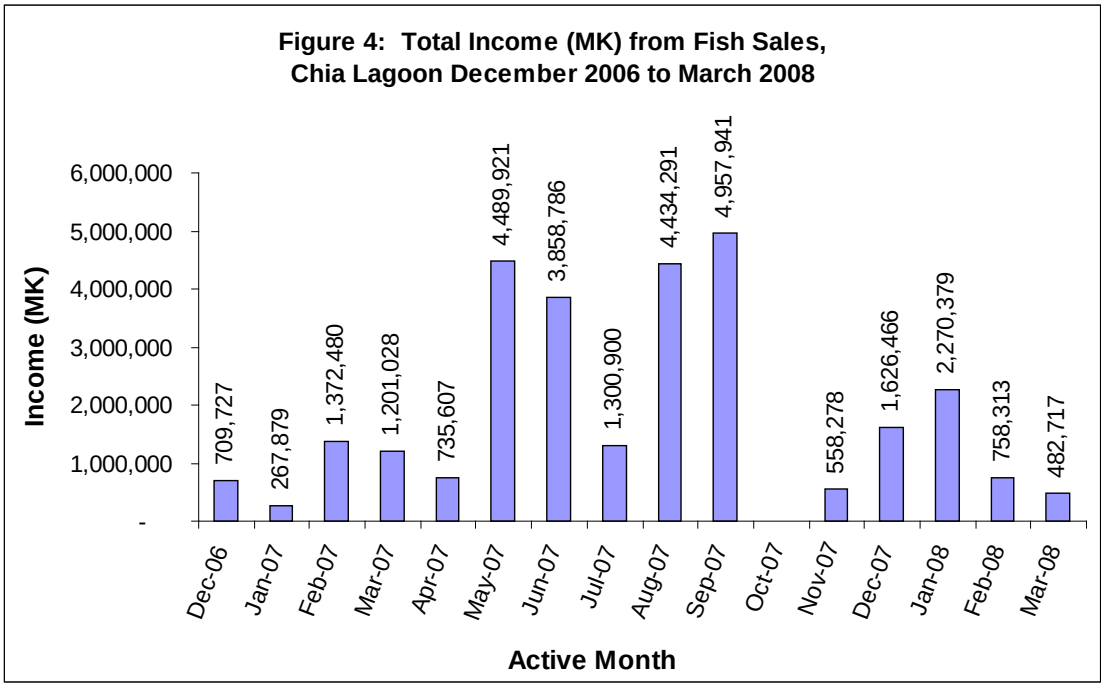
Species	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Nov-07	Dec-07
Chambo	-	-	-	-	150.00	150.00	100.00	160.00	100.00	-	188.16
Tilapia Spp.	147.73	104.19	90.38	132.27	133.33	96.36	98.04	135.29	114.21	192.31	147.73
Utaka	-	-	-	-	-	-	-	-	-	-	93.00
Chisawasawa	-	-	-	-	78.00	65.00	-	-	-	-	66.00
Kambuzi	75.00	50.00	50.00	55.00	50.00	53.20	89.29	90.91	97.06	70.00	75.00
Kampango	100.00	150.00	66.67	150.00	150.00		112.00	150.00	91.67	70.00	100.00
Mlamba	77.46	89.46	84.62	93.90	84.05	76.81	92.05	97.71	84.44	88.60	77.46
Others	70.00	100.00	200.00	190.00	62.50	100.00	80.00	80.00	130.00	84.62	70.00

* No data in Sep/Oct 07 due to the illness and untimely death of Project Data Collector

Table 6B: Fish Catch Data by Species for March 2008

Species	Price/ kg	Catch (kg)	Food Security (Kg)	Sales (Kg)	Total (MK)	Avg HHI (MK)
Chambo/Tilapia	114.29	950	190	760	86,860	104.53
Kampango	120.00	310	62	248	29,760	35.81
Mlamba	92.00	2,730	546	2,184	200,928	241.79
Sanjika	254.15	220	44	176	44,730	53.83
Others	56.82	960	192	768	43,638	52.51
Totals/Avg	**127.45**	**5,170**	**1,034**	**4,136**	**405,917**	**488.47**





5.2.2 Cage Culture

Cage culture is a new intervention in Malawi based upon successes from neighboring Zambia. The project introduced the concept with pilot cages to several Chia fishing communities who felt it offers a quick and sure way of subsidizing fish production from the lagoon which has been dwindling due to human population pressures, increased number of fishermen, and increased use of illegal fishing gear.

The pilot cages were built from wood and bamboo, each 2.2 x 2.2 x 2.8 m in size. A special net was installed inside measuring 2 x 2 x 2.5 m with a stocking density of 300 fish per m^3, or 3000 fingerings per cage. The plan was to raise the fish to a size of 300 – 400g giving a projected output of 900 – 1200 kg per cage. A total of 4 cages were constructed for testing with a small fishing community, but only 2 were stocked with fingerlings.

Damaged cage after storm at left; Intact cage at right

After stocking, initial mortality was 20 – 30%. This was normal, although some mortality was thought to be a result of water quality and use of a feed low in protein, vitamins and minerals (all rice bran). Losses increased to 40 – 45% when the cages were swept away and smashed against the shore by floating islands after a heavy storm. Both cages were badly damaged, one irretrievably. The losses were due to trauma from the ordeal as well as escape from the damaged cages (*see picture below).* Ultimately, the surviving fingerlings were moved into one of the new cages, while repairs were undertaken on the damaged cages.

Two cages are now under full capacity, and the fish have been growing at a reasonable rate with low mortality. This growth is due mainly to improvements in the feed by developing a ration comprising rice bran, cassava leaves, trash fish and processed soya bean flour.

Potential for Expanding Cage Culture

Based on experiences from these trials, collaboration is planned with the World Fish Center to improve and expand cage culture by a) protecting cages from storms and theft b) increasing the production of fingerlings to stock cages, c) improving management, and d) providing a high quality feed ration using local feed materials to keep costs low. It is likely that the demand for quality fish feed will create businesses to use and produce the ingredients needed. The ideal situation is to have several fish cages per household stocked at different periods to provide a steady supply of fish to meet market demands and income needs by the households involved.

5.2.3 Chia Fish Vendors' Market

Organization

There are 143 registered members operating under a sub-committee to the Chia Lagoon Fisheries Management Association to which they are affiliated.

Why the Market?

The fish vendors have been selling their fish by the roadside for many years under no formal structure and with intense competition for sales with risks of road accidents. The idea for the market came from fish vendors who approached the Project for assistance.

Funds spent to date total slightly over MK 500,000. Vendors contribute labor, sand and bricks. Investigations are underway to establish the cheapest and most reliable source of power – the options include solar, diesel generator, and electricity through the new ESCOM power line. Membership fees will pay for the installation and operating costs of cold facilities. When ready, it is expected that the market will function more efficiently with benefits to sellers and buyers. These will include improved fish handling, processing and storage with reduced post harvest losses, improved hygiene, and reduced risks of road accidents. The market will also offer potential for other products (e.g., *fish fillets, roadside restaurants*). The overall impact will provide a stronger and more consistent price for fish sales with healthy competition among vendors based on product quality. The market has the following structures:

- Fish Vendor Shed x 1
- Fish Smoking Kilns x 4
- Fish Sun Drying Racks x 3
- Fish Washing Basin x 1
- Shallow Well (for safe water) x 1
- Fish Storage Facilities
  - Fresh Fish x 1
  - Dry Fish x 1
- Eco-Pit Latrines x 3 (for use by vendors and buyers)
- Car Parking Lot x 1

Progress to date

1. The main structure for storing fresh and dried fish is complete with separate rooms.
2. 4 smoking kilns are complete.
3. The 3 sun drying racks have been constructed.
4. The vendor shed for selling fresh fish is complete, but cold storage facilities are not ready.
5. The wash basin and shallow well have been installed.

Chia Fish Market: Newly Constructed Storage Facility and Vendor Shed

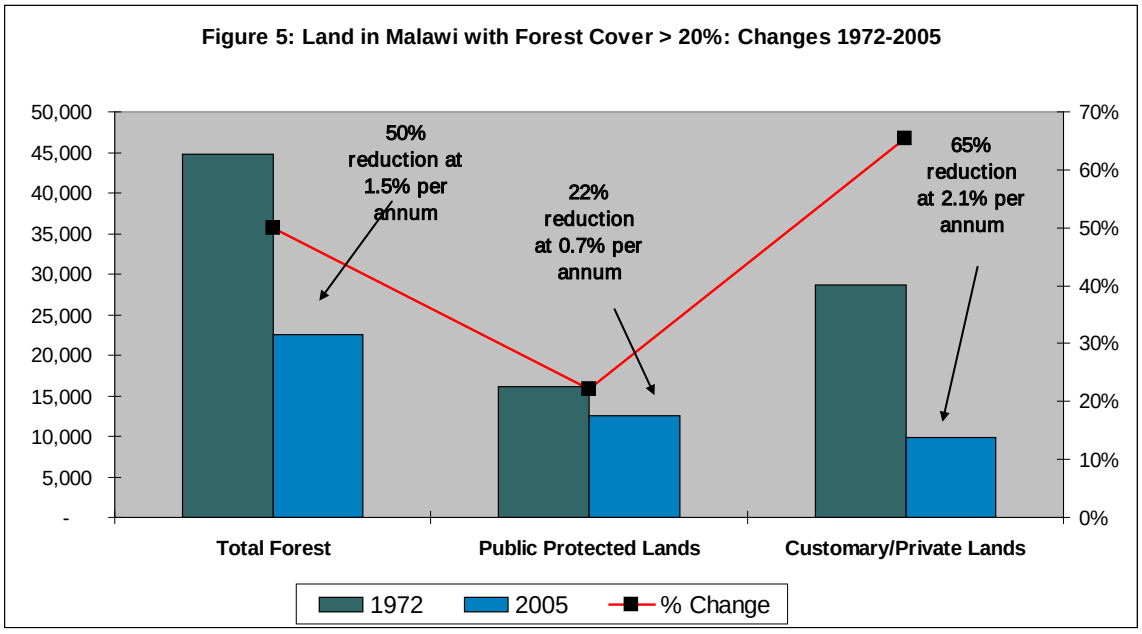
5.3 Improved Community-Based NRM

5.3.1 Background and Challenge

Population pressures in Malawi impact directly on renewable natural resources, agricultural productivity, employment, marketing, food security, poverty, health, and education. For many areas, land holdings are shrinking in size and becoming more fragmented. Traditional practices that preserved the integrity of natural resources are dying out and marginal areas have been brought under cultivation. Loss of valuable top soil averages over 20 tons per ha per annum, and in upland areas can exceed 100 tons/ha (Bunderson & Hayes, 1995). The impacts on soil structure and fertility in terms of farm productivity are self evident. The rising demand for agricultural land and wood for fuel and building materials has led to serious levels of deforestation, water runoff and erosion. The attendant loss of biodiversity is often accompanied by adverse changes in climatic and hydrological regimes. The result threatens major watersheds from diminished stream flows, risks of flood, and siltation of rivers, dams, and lakes. These problems have far-reaching effects on agriculture, fisheries, industry, trade, and health.

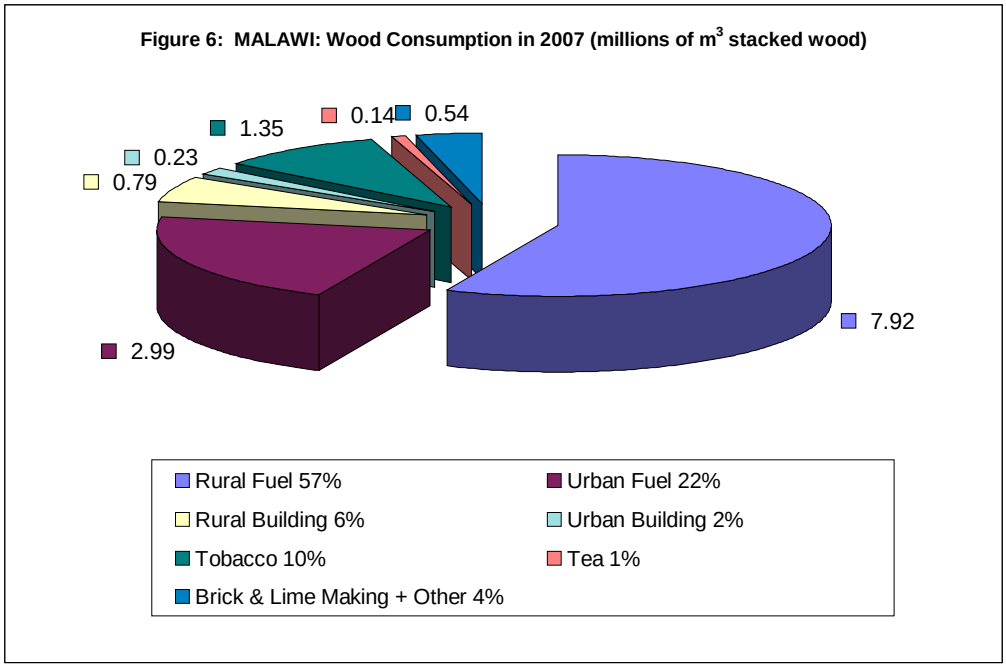
Most deforestation in Malawi has occurred on traditional and private land where wood is regarded as a free resource, but encroachment into protected lands is increasing due to declining enforcement by government. Between 1972 and 1990, total forest cover in Malawi declined by an appalling 41%, averaging 2.3% annually (see **Figure 5**)[1]. Forests declined by another 15% from 1990 to 2005. Wood used by rural communities for cooking and heating accounts for 57% of the wood consumption in Malawi (see **Figure 6**). Another 10% is used for construction materials and brick making. Tobacco is a special concern, representing a conservative 10% of total consumption, for leaf curing and shed construction.

Figure 5: Land in Malawi with Forest Cover > 20%: Changes 1972-2005



Source: Calculated from Bunderson and Hayes 1995; MFNR 1993; WB 1992.

[1] Sources: 1) World Bank. (1992). Economic report on environmental policy, Malawi. Volumes I and II. Lilongwe. 2) Bunderson, WT and IM Hayes (1995). Agricultural and Environmental Sustainability in Malawi. Proceeding of Sustainable Agriculture for Africa, Abidjan, Côte d'Ivoire, July 1995. 3) Ministry of Forestry and Natural Resources. (1993). Forest resources mapping and biomass assessment for Malawi. Satellitbild, Kiruna Sweden in cooperation with the Department of Forestry, Lilongwe.



5.3.2 Project Interventions

The challenges highlighted above are being tackled on 5 fronts operating together to produce a positive impact. Major activities included 1) co-management agreements (discussed above), 2) tree and bamboo planting, 3) demarcation of village forest areas for sustainable management and harvesting of forest products, 4) the introduction of low cost, energy efficient kitchen stoves to save wood and labor, and 5) sustainable land and water management practices (discussed in section 5.4 below).

Planting of Trees and Bamboo

Planting trees and bamboo is an activity promoted with all villages and households, regardless of the intervention focus. The reason is simple. Village life in rural Malawi depends on a vast range of uses and products derived from these plants – fuel for cooking, heating, brick-making, and tobacco curing; construction materials for houses, kitchens, stores, farm sheds, granaries, corals, latrines, fences, corals, animal pens, chicken coups, doors, window frames, furniture, ox carts, hand-tools. Other valuable products are baskets, mats, fruits, medicines, fodder and shade. Use of local bamboo for roofing material, granaries, fencing, and fish cages reduces deforestation pressures on trees for these products. Planting results are shown in **Table 7.**

Table 7: Establishment of Tree Nurseries, Seedlings Raised and Number Outplanted 2004 - 2007

Season	Villages (#)	Nurseries (#)	Households (#)	Seedlings Raised	Avg / Nursery	# per HH	Seedlings outplanted	% of Nursery
2004 - 2005	72	64	728	167,153	2,612	230	143,364	86%
2005 - 2006	283	285	6,705	922,253	3,236	138	818,486	89%
2006 - 2007	249	279	6,427	881,538	3,159	137	652,338	74%
2007 - 2008	78	108	853	311,250	2,882	365	273,306	88%
Totals	**NA**	**NA**	**NA**	**2,282,194**	**2,972**	**217**	**1,887,494**	**84%**

NA - Data Not Additive

Of the 2.3 million seedlings raised, 1.9 million were outplanted with an average survival of 84%. In 2007/08, targets were lowered due to the imminent closure of the project and reduced staff.

Demarcation of Village Forest Areas (VFAs)

Many communities have expressed strong interest in this concept because indigenous trees and their products are disappearing from their environment. The objective of this practice is to promote the regeneration and management of natural forest areas under customary land tenure for the dual-purpose functions of 1) improving the biodiversity of Malawi's landscape, and 2) providing sustainable supplies of diverse forest products through management plans to control the nature, scale, and type of use or harvesting.

Promoting natural regeneration has several notable advantages over tree planting:

- ◊ It promotes biodiversity of Malawi's indigenous flora and fauna.
- ◊ The resulting diversity offers multiple uses and products for the benefit of all life and for the welfare of the environment as a whole.
- ◊ Malawi's landscape, given an opportunity, has a inherent capacity to regenerate naturally. The trees that emerge have strong and well established root systems that can easily weather low and erratic rainfall. This means there is no fear of setbacks from poor or untimely outplanting.
- ◊ Natural trees are well adapted to the ecology with inherent resistance to drought, fire, browsing, pests and diseases.
- ◊ There is no need to undergo the huge expense and effort of raising, transporting, outplanting and protecting seedlings produced in nurseries. A special advantage is that there is no concern over the critically narrow window for outplanting trees.

The names, location and area of VFAs established over the life of the project are shown in **Tables 8A and 8B and in Map 11 of section 5.6**. The total number of VFAs is 68 covering an area of 875 ha in 3 EPAs with 4,277 villagers. Of the total, 27 VFAs have not been mapped yet (see **Table 8B**).

Energy-Efficient Stoves

The use of woodfuel in rural areas represents 57% of Malawi's total wood consumption. Consequently, a strategy is needed to save wood energy through more efficient methods of using it, or by providing alternative sources of energy. The latter at present is not plausible in rural areas due to cost and supply problems for alternative fuels. Given the realities of the situation, our strategy involves introducing simple fuel-efficient stoves into the targeted communities using models that can be made by one adult in 1-2 hours with local materials. The current model promoted reduces wood use by over 50%. This reduces labor by women and girls for cooking and for fetching firewood from the bush, allowing engagement in other activities including school attendance by girls.

Energy-efficient kitchen stoves were introduced to reduce demands on woodlands for fuel and to save labor in cooking and fetching firewood. Demonstrations were used by field coordinators in the watershed to create awareness, and to train women how to construct them with local materials. Research is being conducted to improve the efficiency of these stoves, as well as to reduce smoke in the kitchen.

Although implemented on a small-scale (see **Table 9**), the response by households to improved stoves has been highly favorable, especially among women who claim a fuel savings of over 50%. This indicates need to intensify promotion efforts on a larger scale.

Table 8A: Demarcation of Mapped Village Forest Areas during the Life of the Project

VFA Name	Village	Extension Planning Area (EPA)	Area (Ha)	Participation		
Mapped VFAs				Men	Women	Total
Chizula	Chizula	Linga	7.86	9	7	16
Kalimanjira	Kalimanjira	Linga	119.98	12	34	46
Dziwazako	Kaulungu I	Linga	2.82	8	12	20
Sanga	Mnthanje I	Linga	2.03	12	10	22
Kacheyo	Bimphi	Mwansambo	30.69	4	8	12
Bulire	Bulire	Mwansambo	4.11	36	31	67
Chitenje	Chalewa	Mwansambo	0.91	9	5	14
Changa	Changa	Mwansambo	5.89	10	14	24
Chinthankhwa	Chinthankhwa	Mwansambo	2.87	7	4	11
Mkaziazimvankhwali	Chipalanji	Mwansambo	12.71	6	10	16
Kavuma	Chitsulo 2	Mwansambo	13.87	40	32	72
Nthilirano	Filipo I	Mwansambo	4.82	8	5	13
Mgoza	Filipo II	Mwansambo	3.40	10	-	10
Nambale	Gvh Bulire	Mwansambo	139.30	798	260	1,058
Kalumphadeka	Kalumphadeka	Mwansambo	2.77	5	5	10
Takumana	Kambabvi	Mwansambo	4.11	11	5	16
Kanjiwa	Kango	Mwansambo	2.48	70	130	200
Kapongola	Kapongola	Mwansambo	6.79	14	11	25
Kapongola	Kapongola 1	Mwansambo	7.72	22	18	40
Mtsekadoko	Malambiro	Mwansambo	1.99	30	36	66
Kaphande	Malanda 1	Mwansambo	39.66	150	200	350
Masitala	Masitala	Mwansambo	8.07	11	9	20
Masitala 2	Masitala	Mwansambo	2.78	11	9	20
Malangalanga	Matchipitsa	Mwansambo	26.65	18	9	27
Mphondero 2	Mpondero 2	Mwansambo	2.25	11	11	22
Kasiya	Msakacharo	Mwansambo	22.21	70	81	151
Chankhadze	Mtambalika	Mwansambo	9.25	12	17	29
Mtambalika	Mtambalika	Mwansambo	9.03	16	7	23
Mtsiliza	Mtsiliza	Mwansambo	2.63	16	23	39
Sabwera	SabweRa	Mwansambo	3.60	24	29	53
Dzunga	Sendeza	Mwansambo	4.52	150	250	400
Nolo	Zambwe	Mwansambo	15.38	6	5	11
Tamvana	Bamba I	Zidyana	38.52	19	14	33
Mthila	Bamba II	Zidyana	4.20	15	4	19
Takumana	Bamba III	Zidyana	6.94	7	6	13
Namachete 2	Botomani	Zidyana	2.50	8	7	15
Mwalawoyera	Chitedze 2	Zidyana	9.52	12	18	30
Namachete	Khondowe	Zidyana	5.91	15	5	20
Kachule	Malamba	Zidyana	5.39	6	4	10
Tiyesenawo	Mnthanje I	Zidyana	2.83	18	4	22
Mpambadzi	Njumbula	Zidyana	1.52	8	5	13
Total	**41**		**600.48**	**1,724**	**1,354**	**3,078**

Table 8B: Demarcation of Village Forest Areas (not yet mapped)

VFAs Not Yet Mapped	Village	EPA	Area (Ha) *	Men	Women	Total
Mataka	Mataka	Kalira	3.40	12	9	21
Ngoza	Ngoza	Kalira	3.00	19	16	35
Zimbwe	Zimbwe	Kalira	8.00	32	24	56
Mphachiyawo	Mphachiyawo	Kalira	4.00	12	8	20
Chakwawa	Chakwawa	Kalira	3.00	12	13	25
Mikwala II	Mikwala II	Kalira	4.50	11	14	25
Katayika	Katayika	Kalira	3.00	9	7	16
Kangolwa	Kangolwa	Kalira	3.00	24	19	43
Mchirawayingo	Mchirawayingo	Kalira	4.00	12	16	28
Chaseta	Chaseta	Kalira	2.00	8	12	20
Chapinga	Chapinga	Kalira	3.50	9	11	20
Kapamphala	Kalijewene	Kalira	6.00	19	24	43
Michilu	Katembo	Kalira	3.00	12	13	25
Wudesi	Wudesi	Kalira	4.00	15	17	32
Mpalata	Mpalata	Kalira	4.00	25	34	59
Jekeseni	Jekeseni	Kalira	2.00	9	7	16
Katuka	Kapatuka	Kalira	4.00	12	15	27
Kapolodzunga	Kasanja	Kalira	5.00	64	57	121
Chisambo	Thundu	Kalira	3.00	29	24	53
Mthandiza	Mthandiza	Kalira	3.00	7	9	16
Chibzanzi	Chibzanzi	Kalira	3.00	37	43	80
Chileka	Kandodo	Kalira	5.00	64	59	123
Galumtsukwe	Galumtsukwe	Kalira	1.00	15	9	24
Mang'anga	Mang'anga	Kalira	3.00	21	17	38
Biwi	Biwi	Kalira	3.00	19	21	40
Pondani	Pondani	Kalira	4.00	27	31	58
Nyenje	Chinthankhwa	Mwansambo	180.00	58	77	135
Total	**27**		**274.40**	**593**	**606**	**1,199**
Grand Total	**68**		**874.88**	**2,317**	**1,960**	**4,277**

* Area estimates as these VFAs have not been mapped yet

Table 9: Energy-Efficient Kitchen Stoves 2005 - 2008

Season	Villages (#)	Households (#)	Improved Stoves (#)
2005-06	2	25	25
2006-07	21	228	228
2007-08	7	67	67
Total	**30**	**320**	**320**

5.4 Sustainable Land and Water Management Practices

Interventions focused on increased crop production and diversification under rainfed and low-cost irrigated systems to improve household food security, nutrition and incomes with a strong aim to reduce vulnerability and risk. In this regard, dry season irrigation offers tremendous opportunities to off-set threats to rainfed crops from poor or unpredictable rainfall. Agroforestry, conservation agriculture and use of legume crops and organic manures were integrated with these interventions to ensure sustainability and to enhance profitability by reducing labor and input costs under unpredictable conditions.

For households or groups that meet established criteria, loans were offered to meet the costs of improved seed, inputs and equipment with a cash deposit. Payments were made into interest-bearing accounts to provide funds for expansion. Defaulters were handled by several means: a) peer pressure from the club to honor the loan; b) canceling membership in the club and all related privileges; and c) confiscating equipment or produce to cover the outstanding balance**.**

Specific interventions included:

5.4.1 Low-Cost Irrigation

The objective of promoting low cost systems of irrigation was to increase food security, nutrition and incomes. Basic features of these systems include practicality, affordability, acceptability, and sustainability. The type of system used depended on local physical and social factors but all incorporated sound ecological principles to maintain the integrity of the resource base - land, soil, water and vegetation.

With irrigation taking center stage in Malawi's development agenda, there is great promise to address the escalating problems of food security and poverty in the face of recurring droughts, declining soil fertility and crop yields, all aggravated by the increasing costs of inputs. At the same time, irrigation poses serious threats to the environment if designed and implemented irresponsibly. It is vital to take stock of this danger because targeted areas comprise the most productive lands in the country. These are wetland areas with fertile soils, abundant water, and rich indigenous vegetation that fringe Malawi's life-giving rivers and streams.

This threat has become a reality today. Farmers, often with support from Government, NGOs, and Donor-funded Projects, are encroaching into wetland areas and riverine habitats to cultivate annual crops directly in the waterways and on vulnerable banks of streams and rivers. The resulting degradation is highly visible with unchecked levels of erosion, deforestation, depletion of soil nutrients, reduced stream flows and risks of floods.

The situation demands urgent attention before Malawi's most valued land areas become seriously and irreversibly degraded. Charged with actions to support development and growth, Government agencies, Projects and NGOs have an obligation to ensure that activities are implemented in ways that are economically and environmentally productive and sustainable.

Since farmers are frequently unaware of the destructive nature of their actions, and how best to avoid this problem, the Chia Project adopted a policy to ensure that irrigation is implemented using methods that are environmentally sound. The key elements involve the following:

- Feasibility assessments with site selection based on soils and slopes suitable for irrigation.
- Protection of waterways and stream banks by maintaining native vegetation, or planting trees, bamboo and bananas along a belt of land along the waterway.
- Minimal clearing of native trees when opening new land for irrigation.

- Minimum tillage practices on irrigated plots.
- Return of crop residues to maintain/improve soil organic matter and to improve water use efficiency by reducing evaporation.
- Introduction of crop rotations and agroforestry to maintain soil fertility.
- Incorporation of vetiver grass hedges and / or simple terraces where erosion dangers exist.

The policy and checklists established by the project conform with USAID's environmental requirements.

Results of the main irrigation systems promoted are outlined below:

Treadle Pump Irrigation

This system operates by pumping water manually from shallow wells or streams to a high point on the farm from which water is directed by gravity through channels and basins to irrigate crops. It is ideally suited to smallholders where ownership and operations are controlled by individual households on plots less than 0.5 ha in size.

The project facilitated formation of 78 village-based irrigation clubs involving 574 households (see **Table 10**). Each club received training and extension support with the provision of treadle pumps and input packs through a revolving fund to ensure sustainability and opportunity for expansion. Crops grown under treadle pump irrigation included green maize, cabbages, beans, tomatoes, onions and paprika. The area covered was approximately 103 hectares, with an average of 0.14 – 0.2 ha/household.

Table 10: Treadle Pump Distribution and Use 2005 - 2007

Year	# Pumps Distributed		# Clubs and Villages *		Area (Ha)
	Current Year	Cumulative	Current Year	Cumulative	
2005	317	317	19	19	45
2006	229	546	51	70	87
2007	28	574	8	78	103
2008 **	400	974	40	118	175

* One club per village ** Planned for distribution under loan in June 2008

Note: Advaith and Balaji pumps with wood treadles distributed in 2005 were later replaced by the Kickstart money maker pumps which proved more popular due to ease of use and durability.

River or Stream Diversion

The project was involved in identifying and assessing potential sites to divert water from streams for irrigation. This practice was promoted where terrain allows the diversion of water from perennial streams to irrigate crops by gravity. The system involves building weirs at specific abstraction points to raise the volume and level of water for irrigation with supervision from district and project staff. The water is then channeled into well aligned canals constructed manually as a communal activity to convey water to irrigable land. The system is cheap in terms of capital investment but requires substantial labor during the construction phase. A total of 34 farmers in 4 villages participated in the program. Several crops were grown under stream diversion in the 2004-05 season, totaling 4-5 hectares. The partner alliance supported the community with 90 mm class 10 HDPE pipes totaling 200 meters for diverting water around rocky sections and for crossing streams and gullies to supply water to other suitable land.

Rain Water Harvesting

Where streams are perennial, a few small dams were constructed to capture rainwater runoff. These were built by hand and used to irrigate areas close to dams using treadle pumps or by gravity. Spillways were protected with stone pitching. All earth structures were stabilized with conservation measures, e.g., contour ridges, tie ridging, fanya juu terraces, potholes, checkdams or stone bunds. The objective was to increase infiltration and to recharge ground water levels to improve water yield at the point of extraction (either stream diversion or groundwater extraction to irrigate areas close to dams by gravity or with treadle pumps).

Larger Scale Irrigation Schemes

Two existing non-functional irrigation schemes have been identified for rehabilitation at Mpamantha (130 ha) and Lifuliza (75 ha). Both schemes involve diverting water by gravity into an existing canal network. The schemes were used to produce rice, and relied on water from adjacent rivers. Mpamantha had an earth dam that was breached almost 10 years ago. Both schemes each had over 200-250 beneficiary households, but the potential area and number of households could be increased with good planning.

Investigations were conducted to establish how the schemes could be rehabilitated and expanded. Equal emphasis was placed on both the infrastructural and organizational aspects to address the problems that disrupted the operation of these schemes. The project developed a plan to repair the damaged infrastructures, assisted the beneficiary communities to form effective organizations, evaluated the best crops to be grown (including a crop calendar), and established sound mechanisms to ensure the sustainability and maintenance of the schemes. Opportunities to expand include enlarging storage capacity and increasing the canal network.

➡ ***Mpamantha Rice Scheme:***

- Topological survey and mapping was completed.
- Technical designs for rehabilitation works were prepared with a list of inputs, bill of quantities, and cost estimates.
- Quotations were tendered and received from contractors.
- An MOU was drafted for the long term lease of the land from the land owners, Chamwavi Group to the local community under a newly constituted Association (Mpamantha Farmers Association). The content of the MOU has been under review for over 2 years with lawyers representing both sides. The main concern of the project is to ensure use and control by the targeted communities over the long term with freedom to sale produce on the open market. Several meetings on the MOU were convened between the parties involved with representation by Project Management District Authorities, and the Association. Signatures now appear imminent, which will allow rehabilitation works to take place during the dry season of 2008.
- In the interim, sand bags were provided each year to block the river at the bridge to divert water towards the end of the rains so that farmers could irrigate a small area of winter crops using water from the river flow. This was limited to only 25-30 farmers who could divert sufficient water to irrigate land close to the diversion.

➥ ***Lifuliza River and Scheme***

- o A reconnaissance survey was done and the potential off-take for a contour canal has been identified.
- o Detailed investigations were undertaken to assess the scale and nature of required intervention. The designs demonstrate that the water off-take is capable of supporting the existing scheme, although presently non-functional.

The project provided support through sensitization meetings and training exercises to build capacity for decentralization. A key aim was to assist the beneficiary communities to form associations with constitutions and bye-laws concerning land allocation, tenure, membership fees, operational guidelines for water access and use, management responsibilities, access to inputs, and negotiations with commodity buyers in the market. Market linkages were established for both inputs and outputs of the irrigated produce.

5.4.2 Crop Diversification

A central objective was to increase household food security, nutrition and incomes by diversifying and marketing high value crops. Diversification focused on rice, beans, cassava, bananas, paprika and a wide range of horticultural crops under irrigation (discussed above). The aim focused on high yielding, disease resistant varieties of these crops in high demand among communities in the district, and which command good prices in local and regional markets. Legume crops attracted special emphasis because they are being grown as intercrops or in rotation with cereals and cassava to improve soil fertility as well as diets and incomes.

***Seed Sources*:** Improved varieties of crop seed were obtained from different sources: Kilombero rice from Bwanje and Domasi Irrigation schemes; Kalima beans and red speckled sugar beans from the WSU/Bunda College Bean/Cowpea CRSP and CIAT; sweet Manyokora cassava from IITA / SARRNET and collaborator smallholder producer groups; suckers from Williams bananas from Bunda College and Mkondezi Research Station, maize and vegetable seeds from SeedCo Malawi Ltd., and paprika from Cheetah Ltd.

Crop Results 2004/05 to 2007/08

Production, consumption and sales of irrigated and rainfed crops over the life of the project are shown in **Table 11** for paprika and other irrigated crops, **Table 12** for beans and rice, **Table 13** for cassava, and **Table 14** for bananas. Total and average income per household in 2007/08 respectively was MK 8.1 million and MK 10,000 for irrigated crops; MK 67 million and MK17,000-107,000 for beans and rice, and MK 98.7 million and MK 67,000 for cassava.

Participation, area, production, diversification, sales and household income increased significantly over time with positive impacts and potential for further growth. It is noteworthy that planting material from cassava is highly lucrative at present, perhaps due to shortages and high demand, which should balance out in future. This resulted in planting a large area in 2007/08.

The results demonstrate a clear transformation among participating households from subsistence to business-based farming, a change facilitated by the formation of action-oriented clubs and associations. The scale of increase would have been larger still with the signed agreement between Chamwavi Group and Mpamantha Farmers Association. This will become a reality with the imminent signing of the MOU in May 2008. Anticipated support from the Norwegian Government to rehabilitate the Lifuliza irrigation scheme will further contribute to impacts on communities and households in that area.

Table 11: Production and Sales of Irrigated Crops 2005 - 2007

Season	Crop	# HH	Production			Consumption		Sales				
			Area (ha)	Total Kg	Kg/HH	Total Kg	Kg/HH	Total Kg	Kg/HH	Price/Kg	Total MK	MK/HH
2005	Paprika	38	1.3	1,447	38	0	0	1,447	38	94	135,990	3,579
	Maize [3]	317	38.3	172,125	543	127,373	402	44,753	141	33	1,476,833	4,659
	Tomatoes	317	2.7	81,000	256	12,150	38	68,850	217	45	3,098,250	9,774
	Onions	317	1.8	36,000	114	5,400	17	30,600	97	35	1,071,000	3,379
	Cabbage	317	2.3	135,000	426	20,250	64	114,750	362	20	2,295,000	7,240
Totals (as applicable)		**NA**	**46.3**	**425,572**	**NA**	**165,173**	**NA**	**260,399**	**NA**	**NA**	**8,077,072**	**NA**
2006 [1]	Paprika	54	2.7	2,973	55	0	0	2,973	55	106	314,037	5,816
	Maize [3]	683	110.5	497,224	728	372,918	546	124,306	182	42	5,179,417	7,583
	Tomatoes	124	0.3	8,425	68	1,264	10	7,161	58	60	429,660	3,465
	Onions	124	1.8	35,760	288	5,364	43	30,396	245	40	1,215,840	9,805
	Cabbage	124	0.8	49,600	400	7,440	60	42,160	340	24	1,011,840	8,160
Totals (as applicable)		**NA**	**116**	**593,982**	**NA**	**386,986**	**NA**	**206,996**	**NA**	**NA**	**8,150,794**	**NA**
2007 [2]	Paprika	89	6.2	6,860	77	0	0	6,860	77	119	816,340	9,172
	Maize [3]	427	67.9	305,347	715	213,743	501	91,604	215	47	4,274,859	10,011
	Tomatoes	427	2.2	66,155	155	9,923	23	56,232	132	60	3,373,901	7,901
	Onions	427	1.6	31,574	74	4,736	11	26,838	63	50	1,341,893	3,143
	Cabbage	427	0.6	33,077	77	4,962	12	28,116	66	25	702,896	1,646
Totals (as applicable)		**NA**	**78**	**443,013**	**NA**	**233,364**	**NA**	**209,650**	**NA**	**NA**	**10,509,890**	**NA**

NA = Data not additive

[1] Farmers grew mostly maize due to the poor rainfed crop in 2005/06; a small percentage also grew tomatoes, onions and cabbages

[2] With a better rainfed crop in 2008/07, farmers interviewed grew a range of crops to take advantage of markets based on results from previous year

[3] Sold as green maize at MK 5-10/cob, hence higher price than for grain

Table 12: Crop Diversification with Rainfed Beans and Rice 2005 - 2008

Season	Crop [1]	# HH	Seed from Project (kg)	Production			Consumption [3]		Sales				
				Area (ha)	Total Kg	Kg/HH	Total Kg	Kg/HH	Total Kg	Kg/HH	Price/Kg	Total MK	MK/HH
2005	**Kalima Beans**												
	Seed	90	900	11.0	11,794	131	0	0	11,794	131	130	1,533,220	17,036
Totals (as applicable)		**NA**	**900**	**11.0**	**11,794**	**NA**	**0**	**NA**	**11,794**	**NA**	**NA**	**1,533,220**	**NA**
2006	**Kalima Beans**												
	Seed	30	264	3.0	3,900	130	0	0	3,900	130	140	546,000	18,200
	Grain	560	6,160	78.4	50,624	90	14,936	27	35,688	64	100	3,568,800	6,373
	Kilombero/SuperFaya Rice												
	Grain	398	6,700	178.7	89,247	224	21,419	54	67,828	170	35	2,373,980	5,965
Totals (as applicable)		**NA**	**13,124**	**260.1**	**143,771**	**NA**	**36,355**	**NA**	**107,416**	**NA**	**NA**	**6,488,780**	**NA**
2007	**Kalima Beans**												
	Seed	40	400	5.2	7,626	191	0	0	7,626	191	150	1,143,900	28,598
	Grain	455	6,000	81.9	85,735	188	8,573	19	77,162	170	100	7,716,200	16,959
	Sugar Beans												
	Seed	18	90	1.1	1,589	88	0	0	1,589	88	150	238,350	13,242
	Kilombero Rice												
	Seed	12	200	5.3	8,830	736	0	0	8,830	736	100	883,000	73,583
	Grain	1,132	14,000	373.3	997,081	881	110,589	98	886,492	783	40	35,459,680	31,325
Totals (as applicable)		**NA**	**20,690**	**467**	**1,100,861**	**NA**	**119,162**	**NA**	**981,699**	**NA**	**NA**	**45,441,130**	**NA**
2008 [2]	**Kalima Beans**												
	Grain	385	7,600	95.0	118,750	308	23,750	62	95,000	247	70	6,650,000	17,273
	Sugar Beans												
	Seed	40	1,000	12.5	21,875	547	0	0	21,875	547	150	3,281,250	82,031
	Grain	133	2,000	25.0	37,500	281	7,500	56	30,000	225	100	3,000,000	22,500
	Kilombero Rice												
	Seed	28	450	12.0	30,000	1,071	0	0	30,000	1,071	100	3,000,000	107,143
	Grain	1,357	16,320	514.0	1,130,800	833	113,080	83	1,017,720	750	50	50,886,000	37,499
Totals (as applicable)		**NA**	**27,370**	**658.5**	**1,338,925**	**NA**	**144,330**	**NA**	**1,194,595**	**NA**	**NA**	**66,817,250**	**NA**

NA = Data not additive

[1] Improved varieties of beans obtained from the Bean/Cowpea CRSP Project with Bunda College and WSU and CIAT Chitedze for multiplication; Improved varieties of rice - Kilombero and Superfaya - obtained from Domasi and Bwanje Valley for testing and multiplication. Kilombero gave the best yields and prices, and hence was promoted in subsequent years. Sugar beans are replacing Kalima beans for the same reasons.

[2] Yields of Kalima Beans, Sugar Beans and Kilombero Rice for 2008 are estimates based on seed distributed and area planted

[3] Consumption includes some retention of seed for replanting next season

Note: Gross Margins and returns to labor for different scenarios with and without fertilizer and irrigation are presented for rice and beans in **Annex 4.**

Table 13: Crop Diversification with Sweet Manyokora Cassava 2004 - 2008 (Germplasm from Mitundu, Bunda College, Chitedze Horticulture and local farmers)

Season	# HH	Production (Tubers)			Consumption (Tubers)			Sales (Tubers)				Germplasm Sales (Bundles of 50 Sticks) [1]				
		Area (ha)	Total Kg	Kg/HH	Total Kg	Kg/HH	Total Kg	Kg/HH	Price /Kg	Total MK	MK/HH	Total #	# / HH	Price/ Bundle	Total MK	MK/HH
2004/05	55	1.8	30,800	560.0	24,640	448	6,160	112	5	30,800	560	1,320	24	200	264,000	4,800
2005/06	397	4.0	70,000	176.3	56,000	141	14,000	35	5	70,000	176	3,000	8	200	600,000	1,511
2006/07 [2]	581	0.6	11,149	19.2	8,919	15	2,230	4	6	13,379	23	478	1	250	119,454	206
2007/08 [3]	1,480	45.1	789,250	533.3	473,550	320	315,700	213	7	2,209,900	1,493	33,825	23	350	11,838,750	7,999
Total	**NA**	**51**	**901,199**	**NA**	**563,109**	**NA**	**338,090**	**NA**	**NA**	**2,324,079**	**NA**	**38,623**	**NA**	**NA**	**12,822,204**	**NA**

NA = Data not additive

[1] Surveys estimated that germplasm sales represented 25% of the area planted

[2] No new injection of material in 2006/07 due to expectation of local expansion which turned out to be limited

[3] Production and Sales of Tubers and Sticks in 2007/08 estimated based on area planted and current market prices

Table 13B: Distribution of Cassava Planting Material in December 07 for 2007/08 growing season

EPA	# Villages	# Clubs	# Farmers			Seed Given	Ha
			Men	Women	Total		
Linga	25	22	266	114	380	1,521	11.7
Zidyana	33	26	307	126	433	1,479	11.4
Total	**58**	**48**	**573**	**240**	**813**	**3,000**	**23.1**

Note: Total area currently under cassava is 77 ha

Table 14: Banana Planting, Williams variety, 2004/5 - 2005/6 (Germplasm from Bunda College & Mkondezi Research Station)

Season	# Suckers Planted	# Villages	# HHs	Production and Disposition (Bunches)					
				Total	Consumption	Sales	Price/ Bundle	Total MK	MK/HH
2004/05	188	2	10	169	18	151	350	52,850	5,285
2005/06	960	5	145	844	87	757	400	302,800	2,088
Total	**1,148**	**7**	**NA**	**1,013**	**105**	**908**	**NA**	**355,650**	**NA**

NA = Data not additive

Note: No suckers were provided in 2006/07

5.4.3 Conservation Agriculture (CA)

The common land preparation method among smallholders in Malawi is annual construction of ridges about 90cm apart, which requires an enormous amount of manual labor. This practice contributes to soil erosion and declining fertility, particularly under conditions of low input, continuous cultivation. Moving the soil accelerates oxidation of organic carbon and reduces carbon content. This means that soils with low levels of organic carbon are vulnerable to raindrop action and erosion. Turning the soil also disrupts natural aeration and the beneficial actions of soil micro-flora and fauna. Although extension agents advocate incorporation of crop residues, which some farmers follow, results suggest that residues are better left on the soil surface where they intercept raindrops and protect the soil from the elements.

Conservation farming offers opportunities to produce higher and more stable yields, with significantly less labor, while dramatically reducing soil erosion and moisture loss.

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Benefits of CA over Conventional Farming:

- Saves much labor to allow early planting to maximize yields, increased area of cultivation, and diversification
- Protects the soil against the impact of rain and erosion
- Ensures infiltration of water from rainfall
- Controls and suppresses weeds
- Improves physical, chemical and biological properties of soils
- Retains soil moisture and nutrients
- Complements and reduces use of chemical fertilizers
- Incorporation of n-fixing leguminous shrubs (e.g., Tephrosia, pigeon peas) helps to break up hard pans and improves soil fertility

Net Results: Conservation of soils and water; increased area of cultivation; diversification; sustainable increases in productivity and incomes.

Under this program, the Chia Project is collaborating with the International Maize and Wheat Improvement Center (CIMMYT) in Zimbabwe and Chitedze Research Station to demonstrate best practices for conservation agriculture (CA). This includes: farm planning and crop rotations; management of crop residues and cover crops; zero tillage and direct planting; pest, weed and soil fertility management. A key component in the Chia watershed is the integration of Pigeon peas and *Tephrosia* as soil-improving nitrogen-fixing legumes that help to penetrate any hard-pans that have developed from continuous hand-hoe cultivation. These plants offer other useful products. Pigeon peas are a nutritious grain legume, while *Tephrosia* provides a useful, eco-friendly pesticide (stalk borer, aphids, weevils, fleas and ticks) as well as abundant fuelwood. CA offers the opportunity for rural households to improve yields, particularly in dry years, to reduce labor, time and costs, and to increase incomes.

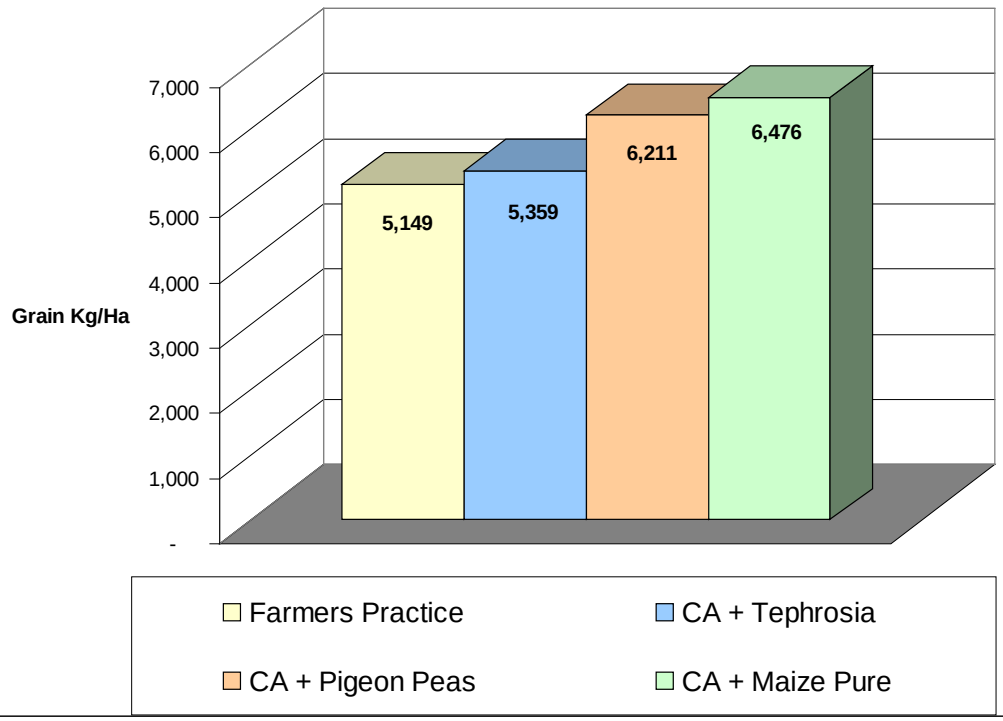
CA Results

Initial efforts in 2004/05 involved promoting reduced tillage with 50 farmers on 30 ha of land. Additional practices with inputs were instituted in 2005/06 under the name of conservation agriculture with 10 farmers. The number grew to 68 farmers in 2006/07 and 226 farmers in 2007/08. These farmers served as model demonstrators to promote greater awareness about the technology to improve the conservation and management of soils and water. Each of the 68 participating farmers received inputs for 0.3 ha for CA practices split between 0.1 ha under sole maize, 0.1 ha of maize intercropped with *Tephrosia candida*, and 0.1 ha under maize with pigeon peas. All treatments used hybrid maize and modest rates of N and P fertilizer. In addition, each farmer had 0.1 ha under standard practice with the same fertilizer rates.

Impacts of CA on maize yields from only the current season are illustrated in **Figure 7** relative to the standard farmer practice. Over a period of 3 years, the differences will be substantially greater. The effects also exclude the value of the products from *Tephrosia* and Pigeon peas (grain harvest not expected till August). The yields of CA plots under pure stands of maize were 26% higher than under the standard sole maize practice. Total maize production from all 68 farmers on the 0.3 ha under CA was 123,000 kg plus another 35,000 kg under standard farmer practices. 50% of this produce was sold to finance inputs for the next season, with the balance contributing to food security.

Results from the last two seasons have generated great interest for adoption among farmers within and outside the watershed. In the 2007/08 season, the number of farmers within Chia who are using the practice increased to 226. There are another 200+ farmers using the practice outside the watershed. This trend indicates high potential for rapid and wide scale adoption.

Figure 7: Impacts of Conservation Agriculture on Maize Yields
CHIA Project (May 2007)



Remarks on CA by Farmers

Previously farmers failed to harvest enough grain from 1.6 ha to take them through to the next harvest. Production from only 0.3 ha under CA exceeded this need with much less labor, not to mention future improvements in soil fertility. Farmers exposed to this practice expressed great interest to adopt it across their entire farms.

5.4.4 Soil and Water Conservation / Fertility

Soil and water conservation measures and low-cost agroforestry practices were promoted to conserve soil and water, combined with practices to improve soil fertility with a) crop rotations, b) organic manures, and c) intercropping and improved fallows with nitrogen fixing trees and shrubs. Results achieved over the life of the project in **Table 15** are not dramatic, but high interest in them with conservation agriculture is expected increase adoption rates.

Table 15: Adoption of Agroforestry and Soil and Water Conservation Measures During the Project

Sustainable Agricultural Practices [1]	# Villages	# Clubs	No. of Participating			Area (ha)	
			# Men	# Women	# Total	Total	Per HH
Agroforestry for Soil Improvement	322	215	1,916	1,184	3,100	302	0.10
Compost & Animal Manure	75	15	604	289	893	106	0.12
Soil & Water Conservation Measures [2]	280	71	1,633	456	2,089	315	0.15
Conservation Agriculture	75	52	169	57	226	98	0.43

[1] Figures not additive as some households implemented more than 1 intervention sometimes on the same land unit

[2] Involves gully control, contour ridging, vetiver nurseries, vetiver hedgerows and raised footpaths/boundaries

5.5 Enterprise Development

The key objective of this initiative is to empower households and special interest groups to identify, develop, and operate small enterprises related to the production, processing and marketing of agricultural and natural resource-based products in response to markets.

Activities to achieve this objective included:

◊ Sub-sector analysis (SSA) of those enterprises where information was deficient or out of date to assist communities, clubs and households in selecting the best enterprises for investment of their time and resources.

◊ Assessment of alternative low-cost value-added processing of agricultural and natural resource products to identify appropriate products, technologies/methods and community organizational structures to operate and manage these enterprises.

◊ Training in group dynamics, leadership, technical and business management skills for production and marketing of targeted agriculture and natural resource products. This included winter irrigation, cassava multiplication, bee keeping, fish farming, cage culture, mushroom production, cane rat and guinea fowl production, and eco-tourism. Training on the formation of clubs and associations with constitutions and bye-laws led to the formation of special interest groups for coordinating production, management and marketing of selected products.

◊ Capacity building of district and project staff through a five-tiered business management training program that combined developing business skills with the study of market access issues to support the development of community-based enterprises.

◊ Development of market information for both communities and buyers with market linkages by providing information such as market trends, prices, and contact details of buyers.

Of the enterprises investigated, the following showed good promise from results produced:

5.5.1 Bee Keeping, Honey Processing and Marketing

Start-up Activities

Using COMPASS studies as a base, the project completed a sub-sector analysis and pre-investment assessment of honey in Malawi. Details of this assessment were documented in the 2nd Annual Report. The exercise provided useful information and analyses to inform project management on whether and how to take forward any possible interventions within the honey sub–sector in Nkhotakota. It also provided useful information and analysis to inform project management on an understanding of the dynamics of honey sub–sector in Nkhotakota with a view of coming up with a modest intervention strategy within this sector.

The study also established the structure of the marketing chain of honey including the vertical arrangement of functions from production, processing, packaging, distribution and retailing to the end consumers, and prospects of export.

The project provided training support and inputs on loan for apiary site selection, construction of hives by local carpenters, materials to construct hives, hanging of hives, colonization of hives, practices associated with the management of bees, and the collection, processing and marketing of honey. Managing clubs and basic book keeping were addressed in training programs. Local markets for selling honey were explored and promoted.

The Project initiated bee keeping in all 4 EPAs of Linga, Zidyana, Mwansambo, and Kalira in Kasakula based on demand by farmers as well as the area's good potential due to the forests available. Support for developing the enterprise included the following activities.

Club Organization and Training

Clubs are formed with an average membership of 10 involving both men and women who have expressed keen interest in bee keeping. To date, 64 clubs have been formed with a total of 898 members comprising 537 men and 361 women.

Intensive training courses were conducted with bee clubs using materials and expertise from Peace Corps, COMPASS II and Eco-Products Ltd. Training involved all bee clubs and members. Each club received 3 days of intensive training in bee-keeping management, apiary selection, hive products including bees wax, modern beekeeping equipment, installation of hives and baiting materials, basic requirements to start beekeeping, capture of swarms, colony transfer and colony division, extraction of honey, marketing and record keeping. The project also trained 20 local carpenters within the watershed to build proper hives.

Construction of Hives and Loans to Farmers

To date, carpenters have built 272 hives. An additional 50 hives are nearing completion. The project supplies the required materials for building the hives, and therefore pays carpenters only for their workmanship. Material costs are recovered from the sale of hives to farmers, which are distributed to selected clubs through signed loan agreements. Loans include the value of other materials, which are shared by club members to reduce costs. Materials include bee-suits, gloves, hive tools, pails, and smokers. Loans are repaid when sales of honey begin.

Proper construction and hanging of hives

Distribution of Hives and Honey Production

The number, location and membership of clubs are shown in **Table 16**, along with the distribution of hives and honey production to date. Research conducted by the project indicates that an individual bee keeper needs 5 hives to repay his loan and to earn a decent profit. This number can be reduced when implemented by clubs. With a target of 20 hives/club, 1280 hives are required for the 64 clubs. But, to maintain momentum and interest after training, and to reduce risks of loan defaulters, a decision was made to supply 5 hives per club to selected clubs based on the level of interest and commitment expressed by members. To date, 272 hives have been distributed to 47 clubs in 3 EPAs. 5 of the clubs are not active, and hence have received no hives.

Of the 272 hives distributed, 3 require repair, and 146 have been colonized with bees. So far, 547 kg of honey have been harvested most of which has been sold. With a price ranging from MK 200-250 per kg, the value of honey harvested is estimated at MK 124,250. This represents only a fraction of the potential harvest based on a conservative 40 kg/hive per annum.

Scaling up the construction and proper colonization of hives, along with sound management practices, is clearly critical to demonstrate that bee keeping is truly a worthwhile enterprise for people in the Chia Watershed.

Inspection of bee hives

Honey processing for sale

Table 16: Production and Sales of Honey 2005 - 2008

Period	# Villages	# Clubs	# Hholds[1]	# Hives Constructed & Distributed	# Hives Colonized	Production (Kg)	Food Security	Sales			
						Total	Total	Volume (Kg)	Price (MK/Kg)	Total Income (MK)	Income/HH (MK) [2]
2005/06	25	25	289	100	8	Establishment phase of bee keeping					None
Cumulative to April 07	50	50	704	231	92	210	0	210	200	42,000	150
April 07-Mar 08	64	64	898	272	201	337	8	329	250	82,250	105
Total	**51**	**51**	**898**	**272**	**201**	**547**	**8**	**539**	**225**	**124,250**	**255**

[1] 554 men, 344 women members

[2] Based on clubs with colonized hives

[3] No sales reported in Jan-Mar 2008 as this is the off season (few trees are in flower)

Table 17: Production and Sales of Mushrooms, 2005 - 2008 [1]

Period	# of Houses	# of Members	Production (Kg)		Food Security (Kg)		Sales				
			Total	Per HH	Total	Per HH	Volume (Kg)	Price (MK/Kg)	Total Income (MK)	Income/ HH (MK)	Income/ House (MK)
2005/06 (Demo Phase)	7	99	1,447	15	685	6.9	762	400	305,002	3,081	43,572
April 2007-March 2008	22	22	1,259	57	125	5.7	1,134	500	567,000	25,773	25,773

[1] A total value across the 2 periods was not calculated since the first phase was a demonstration with a large group of participants

Table 18: Production and Sales of Fish from Fish Ponds, 2005 - 2008

Period	# Clubs	# Ponds (active)	# Members (active) [1]	Production (Kg)			Food Security (Kg)		Sales				
				Total	Per HH	Per Pond	Total	Per HH	Volume (Kg)	Price (MK/Kg)	Total MK	Income/ HH (MK)	Income/ Pond (MK)
Oct 05-Sept 06	3	11	22	112	5	10	19	0.9	93	104	9,691	440	881
Oct 06-Mar 07	8	17	78	680	9	40	215	2.8	465	99	46,221	593	2,719
April 07-Mar 08	8	30	104	3,170	30	106	52	0.5	3,118	161	501,695	4,824	16,723
Total	**8**	**30**	**104**	**3,962**	**44**	**156**	**286**	**4.1**	**3,676**	**122**	**557,607**	**5,857**	**20,323**

Table 19: Production and Sales of Fingerlings from Fish Ponds, 2005 - 2008

Period	# Clubs	# Ponds (active)	# Members (active) [1]	Production (Fingerlings)			Sales				
				Total	Per HH	Per Pond	Volume (Fingelings)	Price / Fingerling (MK)	Total Income (MK)	Income/ HH (MK)	Income/ Pond (MK)
Oct 05-Sept 06	3	11	33	3,237	98	294	3,237	7.0	22,666	687	2,061
Oct 06-Mar 07	8	11	32	23,477	734	2,134	23,477	7.6	178,895	5,590	16,263
April 07-Mar 08	8	30	104	44,191	425	1,473	44,191	7.3	322,580	3,102	10,753
Total	**8**	**30**	**104**	**70,905**	**1,257**	**3,902**	**70,905**	**7.3**	**524,141**	**9,379**	**29,076**

[1] Membership in 2008 involves 50 men and 54 women

5.5.2 Mushroom Production

Mushroom production was identified as a promising business enterprise for farmers in the Chia Watershed. The project initiated demonstration houses to serve as training grounds for mushroom production by clubs of farmers. A total of 7 houses were constructed for this purpose targeting all 7 clubs comprising a total of 99 members. Cumulative production and sales from these clubs are shown in **Table 17**. Members shared production for home consumption as well as proceeds from sales.

Although these demonstration houses have served a useful training function, they were not efficient in terms of production and sales, and almost 50% of the mushrooms were consumed – mainly because the low production was shared by a large number of households.

Individual Mushroom Houses

In the second phase, the project targeted individual ownership of houses to maximize production and sales. All costs for constructing the houses, spawn, and tubes were originally to be provided through loans from OIBM. This arrangement failed because of OIBM's demand for a 50% guarantee along with high interest rates. With no other option for micro-credit, TLC provided individual loans for 22 houses, each totaling about MK 42,000 per person. Full repayment was expected within 12 months starting 4-6 months after the loan is given.

To date, 22 houses have been constructed. Each house is owned by an individual responsible for repaying the loan, but he/she was assisted by 2 selected club members to essentially "learn the ropes" with the aim of securing a loan in the near future. Once repayment is made in full, funding will be available to those members are have participated in the first production cycle. With production per house estimated at 300 kg, total gross revenue per annum should be MK 120,000-150,000, sufficient to cover the value of the loan, with a balance to buy inputs for the next cycle.

Production and Markets

Over 5500 tubes were spawned in the new houses with an average of 253/house. Production per house was considerably lower than expected, perhaps due to the difficulties faced in finding a ready market for the produce from all houses. The challenge is a function of the continuous production cycle of mushrooms, which must be sold fresh soon after harvesting. This demands a reliable market for sales which cannot be met by the local market around Chia. With 22 houses competing for the same limited market, opportunities are being explored farther afield, including Salima, Senga Bay, Kasungu and Lilongwe. The results show potential markets with Lakeshore Resorts and cottages in Nkhotakota and Salima, Dwangwa Sugar Estate, Kamuzu Academy, and super-markets in Kasungu and Lilongwe.

A full market evaluation will be carried out over the next 6 months to assess the performance of this initiative as a viable enterprise that merits expansion. A key focus will be to determine whether production expectations can be met and are in line with markets demands and prices.

Incubation of tubes with spawn in newly constructed house

Mushrooms under production

5.5.3 Aquaculture

Survey results of fish farming clubs are presented in **Tables 18 and 19** for production and sales of fish and fingerlings respectively. Based on this information, the following observations and recommendations were made:

- A total of 8 clubs were initially involved in fish farming with a membership of 108 and construction of 46 ponds by hand. Some clubs abandoned certain ponds. The current number of active ponds is 30 with a membership of 104 comprising 50 men and 54 women.
- Production levels varied tremendously between clubs, with some producing little or no fish, while others did reasonably well. This situation was most noticeable in the early learning phase of promoting aquaculture, which could be attributed to new exposure and limited experience with the enterprise.
- A clear learning curve is apparent from assessments conducted, which shows a general increase in interest and productivity. Drop outs are normal when promoting a new practice, ultimately allowing a focus on those most committed and capable of managing the enterprise.
- The cost and availability of fingerlings is a major problem for production, a challenge which is prevalent across much of Malawi.
- The sale of fingerlings generated more income than fish, which appears to be related to the short supply of fingerlings throughout Malawi. This trend may diminish as production levels meet demands.
- The results above suggest actions to address a number of challenges:
    - ◊ Conduct surveys to understand the nature and cause of the disparities observed.
    - ◊ Assess strategies with other stakeholders to address the fingerling deficiency in Malawi.
    - ◊ Investigate management issues related to water and feed quality, sources and costs of feed, and other factors affecting growth and survival of fish.
    - ◊ Interview clubs to understand the organization and contributions of members in managing the resource, and how the proceeds are distributed.
    - ◊ Assess business skills of the club to manage the venture as a viable financial entity.

Ultimately, the successful management of fish ponds as a business must address the shortfalls evident in the pilot phase of this initiative to realize the potential of aquaculture as a smallholder enterprise that should be pursued.

5.5.4 Eco-Tourism

Early efforts to promote eco-tourism with communities in the watershed were undertaken by WESM with limited success (See **Annex 3**). Thereafter, TLC took on the responsibility, forming Luwi Eco-tourism Club comprising 15 men and 19 women. The area is located just north of the lagoon close to lake resorts such as Nkhotakota Pottery and the Njovu Safari Lodge. The aim is to link opportunities for eco-tourism with the lake resorts. Activities included a) construction of a cultural center, 1 game hide and 1 boat for birding and hippo/croc viewing, b) clearing foot and bicycle paths for easy access to the area, c) conducting tours to view and learn from similar programs at Liwonde, Thuma, and Kuti Game Ranch and d) training 5 Tour Guides.

5.6 Landuse / Land Cover Analysis of Chia Watershed

An advanced GIS computer and software package, ARC GIS, was purchased and set up at the TLC HQ. Three GPS units were purchased to assist in collecting data. A GIS specialist was recruited from Land Resources Conservation Department to set up the software and to manage the data collection, monitoring and analysis, Satellite images were acquired for the base data on land-use and cover. All data are stored in a central spatial data base for analysis and monitoring. The following mapping exercises were undertaken during the life of the project.

A study of the land-use and land cover of the Chia watershed was carried out in an effort to understand the dynamics of landuse / land cover change over time. This was meant to provide a basis to identify land use related problems of the watershed and to target potential interventions that could help to mitigate the identified problems. The analyses were performed on quality satellite imagery acquired at similar seasons for the years 1972, 1990, and 2000.

Unfortunately, quality images at the start of the project in 2004/05 were not available for valid comparisons against earlier periods. It is expected that additional images will be secured for 2007/08 to evaluate change during the life of the project although changes since 2004/05 will not be significant. Information from 2007/08 will then form the basis for future comparisons, results of which will be communicated to USAID by TLC when available.

5.6.1 Objectives of the Landuse / Land Cover Study

- Assess and determine the occurrence and the spatial distribution of landuse/land cover types in the Chia watershed.
- Assess the amount of land covered by each identified landuse / land cover category in the watershed and changes therein between 1972 and 2000.
- Assess the trend of landuse / land cover in the watershed over the past 30 years.
- Establish baseline data on landuse / land cover in the watershed for future comparison to assess the impact of activities in the watershed.
- Identify hotspots that require special attention/intervention.

5.6.2 Land Tenure Categories of the Watershed

The watershed is dominated by customary land (67,980.4 ha). Other land tenure categories are private land (72.8 ha) and protected/public land (30,730.9 ha) and leasehold land, which was mapped with customary land due to unavailability of data. Once data on leasehold land are secured, the status of land ownership will be up-dated.

Table 20 presents the distribution of land tenure categories in the watershed, and **Map 1** presents the spatial distribution of these categories. **Maps 2A-2C** are digital elevation models for the watershed showing the elevation and drainage characteristics.

5.6.3 Image Classification[II]

- Landsat images for the years 1972 (Landsat MSS), 1990 (Landsat TM) and 2000 (Landsat ETM) were acquired and processed according to derive land use/land cover classes using the Integrated Land and Water Information System (ILWIS). Image enhancement and re-projection was done using the software program ERDAS Imagine, while processing and presentation of polygon maps was done with ArcView software.
- Image classification was assessed using the supervised classification method to identify and isolate classes. To ensure good differentiation, as many classes as possible were selected. After running the classification, closely related classes were merged, remaining with 9 dominant classes for the watershed.
- **Table 21** shows the area covered of each landuse / land cover category and **Maps 2-5** show the spatial distribution of the landuse / land cover classes.
- The general trend shows a decline in the "original" land cover (miombo forest) from 50,739.8 ha to only 23,468.1 ha. This is a loss of 53.75% in 28 years, which reflects severe deforestation in the watershed during this period.
- Intensive agriculture increased from 6,850.5 ha in 1972 to 22,286.5 ha in 2000, largely a result of converting miombo forest into farm land.
- Note that the areas mapped as Sparse or Degraded Forest and Fallow/Grassland may seem inconsistent in the classification, but field verification revealed that the two classes were appropriately disaggregated during classification. These two classes also increased in area due to degradation.
- There was little change in the water body area over time but there was a slight decline in wetlands from encroachment by invasive marsh vegetation, mainly species of *Phragmites, Mimosa,* and *Sesbania.* This suggests an eminent problem with the water resources in the watershed which might have been impacted negatively by a wide range of human activities, including expansion of land under agriculture.

Table 20: Breakdown of Land Tenure, Chia Watershed

Land Tenure System		**Area (ha)**
Customary and Leasehold Land		67,980.4
Private Land		72.8
Protected / Public Lands	Nkhota-kota Wildlife Reserve	17,859.6
	Ntchisi Forest Reserve	9,517.9
	Kaombe Forest Reserve	3,355.2
	Totals	**98,785.9**

[II] Although the preference was to analyze images for the years 1972, 1980s, 1990s and 2005, suitable images for the 1980s and 2005 were not available; analyses for 2006 and later will be done in future when images are available.

Map 1: Distribution of Land Tenure Systems in the Chia Watershed

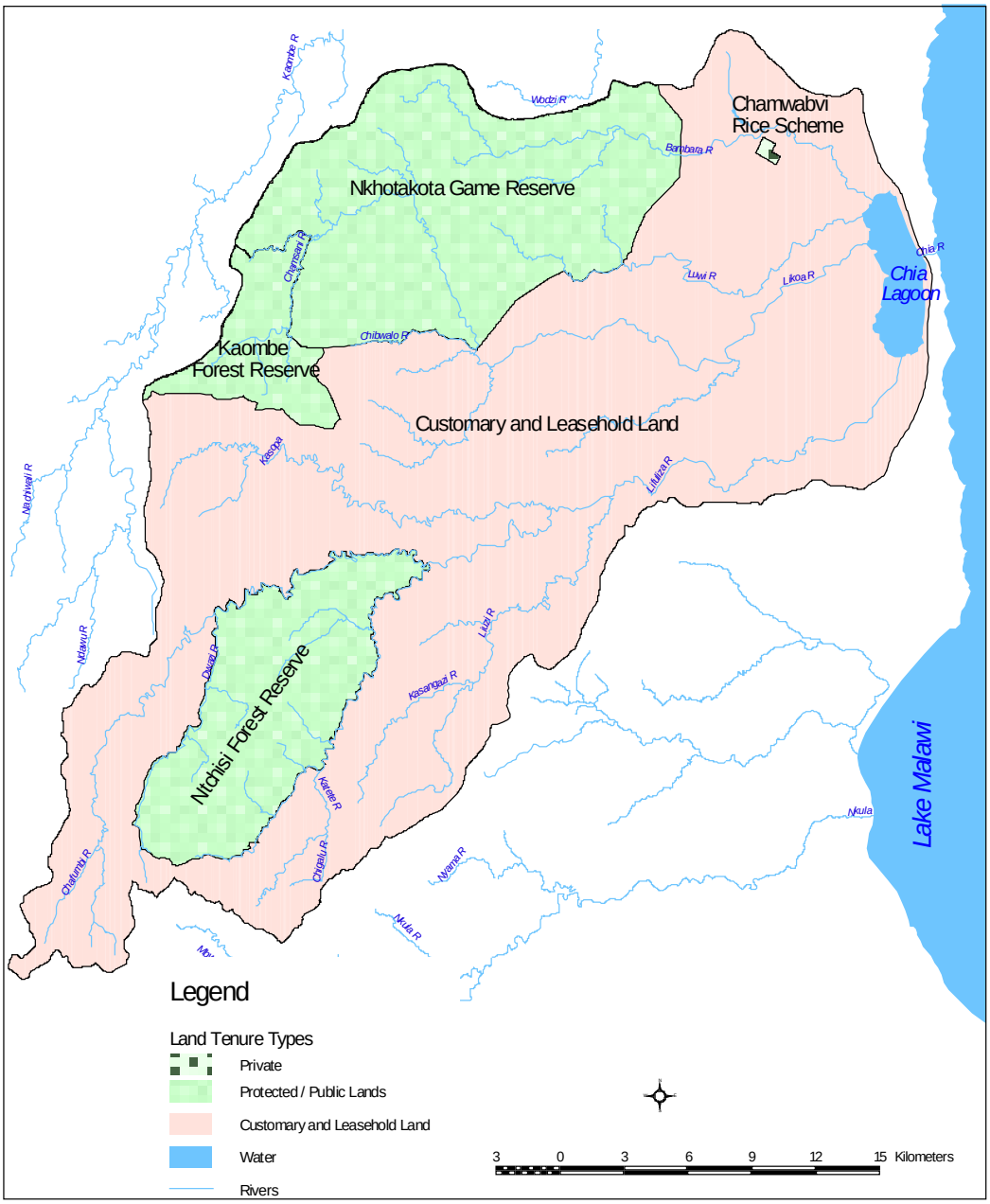


Table 21: Breakdown of Landuse / Land Cover Classes over Time

Landuse / Land Cover Class	Area (ha)[III]		
	1972	1990	2000
Clouds[IV]	0	0	5,691.4
1. Plantation/Evergreen Forest	320.8	693.8	439.6
2. Forest (Miombo Woodlands)	50,739.8	33,963.6	23,468.1
3. Sparse or Degraded Forest	20,296.8	31,564.7	25,849.4
4. Fallow/Grassland	1,789.9	3,599.4	6,797.9
5. Cultivated/Bare Land	14,797.5	21,834.4	4,609.9
6. Intensive Agriculture	6,850.5	3,537.4	22,286.5
7. Riverline / Sub-Wetland Vegetation	0	0	7,083.6
8. Wetlands	2,274.9	1,801.3	1,178.8
9. Water	1,715.9	1,698.8	1,749.4
Totals	**100,758.1**	**100,683.4**	**101,154.6**

5.6.4 Landuse / Land Cover Change Analysis

- A comparative analysis of images obtained at different dates and classified independently was done through an overlay of the landuse / land cover maps to identify which landuse/land cover classes have changed and changed to which class. This was done by an overlay of 1972 and 1990, 1990 and 2000 and 1972 and 2000 classified images.
- **Table 22** summarizes the change in landuse / land cover from one class to another between 1972 and 2000. **Maps 3-5** show the corresponding spatial distribution of the landuse/land cover classes.
- The landuse /land cover category shown with a negative change indicates a relatively smaller area in the preceding year.
- From **Table 22** it can be deduced that major increases took place in “Fallow/ Grassland” and “Intensive agriculture” categories between the 1972 and 2000, with major reductions registered under the “Forest (Miombo Woodlands)” class.
- Ground truthing, verification interviews with villagers, and information from the district assembly confirmed that many tobacco farms were opened up in the area during the period prior to 1990. However, following a drop in tobacco prices in the mid 1990s, most tobacco estates were abandoned and are no longer functioning. Most of this land is now under transition as grassland or forest regeneration.
- **Table 23** summarizes results of landuse / land cover change between 1972 and 2000. **Maps 6-8** show the corresponding spatial distribution of the landuse/land cover change from 1972 to 2000.
- All changes in land-use/cover classes were substantial. Most significant were 1) cultivated or bare land and 2) forest (Miombo Woodlands). This trend indicates a grave problem of land use, which left unchecked will lead to severe degradation of the watershed.
- A total of 32,898.6 ha (33.2% of the total area) changed from one landuse/land cover type to another. Out of this, 11,198.2 (34.0%) changed from Miombo Woodlands to Sparse or Degraded Forest. 8,948.3 ha (27.2% of the total landuse/land cover) changed from Miombo

[III] Minor transformation errors during image processing resulted in small differences in total areas.
[IV] The image for 2000 had some areas obscured by cloud cover, which could not be interpreted because the related land data could not be differentiated.

Woodlands to Intensive Agriculture, and 5,367.1 (16.3%) changed from Sparse or Degraded Forest to Intensive agriculture.

- Between 1972 and 1990, the major increase was in Cultivated/Bare Land (the latter reflecting land preparation), which accounted for an increase of 47.6%, suggesting that vast areas were opened for agriculture during this period, mainly for tobacco when the crop was liberalized. Analyses between 1990 and 2000 verified that most of these areas were abandoned due to cost and marketing problems with tobacco. There was also a relatively high increase in Sparse or Degraded Land, which indicates an increase in land clearing for agriculture, settlements, and wood.
- Plantation/Evergreen Forest is concentrated mainly in Ntchisi hills (Ntchisi Forest Reserve). The area under plantation forest was expanded significantly between 1972 and 1990, but thereafter declined between 1990 and 2000, reflecting limited ability to maintain or expand the plantation.

Table 22: Net Change in Landuse / Land Cover Classes

Landuse / Land Cover Class	1972 - 1990		1990 - 2000		1972 - 2000	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
1. Plantation/Evergreen Forest	373.0	116.27	(254.2)	(36.64)	118.8	37.03
2. Forest (Miombo Woodlands)	(16,776.2)	(33.06)	(10,495.5)	(30.90)	(27,271.7)	(53.75)
3. Sparse or Degraded Forest	11,267.9	55.52	(5,715.3)	(18.11)	5,552.6	27.36
4. Fallow/Grassland	1,809.5	101.10	3,198.5	88.86	5,008.0	279.79
5. Cultivated/Bare Land	7,036.9	47.55	(17,224.5)	(78.89)	(10,187.6)	(68.85)
6. Intensive Agriculture	(3,313.1)	(48.36)	18,749.1	530.02	15,436.0	225.33
7. Riverline / Sub-wetland Vegetation	-	N/A	7,083.6	N/A	7,083.6	N/A
8. Wetlands	(473.6)	(20.82)	(622.5)	(34.56)	(1,096.1)	(48.18)
9. Water	(17.1)	(1.00)	50.6	2.98	33.5	1.95

Table 13: Land-Use/Land Cover Change between 1972 and 2000

Landuse / Land Cover Change	Area (ha)
Miombo Woodlands to Cultivated/Bare Land	1,482.7
Miombo Woodlands to Fallow/Grassland	2,275.4
Miombo Woodlands to Intensive Agriculture	8,948.3
Miombo Woodlands to Sparse or Degraded Forest	11,198.2
Sparse or Degraded Forest to Cultivated/Bare Land	781.3
Sparse or Degraded Forest to Fallow/Grassland	-
Sparse or Degraded Forest to Forest (Miombo Woodlands)	1,637.1
Sparse or Degraded Forest to Intensive Agriculture	5,367.8
Fallow/Grassland to Cultivated/Bare Land	374.3
Fallow/Grassland to Forest (Miombo Woodlands)	23.3
Fallow/Grassland to Intensive Agriculture	340.8
Fallow/Grassland to Sparse or Degraded Forest	469.6
Total Change	**32,898.6**

5.6.5 Risk Assessment of Run-off and Erosion

This analysis considered landuse/land cover and the impact of rainfall in relation to slope. The assessment considered two scenarios as follows:

- ➥ The current risk of water run-off and erosion across different classes of landuse / land cover.
- ➥ The potential risk of run-off and erosion across different classes of landuse / land cover if the current protective cover is removed (i.e. severe degradation).

The major factors considered were the slope of the area (see **Table 24)** and the landuse / land cover of the land parcel in question. **Table 25** summarizes the current and potential risk to run-off and erosion and the level of risk across the watershed. **Map 9** shows the spatial distribution of the current risk to run-off and erosion. **Map 10** shows the potential risk if the current landuse / land cover is badly degraded. The data show that 74% of the total area in the watershed is currently at low risk, but this potentially decreases to 35% if the area is degraded through changes in landuse.

The increase in the area at higher risk shows the vulnerability of the watershed if the landuse / land cover is altered, particularly the high risk areas (see **Table 25** and **Maps 9** and **10**).

Table 24: Slope Characteristics of the Watershed and Total Area

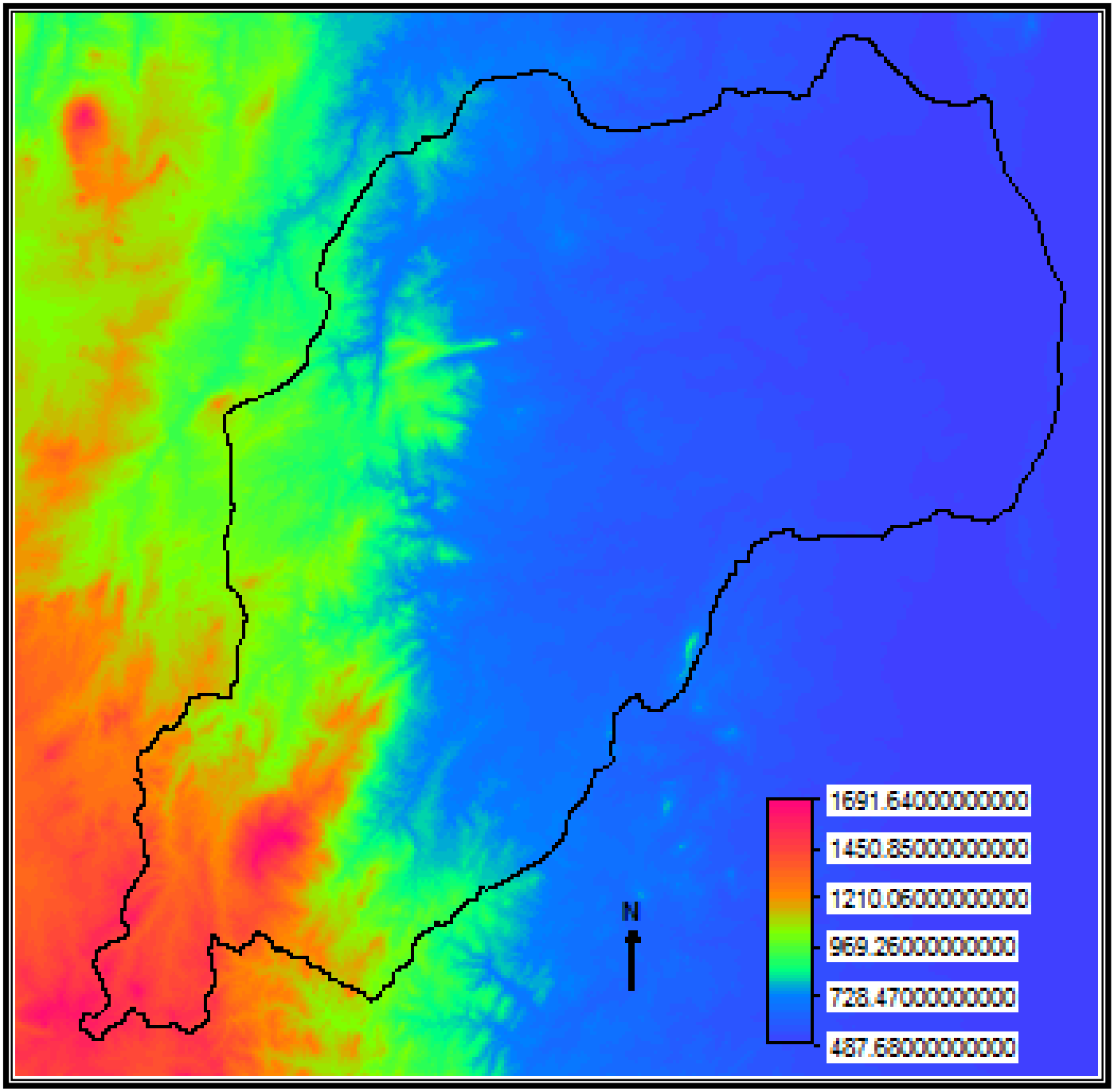
Slope Category[v]	Slope Steepness (%)	Area (Ha)		
		Customary Lands (A)	Public/Private Land (B)	Watershed (A+B)
Almost flat to flat	0 - 2	26,823.1	3,714.6	30,537.7
Gentle Slopes	2 - 6	16,914.6	7,643.5	24,558.1
Low to Slight Slopes	6 - 13	12,740.5	8,839.3	21,579.8
Moderately Steep	13 - 25	7,559.3	6,260.8	13,820.1
Steep Slope	25 - 55	3,817.8	3,911.2	7,729.0
Very Steep Slope	> 55	414.3	433.3	847.6
Total		**68,269.6**	**30,802.7**	**99,072.3**

Table 25: Area of the Watershed under Risk to Run-off and Erosion

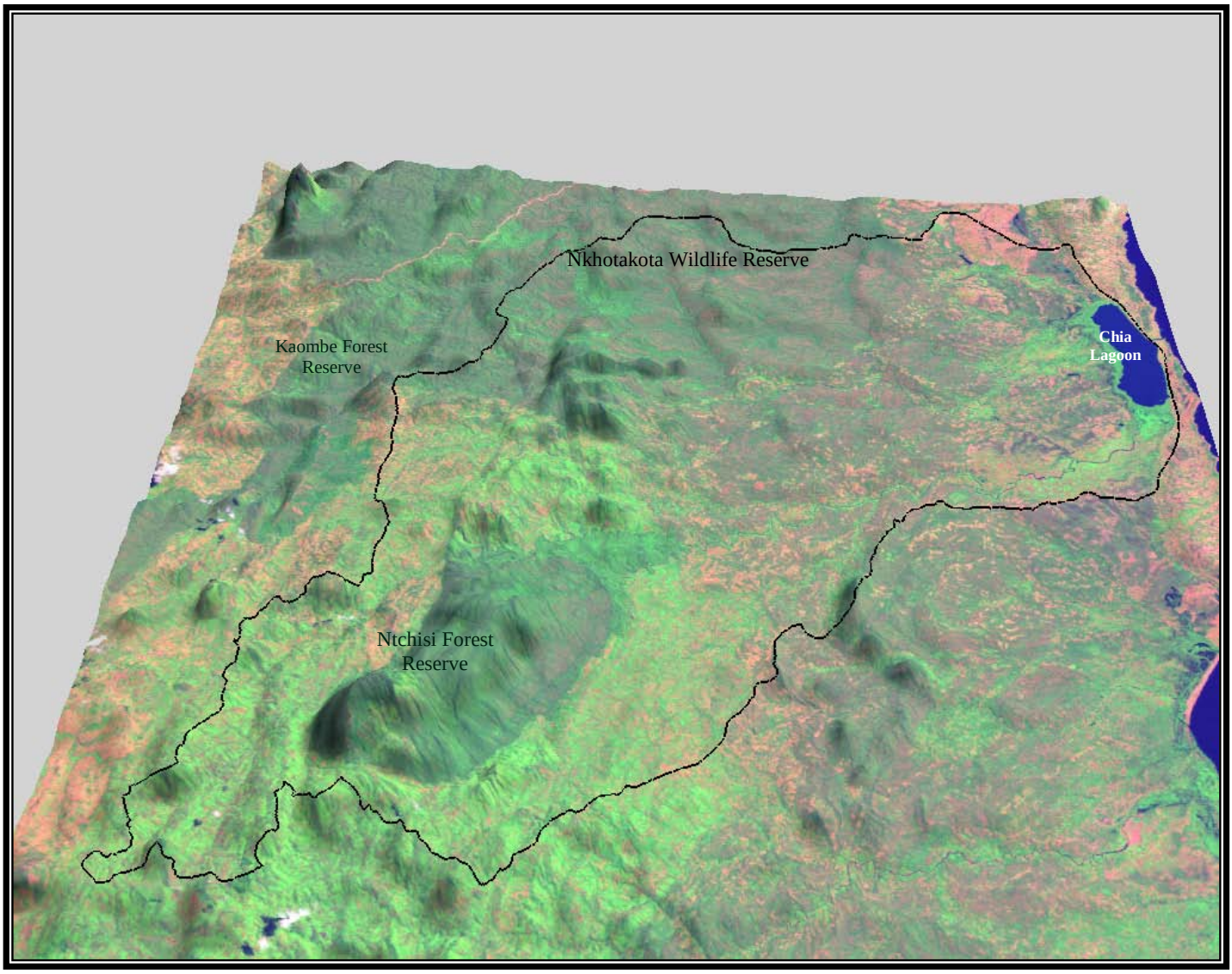
Level of Risk		Area (ha)	% of the Total
Current	Low Risk	68,085	74%
	Medium Risk	20,332	22%
	High Risk	3,296	4%
Total		**91,714**	**100%**
Potential	Low Risk	32,367	35%
	Medium Risk	28,097	31%
	High Risk	31,250	34%
Total		**91,714**	**100%**

[v] *Slope categories adopted from the Land Resources Evaluation Project, Ministry of Agriculture, Land Husbandry Branch, 1991*

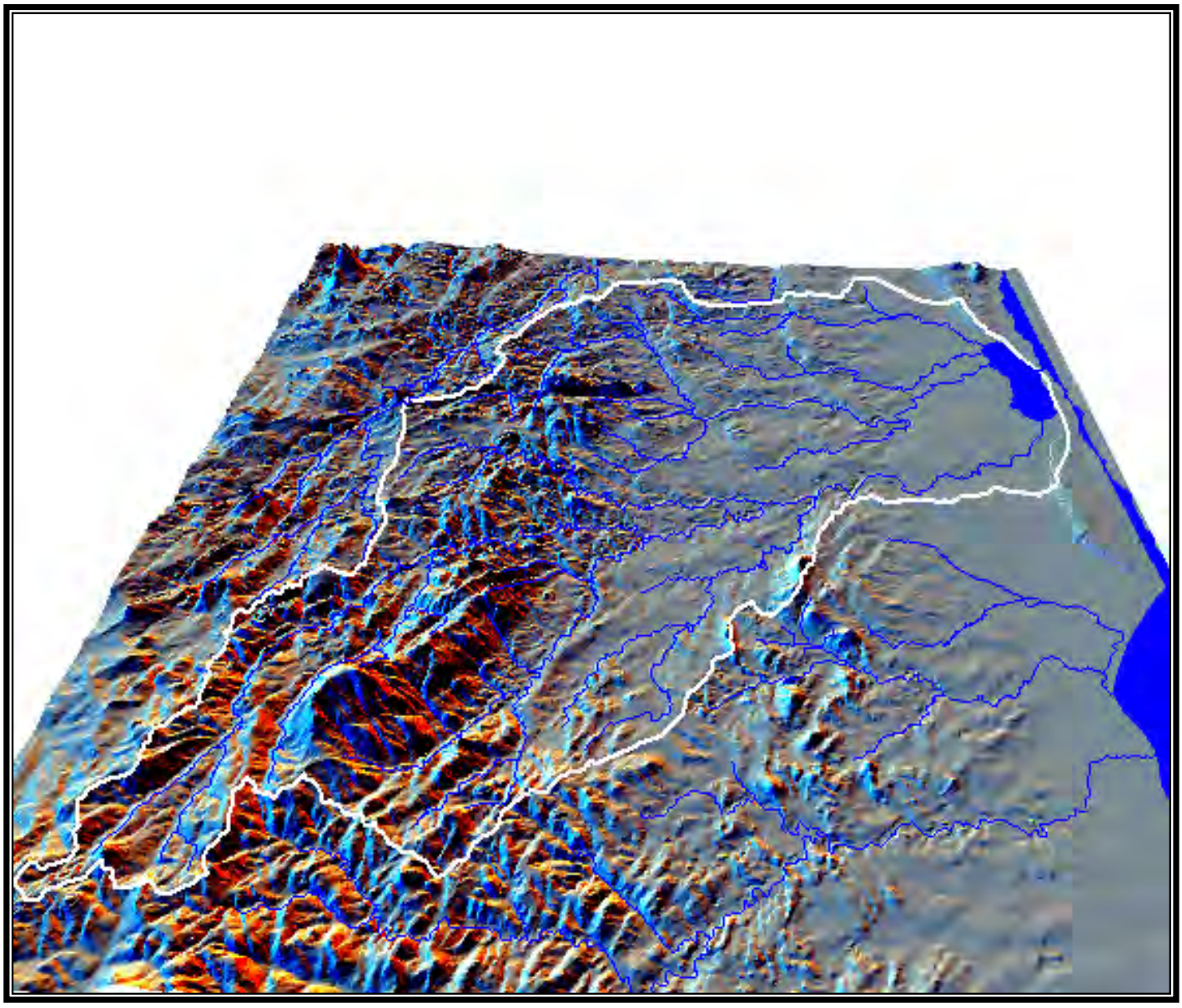
Map 2A: Digital Elevation Model (DEM) for Chia Watershed



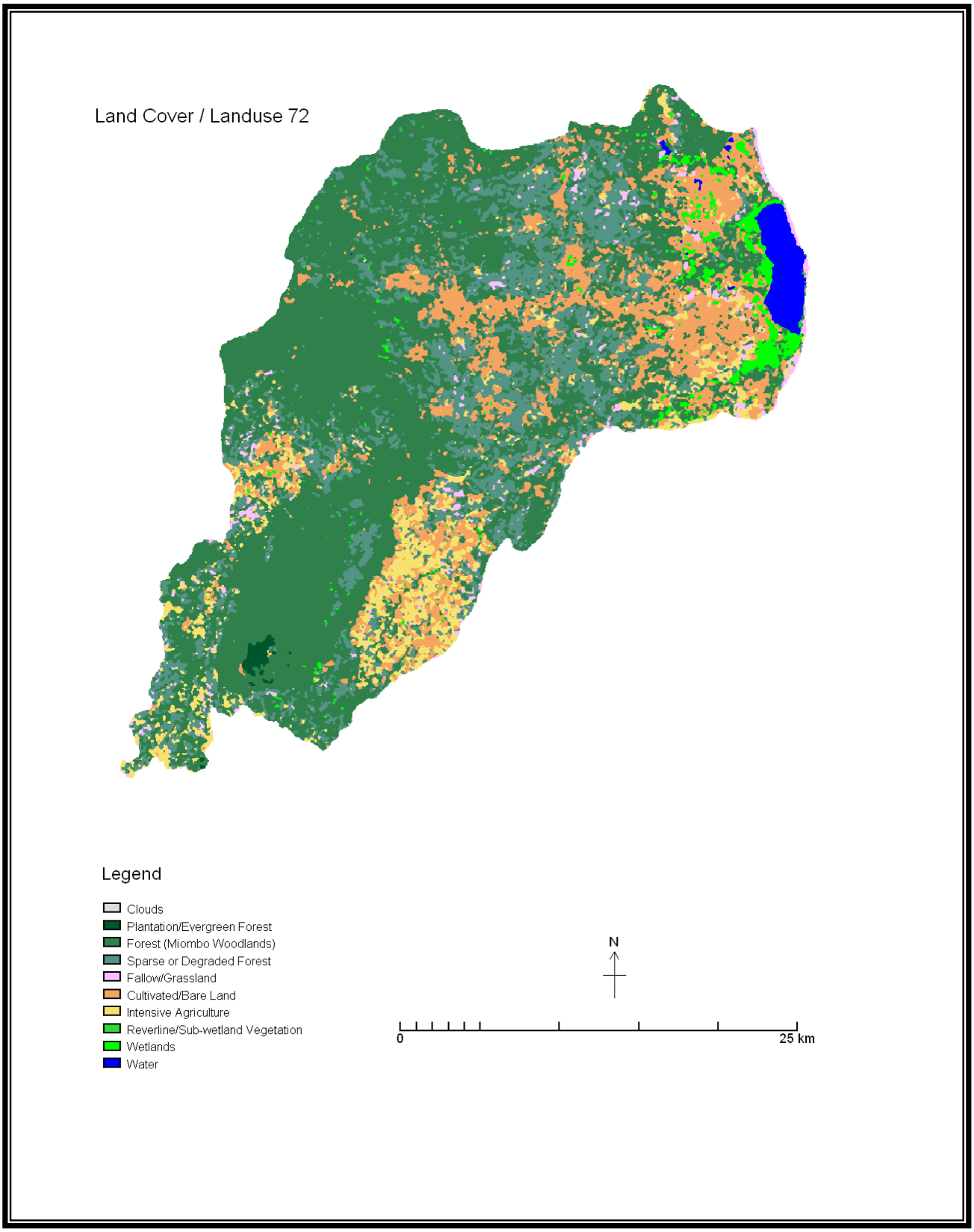
Map 2B: True Colour Composite of 2003 Landsat ETM+ imaged draped over the Digital Elevation Model (DEM) for Chia Watershed



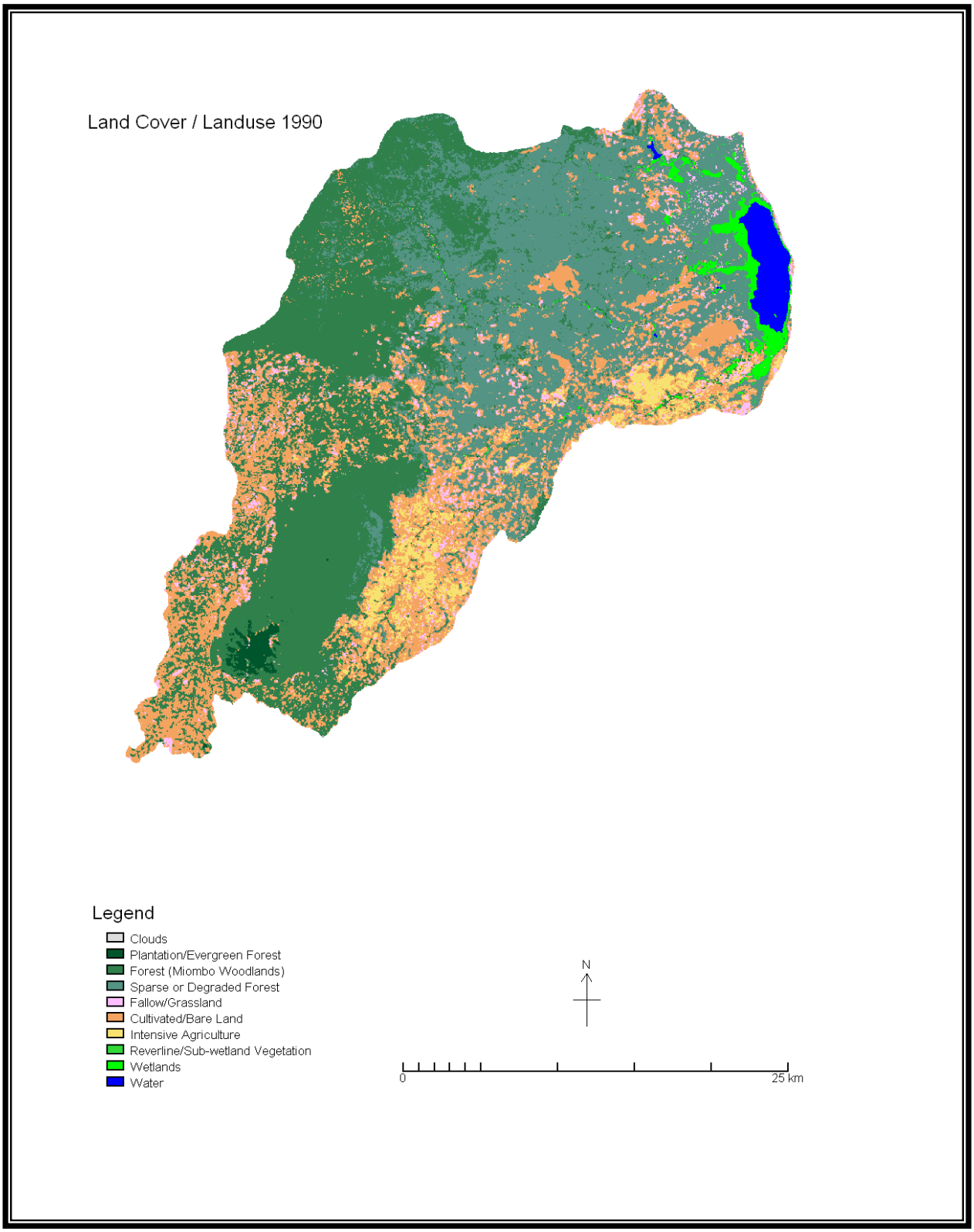
Map 2C: Hill shading draped over DEM showing the Drainage System of the Chia Watershed



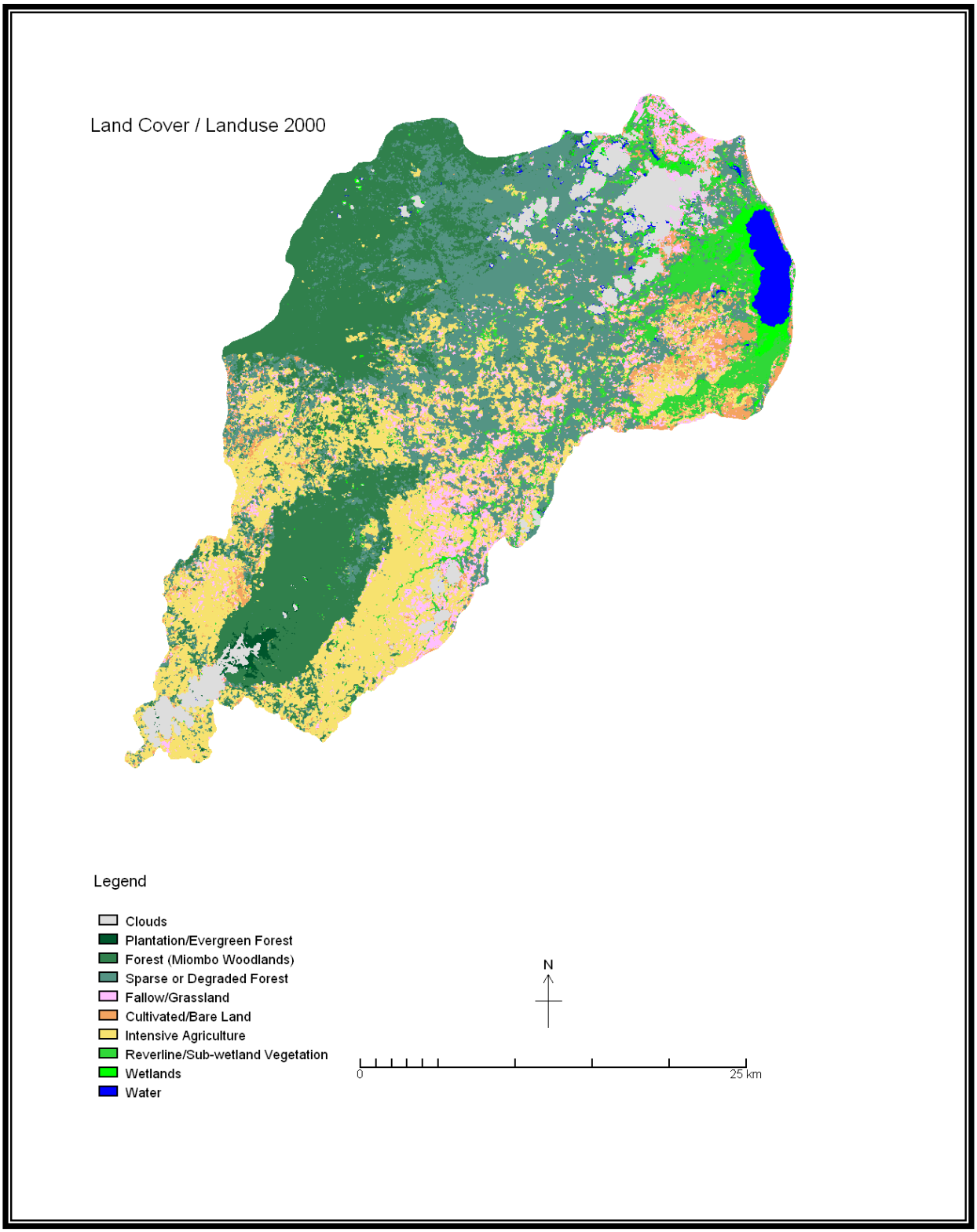
Map 3: Landuse / Land Cover in 1972



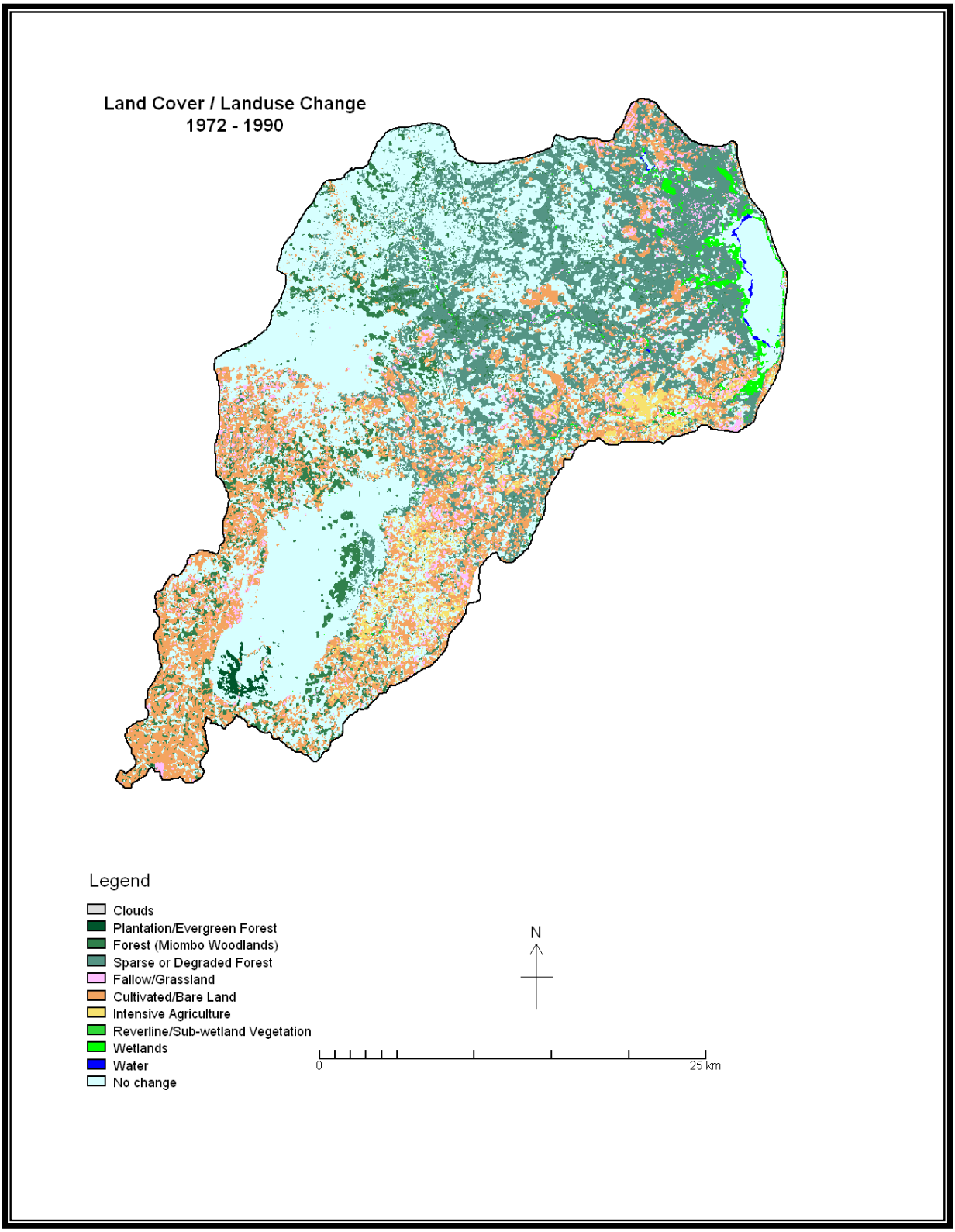
Map 4: Landuse / Land Cover in 1990



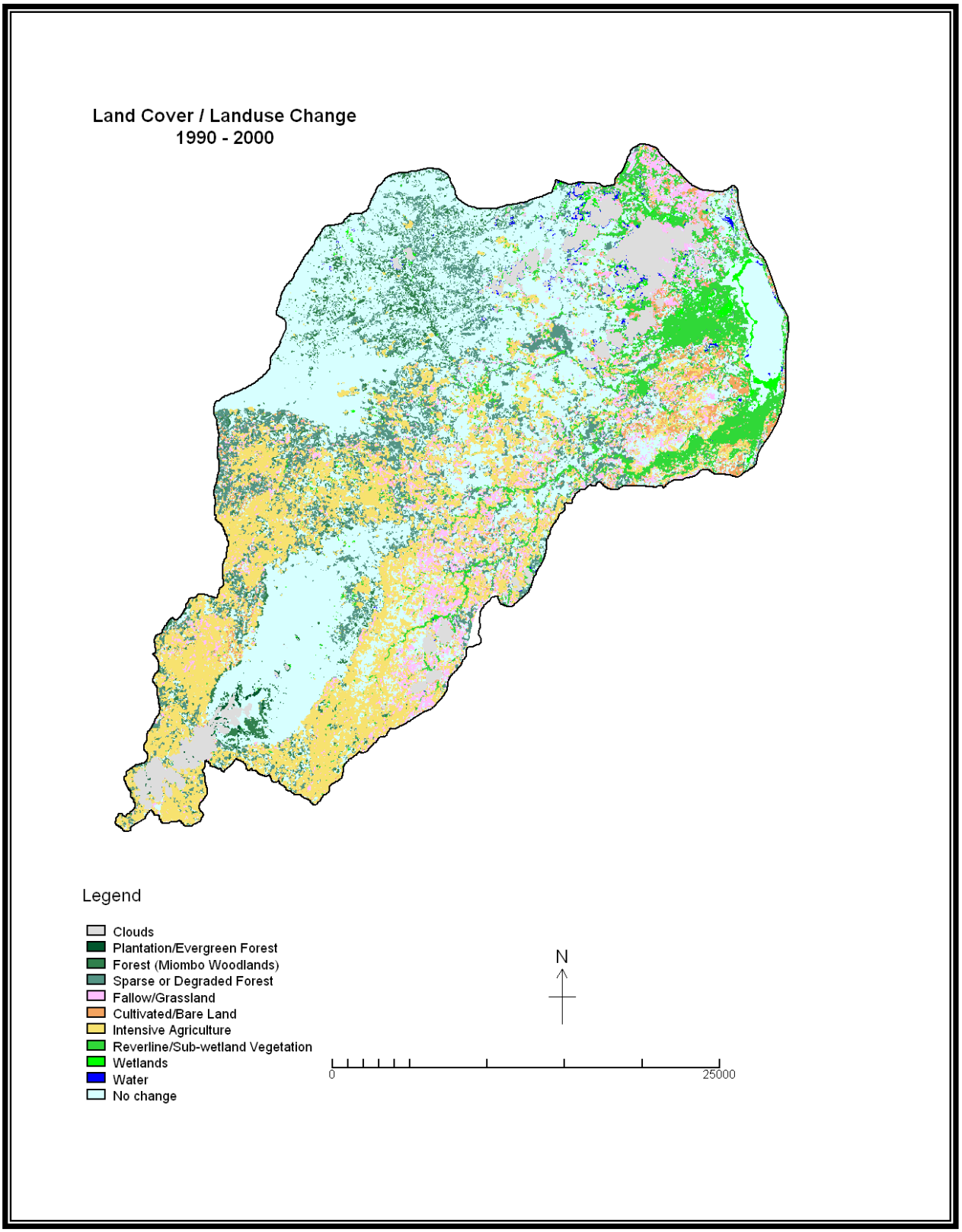
Map 5: Landuse / Land Cover in 2000



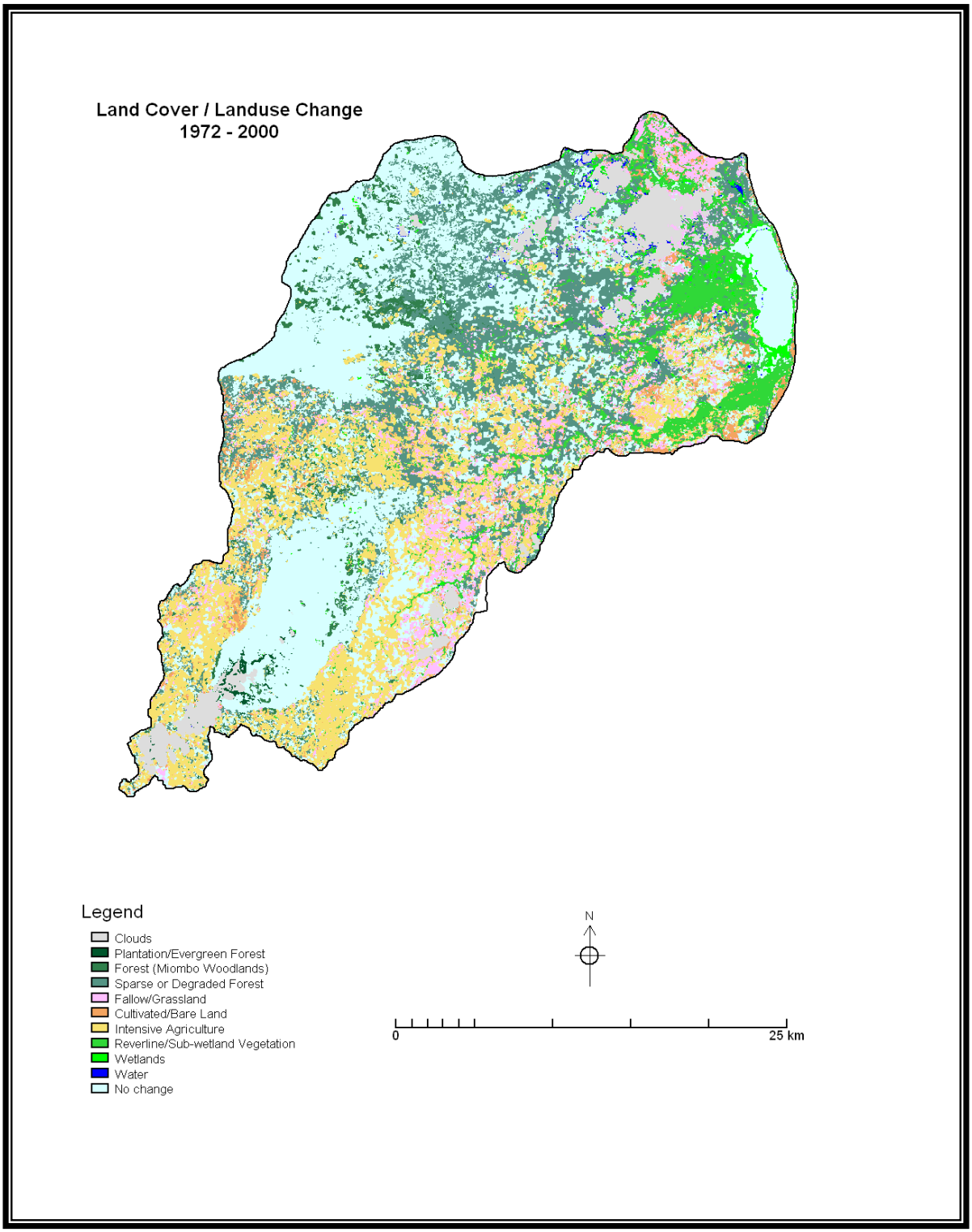
Map 6: Landuse / Land Cover Changes between 1972 and 1990



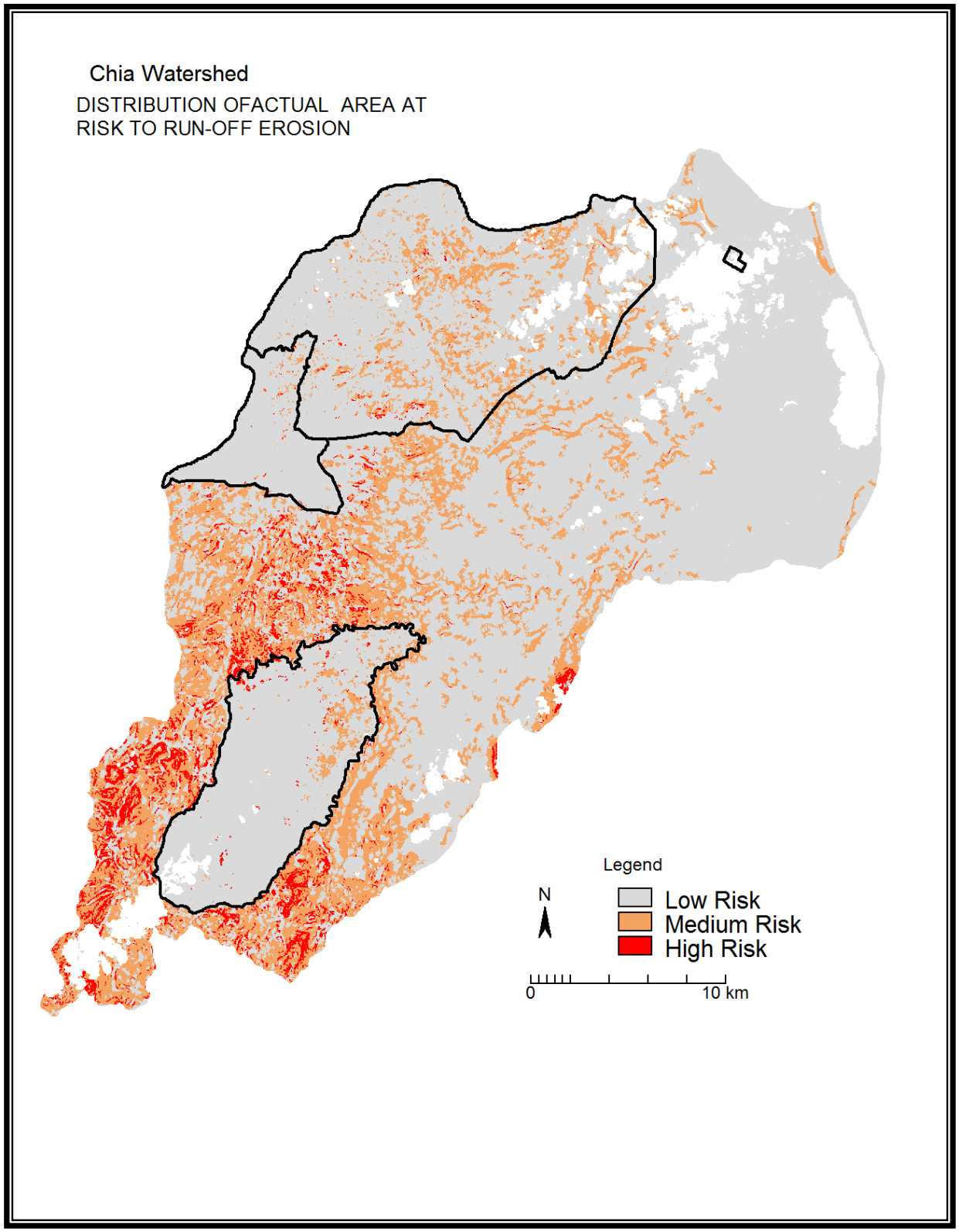
Map 7: Landuse / Land Cover Change between 1990 and 2000



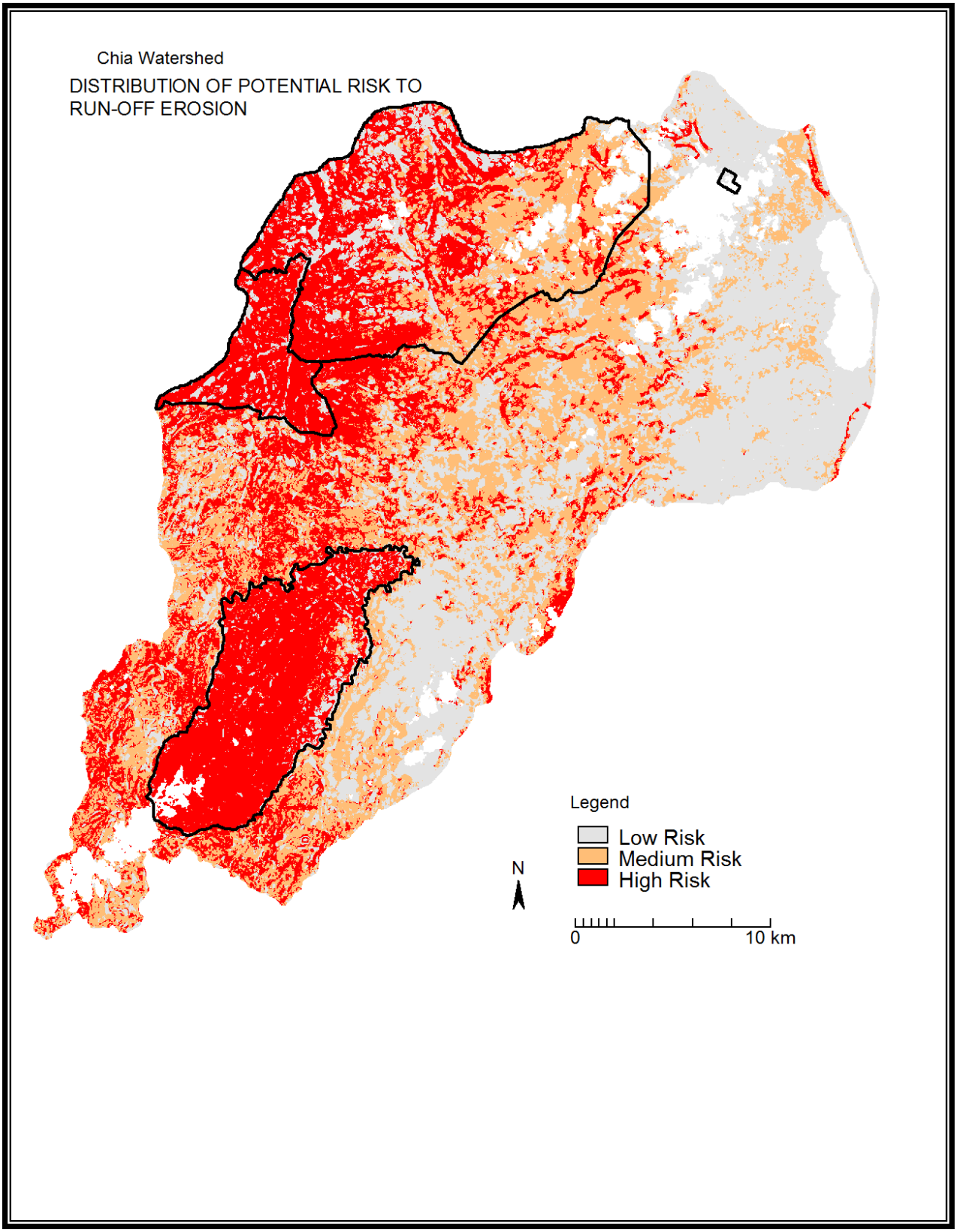
Map 8: Landuse / Land Cover Change between 1972 and 2000



Map 9: The Distribution of Area with Current Risk to Erosion



Map 10: Distribution of Areas with Potential Risk to Erosion



5.6.6 Villages, Infrastructure, and Village Forestry Areas (VFAs) in the Watershed

All topographical features were mapped using hand held GPS units linked to Palmtop computers. Features included roads, major foot paths, villages, schools, markets, sources of potable water, health centers, training centers, bridges, rivers. These features are presented in **Maps 11**. Mapped features are as follows:

- Villages in the catchment were mapped and profiled from the five Extension Planning Areas (Linga, Mwansambo, Zidyana, Kalira and Chikwatula). The information collected included number and structure of households.
- Efforts were also made to map all major infrastructure features in **Map 11**, including trading centres, schools (secondary and primary schools), health centres, water points, and roads. Trading centres include agricultural markets each serving several villages.
- It was noted that the village structure within the watershed is breaking down and there is no structured village system. A total of 395 villages were mapped with a total of 24,259 households, of which 4,697 were female-headed. This translated to a total population of 121,269 (an average of 5 members per household[VI])
- **Table 26** shows the distribution and structure of the mapped villages. **Map 11** illustrates the spatial distribution of the villages in the watershed.

Table 26: **Village Structure in the Chia Watershed**

EPA	Total Surveyed Households	# Female HHs	# Mapped Villages
Chikwatula	3,105	659	83
Kalira	3,589	836	89
Mwansambo	3,486	676	126
Zidyana	7,229	875	81
Linga	6,850	1,451	16
Total	**24,259**	**4,697**	**395**

- Most villages are concentrated in the south eastern part of the Ntchisi Forest Reserve. This area is associated with intense landuse / land cover change and is dominated by gentle to steep slopes.
- The greatest change is conversion from forest to agricultural land. The trend of events continues mostly in the upper part of the watershed.
- Little change was observed in the lower part of the watershed, where the area is dominated by sparse vegetation with scattered villages. In the 1980s and early 90s, some land in this area was under estate tobacco but most of these farms were abandoned. The area is also vulnerable to flash flooding.
- The northern part of the lower section of the watershed is close to Nkhotakota Wildlife Reserve where there are new settlers from other areas and districts, some including former tenants of the tobacco estates.
- Village Forest Areas (VFAs) physically mapped with a GPS are shown in **Map 11**. Names, location, and area of VFAs were presented earlier under **Section 5.3, Tables 8A and 8B.**

[VI] Integrated Household Survey 2004-2005, National Statistical Office. **Vol. 1**.

5.6.7 Summary Assessment of Land-use/Cover Change

The analyses clearly show that there is intense landuse / land cover changes taking place in the Chia watershed. The major contributing factors are increases in the human population and associated pressure on the watershed's natural resources. Although the analysis provided limited details on the precise nature of land degradation, the negative change in land cover indicates a general escalation in poor landuse practices. This signifies a continuing threat to the resources of the watershed. Of particular concern is the loss of biodiversity, forest cover, top soil, and ability to recharge water supplies. Together, these changes translate into lower productive capacity to support livelihoods.

Although the area mapped as hotspots appears small, i.e., areas with low land cover and steep slopes (26% of total area currently under medium to high risk), its total contribution to run-off and erosion is huge. This is demonstrated by the silt-load being discharged by the Lifuliza River and its tributaries which originate in the Ntchisi hills and their environs.

The increase in water run-off from rainfall endangers the lower part of the watershed and the lagoon by depositing silt from top soil carried away with the runoff. Quantitative measurements of soil losses in similar environments (MAFE Project 2004) indicate a rate of loss between 50 and 100 tons/ha/annum. The result appears to be posing a serious threat to the lagoon's fisheries, while simultaneously encouraging the invasion of undesirable vegetation into and around the fringes of the lagoon.

Based on this assessment, it is imperative to prioritize hotspots for intervention now. Failure to address these problems on a meaningful scale across the watershed will endanger the integrity and productivity of the area's natural resources, which in turn will impact the livelihoods of its inhabitants.

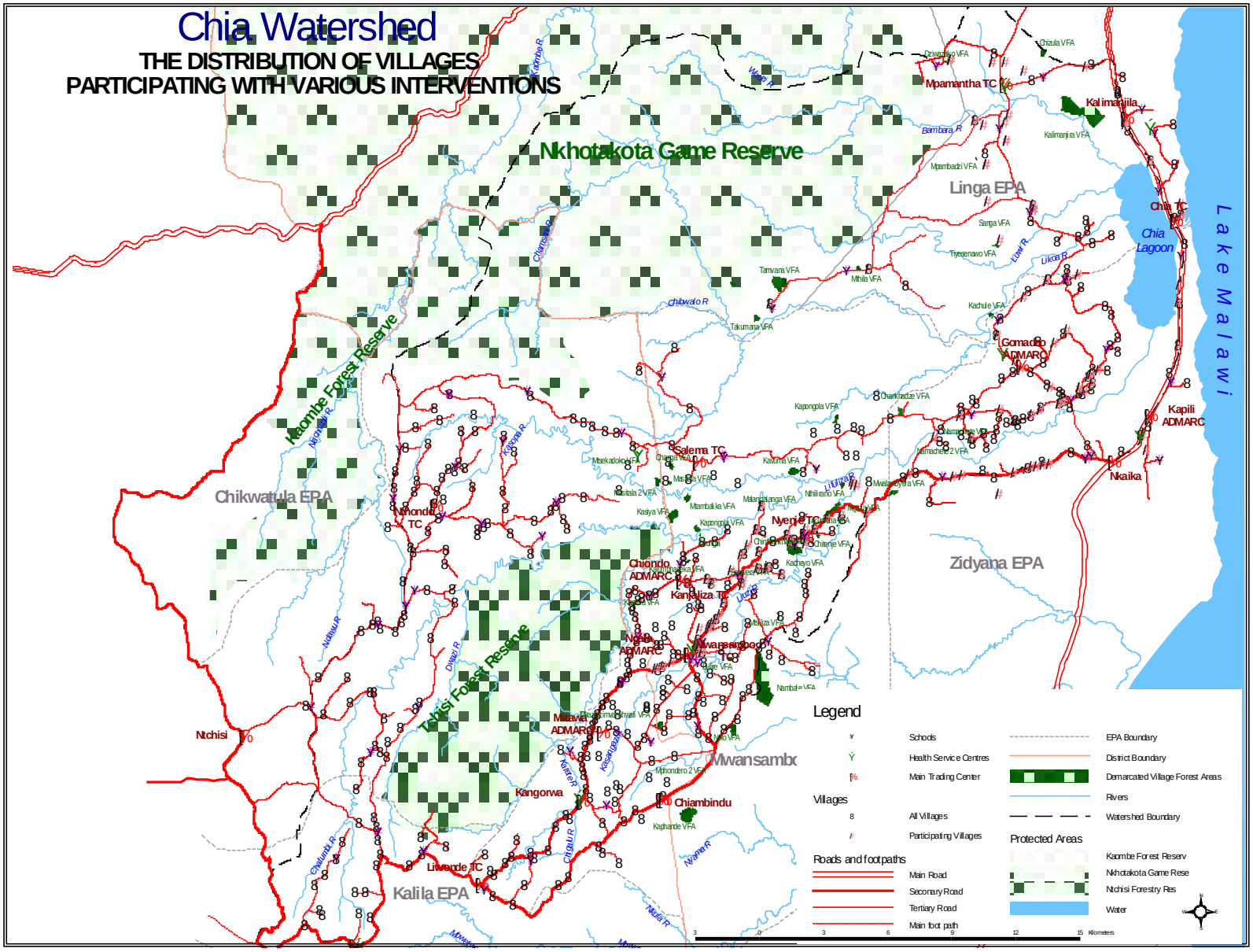
5.6.8 Fisheries Frame Survey of Chia Lagoon

The annual frame survey is a complete enumeration of all basic fishery parameters for the purposes of stock assessment, resource management, planning and economic analysis of the fishery in all the natural waters of Malawi. It is a census of fishing craft, gear owners, crewmembers and types of fishing gears in a fishing area.

A frame survey of the Chia Lagoon was carried out to establish the afore-mentioned parameters as an input into developing a fishery resource management plan for the area which ultimately aims at improving fish catches. Results of the census showed the number of gear owners had increased by 80% from 187 in 2003 to 337 in 2005 while the number of crewmembers also increased by 47% from 336 in 2003 to 494 in 2005. During the same period, the number of gill nets dramatically increased by 216% from 437.5 in 2003 to 1,384 in 2005. There is also a noticeable increase in the number of other important fishing gears in the lagoon during the same period. Long lines appear to have increased by 76% from 57.5 in 2003 to 101 in 2005 while Kambuzi Seine nets also went up by 113%.

These results underscore the importance of the lagoon fishery resources in the livelihood of the surrounding communities. Although the results may imply over-dependence on the lagoon fishery by the communities, the increases may not necessarily suggest that the amount of resources harvested are high. These results call for collaborative efforts by different stakeholders to come up with management plans and interventions which could increase fish stocks and catches, at the same time provide alternative sources of income.

Map 11: Social Economic Map of the Watershed



5.6.9 Hydrographic Survey of Chia Lagoon

A hydrographic survey of the lagoon was carried out by staff from the KKDA Water Department, the Ministry of Water Development and the Department of Surveys.

The objective of the survey was to establish the depth of the lagoon which has been subject to siltation from run-off. Despite the importance of the watershed, no such survey has ever been carried out. The information will be used as a benchmark to assess change over time due to project interventions. The survey involved taking soundings from a well equipped boat along survey lines over the entire body of water. An echosounder built in the boat was used to measure depths at appropriate intervals along survey lines established by the survey team. The survey lines extended onto land from the lagoon fringes up to a predetermined elevation. Results of the survey showed that the lagoon is generally very shallow, with the deepest areas of the bed measuring 4 meters below the surface, at an elevation of 475 meters above mean sea level. However, the channel that connects the lagoon to Lake Malawi is relatively deep, measuring 8.4 meters below the water surface. The survey also revealed that much shallower areas are found around the southern part of the lagoon near the mouth of the Lifuliza River. This confirms the high degree of sentiment from degradation in the upstream catchment of the Lifuliza. The survey also established the total open water of the lagoon which was 13.3 km^2, and the water capacity of the lagoon was estimated at 54.3 million m^3.

5.6.10 Water Quality Analysis

A study was carried out by the Water Department to establish the quality and the amount of sediment of waters in Chia Lagoon and streams/rivers discharging into it. A bacteriological analysis was also conducted to check the extent of pollution of these water bodies.

Chemical composition tests showed that the water in all the bodies are safe for human consumption as per the World Health Organization (WHO) and Ministry of Water Development standards. Microbiological analyses reveal a different story with higher levels of *Faecal coliform* and *Faecal streptococci* types of bacteria in water from the upper and middle reaches of all rivers than at the mouth of the same rivers at Chia Lagoon. This implies high levels of human activity in these sections of the rivers, and that the water is not safe for human consumption. Information on sediment loads cannot be interpreted from this set of data. This will be properly evaluated when more data are collected during the coming rainy season.

Note: Detailed results of the Frame, Hydrographic and Water Quality Surveys are presented in Annex 6, 7 and 8 of the 1st Annual Report of the Chia Watershed Project.

6. OVERALL CONCLUSIONS ON THE PROJECT

6.1 Perspectives on Achievements and Needs

Achievements over the 3 year life of the Chia Project show great promise for making significant impacts on livelihoods of rural communities and their environment. Factors that influenced these achievements are many and varied, but most notable include the integrated nature of the project under a diverse alliance of experienced partners, which created synergies to enhance impacts. The results produced clearly demonstrate the benefits from using a holistic approach to tackle the many inter-related challenges that face small producers and farmers across Malawi.

From a purely external perspective, there is no question that the project has been viewed as a great success based on well articulated verbal and written reports from many outside visitors and evaluators. However, to realize its full potential, a project of this nature, particularly from an environmental perspective, needs a much longer time horizon not only to produce desired results, but to improve the focus, approach, and efficiency of impact in terms of scale and quality. To this end, with the valuable support of USAID Malawi, Total LandCare has secured funding from the Norwegian Government to continue the Chia Project, and to expand the principles of its approach to a larger geographic area. The plan envisages a 5 year program of collaboration with five District Assemblies to replicate the Chia model. The results will provide the opportunity to expand impacts with a much larger number of rural communities, and to demonstrate the value and effectiveness of this development approach for use by others.

6.2 Key Lessons Learned

1. Success with partnerships requires a careful delineation of roles and responsibilities, coordination to ensure communication and collaboration with all relevant parties, and the production of quarterly workplans and budgets in line with the agreed responsibilities.
2. Building trust with communities requires respecting their needs and interests, and honoring project promises and commitments of support with consistency and transparency.
3. Promoting smallscale enterprises with rural communities is a demanding challenge that requires a) understanding of markets at all levels, b) attention in selecting the individuals involved, and c) intensive training to impart essential technical, management and business skills. For true success, care and time must be taken to identify beneficiaries who have the demonstrated capacity to manage an enterprise as a viable business with a focus on optimizing production, minimizing costs, establishing good linkages with buyers and markets, and meeting standards demanded by the market for quality and reliability in supply.
4. Loans to farmers and smallscale enterprises must first involve a thorough assessment of capabilities to undertake the intended practice with ability to repay the loan. To reduce the risk of defaults, and to ensure that beneficiaries are committed to the endeavor, a minimum downpayment of 25% is recommended.
5. Serious problems were encountered with other projects and organizations from conflicts in approaches and capabilities to offer competent extension services based on experience and knowledge. In some instances, our programs were hi-jacked (due to their success), or severely compromised by inappropriate and sometimes unethical actions. Government institutions need to set standards for modalities of operation to promote sound development ethics and to minimize such conflicts. The most critical of these conflicts involves the use of free or subsidized handouts to encourage participation, which is used to report successful results. This practice creates a dependency syndrome which is counter-productive to the goal of building self-sufficiency and sustainability.

7. FINANCIAL REPORT

A breakdown of expenditures against a total budget of US$ 2,074,852 is shown in **Table 27 (**see also the attached pdf file). This produced a balance of US$ 108,996 which was returned to USAID by WSU.

Table 27: Breakdown of Expenditures, September 2004 to December 2007

Budget Category	USD
Salaries & Benefits	297,155
Goods and Services	1,089,211
Travel	124,020
Equipment (over $5000)	55,388
Non-Capitalized Equipment	7,708
Finance & Admin Costs	392,374
Total Expenditures	**1,965,856**

8. ACKNOWLEDGEMENTS

The partner alliance of the Chia Lagoon Watershed Management Project, led by Washington State University and Total LandCare, wishes to express deep appreciation to the Malawi Mission of the United States Agency for International Development for the financial support and direction provided to the project. Thanks and gratitude are also extended to the District Assemblies of Nkhotakota and Ntchisi for their collaboration in implementing project activities. Special thanks are also given to all the implementing partners and their representatives, as well as to all farmers, farmer groups, communities, Traditional Authorities, and Village Headmen who participated and supported project activities. Finally, The Government of Malawi deserves special thanks for their foresight and support for this project.

7. FINANCIAL STATUS REPORT

12R-2949-0341

(Short Form)

(Follow Instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted	2. Federal Grant or Other Identifying Number Assigned by Federal Agency	OMB Approval No.	Page	of
US AID MALAWI	690-G-00-04-00290-00 Formerly: 623-0235-A-00-2056	0348-0039	1	2 pages

3. Recipient Organization (Name and complete address, including ZIP code)
WASHINGTON STATE UNIVERSITY
240 FRENCH ADMINISTRATION #177460
ATTN: Sponsored Programs Services
PULLMAN, WA 99164-1025

4. Employer Identification No.	5. Recipient Account Number or Identifying No.	6. Final Report	7. Basis
91-6001108	12R-2949-0341/0342	☒ Yes ☐ No	☒ Cash ☐ Accrual

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year)	To: (Month, Day, Yr)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
October 01, 2004	December 31, 2007	October 01, 2004 *	December 31, 2007 *

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	$ 0.00	$ 2,559,655.84	$ 2,559,655.84
b. Recipient share of outlays	0.00	593,800.03	593,800.03
c. Federal share of outlays	$ 0.00	$ 1,965,855.81	$ 1,965,855.81
d. Total unliquidated obligations			0.00
e. Recipient share of unliquidated obligations			0.00
f. Federal share of unliquidated obligations			0.00
g. Total Federal share (Sum of lines c and f)			$ 1,965,855.81
h. Total Federal funds authorized for this funding period			2,074,852.00
i. Unobligated balance of Federal funds (Line h minus line g)			$ 108,996.19

11. Indirect Expense — a. Type of Rate (Place "x" in appropriate box): ☐ Provisional ☒ Predetermined ☐ Final ☐ Fixed

	b. Rate	c. Base	d. Total Amount	e. Federal Share
For the Period:	26% MTDC	$ 1,633,663.97	$ 424,752.63	
	26% MTDC	$ 306,597.05	$ 79,715.23	
Cumulative:	46.8% MTDC	$ 23,156.35	$ 10,837.17	$ 435,589.80
	46.8% MTDC	$ 20,677.56	$ 9,677.09	

12. Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.

NOTE: Letter of Credit 42A5P Withdrawals received from DHHS Payment Mgt Sys $ 1,966,718.24 As of 05/08/08

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
Kim Small, Sponsored Prog. Acctg. Mgr.	(509) 335-2047
Signature of Authorized Certifying Official	Date Report Submitted

Previous Editions not Usable

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Prescribed by OMB Circulars A-102 and A-110

CHIA LAGOON WATERSHED MANAGEMENT PROJECT

FINAL REPORT: OCTOBER 2004 TO DECEMBER 2007

Volume II: ANNEXES

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May 2008

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Annex 1: **Paprika Production and Marketing in Malawi: A 2005 Industry Study**

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I. INTRODUCTION

A. Paprika Description

The brilliant red powder we know as paprika comes from the dried pods (fruit) of the plant species Capsicum annuum L., which also includes tobacco, tomatoes and potatoes. As such, it is part of a clan that ranges from the sweet Bell peppers we eat as a vegetable to the very hottest of chillies. The name paprika is Hungarian, but it is also known as pimento (Spanish), ground red pepper, piment moulu and spaniche pfeffer. It must be noted that when talking about paprika one normally refers to the ground product (powder). The whole pods are referred to as "peppers".

Since several varieties of Capsicum annuum L. are used to produce paprika, pods in one growing area may differ in shape and appearance from those of another. Some have a round shape; others are elongated. In general, they are medium to small, as peppers go, and quite fleshy. They grow on small, bushy plants, which are members of Solanaceae family (including tomatoes, potatoes, and morning glory). When ripe, they are picked and either spread out to dry naturally.

B. Areas of Paprika cultivation

Paprika is cultivated worldwide virtually on every continent, from its origin in Mexico and the southwestern states of the U.S.A., to Chile and Peru in South America, from Morocco in North Africa, down to South Africa, Zambia, Mozambique, Malawi and Zimbabwe in southern Africa.

The world demand for paprika is estimated at between 50,000 and 60,000 metric tons per annum, of which Spain is the biggest importer of raw material (15,000 to 20,000 metric tons), and the biggest exporter of the final products (paprika powder and extracted oil). Apart of its exports, Spain also consumes approximately 10,000 metric tons of paprika per annum.

II. PURPOSE OF STUDY

In line with the Chia Watershed Management Project mission of improving rural livelihoods, our purpose has been to investigate the general paprika market and production in Malawi in order to ultimately assess the possibilities that smallholders within Chia Lagoon face in regards to paprika production. The studies main focus was to conduct a thorough examination of the paprika supply and demand, working to identify both strong points and problem areas that the market and producers face in relation to paprika production.

III. METHODOLOGY

The information required to conduct such an assessment included both an in depth market analysis, as well as a production analysis in order to fully understand the future potential of paprika as a smallholder cash crop. Within the market analysis, identification of current market players and operations was carried out, as well as an understanding of pricing and price setting influences. These two components allowed for a strong market analysis that enabled the identification of the market strong points, as well as the potential problems that all paprika participants need be aware of.

Beyond the market analysis, a production analysis was also conducted in order to fully comprehend the possibilities that farmers face in terms of paprika benefits. The production analysis strived to identify what players were involved or supported the production of paprika, as well as relied heavily on the survey results to gain farmers' perspective on production costs. Upon acquiring the necessary market and production information a SWOT analysis was conducted in order to best illustrate all factors that paprika participants need further understanding. In addition to the general SWOT analysis, the study also worked to develop options for action that outline potential steps to improve both the production, as well as market

side, of paprika within Malawi. This option for action is most beneficial to Total Landcare in the sense that it is more explicit in its recommendation strategy, providing Total Landcare, or any other paprika participant with specific points that may help to generate future improvements within the Malawi paprika market.

IV. AREA OF STUDY

Paprika is grown in almost all the three regions of Malawi. Basically, the study was conducted in different villages of Nkhota-kota, Lilongwe, Ntchisi and Dowa districts. The interviewees were farmers from twenty different villages in order to obtain a ramdom sample that would represent the majority of paprika growers.

V. MARKET ANALYSIS

5.1.1. Paprika Market Participants

i. Cheetah

The paprika market in Malawi is an extremely unique market scenario in the sense that the niche product of paprika purchases is very much dominated by one main buyer, Cheetah, a Dutch based company that exports a processed form of paprika to South Africa and Spain for use in food colorant. Upon our investigation of the paprika market it became quite evident that there were mixed feelings regarding Cheetah and their bottleneck domination on the paprika market. With a 95% market share, Cheetah has a strong hold in Malawi and as a result has a strong incentive to support extension services that promote and encourage quality production to existing, as well as potential, farmers. The obvious disadvantage to the monopolistic hold of Cheetah is the possibility of price control, where on numerous occasions farmers commented on not being paid fairly for the grade of paprika they had produced. Cheetah's current paprika purchases are at about 600 ton/year, however Cheetah stresses their ability to purchase up to 3-4 million ton. The operations of Cheetah work to promote farmer alliances in order to create depot pick up spots that ideally give the farmers an economy of scale advantage and make the incurred transport costs worthwhile to Cheetah. Upon arrival in Lilongwe, full pod paprika is deseeded and packaged according to end consumer demands.

ii. Other Paprika Buyers

Apart from Cheetah the Paprika Association of Malawi (PAMA) recognizes three additional paprika purchases, all of whom have only recently emerged on the paprika market. Capsicum, Lurene General Dealers, and JB General Dealer have all begun to purchase Malawian paprika, and although farmers take a positive outlook to new competition, Cheetah seems to continually express concern with a lose of investment in terms of farmer training, inputs and organization. In addition to the buyers officially recognized by PAMA, this year PAMA reported that independent buyers from Zambia have been coming to the Lilongwe area in order to buy paprika. According to PAMA, Zambian buyers also offer farmers a bonus of MK20 per kg on the price paid by Cheetah.

iii. Paprika Association of Malawi (PAMA)

PAMA is a farmer owned organization, created in 1998 as a result of a promotional push from the Malawi Export Promotion Council and the need of paprika organization in an increasing world demand market. PAMA's primary duties are to support farmers via training and research extension with focuses on:

Technique training

Identification of markets

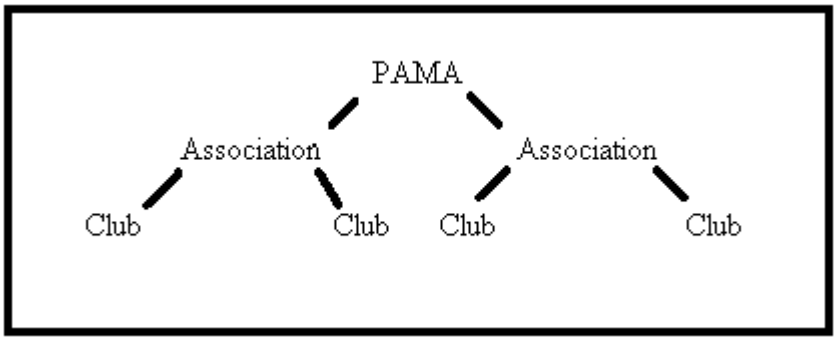
Communication links and Associations Organization

University relations with a focus on research of improved varieties, yields, quality

In addition PAMA also plays a large role in setting the annual price for paprika, where every March representatives of paprika buyers, governmental officials, related NGOs and farmers gather to set appropriate paprika prices for full pod and deseeded A,B,C,D grade paprika. In essence PAMA acts as a roundtable mediator for this price setting session, however there is a tendency for PAMA to represent farmers voices in regards to international paprika price knowledge. Along with certifying paprika buyers and mediating paprika prices, PAMA is also involved in the organization of farmers associations, providing training and market support in an attempt to make farmers less dependant on the services of Cheetah. Furthermore, PAMA is in charge of collecting valuable production and market data.

PAMA Stats 2005

PAMA Membership	*****
Number of PAMA Recognized Associations	*****
Number of PAMA Recognized Clubs	*****



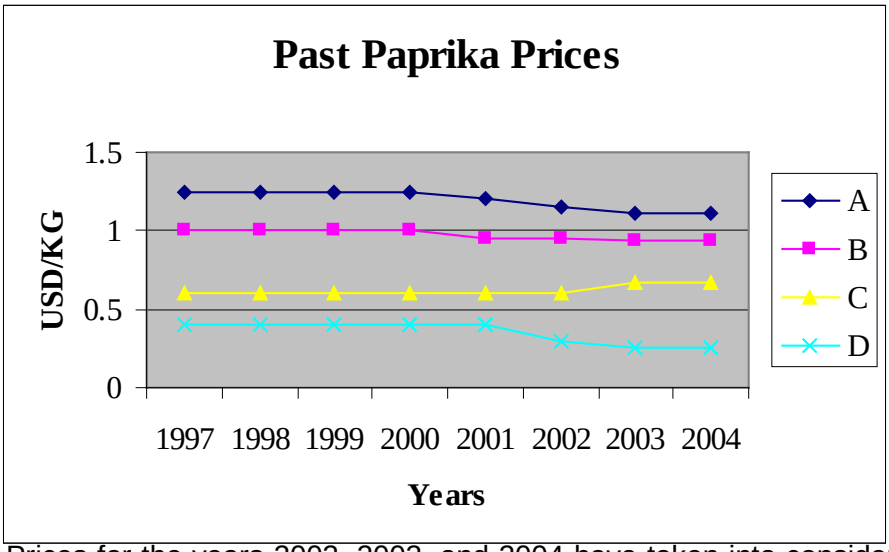
5.1.2. Pricing

Paprika prices in Malawi are set on a yearly basis under a roundtable committee of paprika purchasers, farmers, governmental officials and various other interested parties. Historically, paprika prices have been quite stable in comparison to other cash crops, such as tobacco and cotton which prices came down significantly the last year.

Pricing History (USD/kg)

Grade	1997	1998	1999	2000	2001	2002	2003	2004
A	1.25	1.25	1.25	1.25	1.2	1.15	1.11	1.11
B	1	1	1	1	0.95	0.95	0.94	0.94
C	0.6	0.6	0.6	0.6	0.6	0.6	0.67	0.67
D	0.4	0.4	0.4	0.4	0.4	0.3	0.25	0.25

Provided by PAMA



Prices for the years 2002, 2003, and 2004 have taken into consideration transportation, setting two different prices for warehouse delivery and depot pickup. Unfortunately for 2005, tensions between buyers and PAMA handicapped the pricing progress and as a result forced the roundtable to adjourn with only one warehouse set price for the year. Currently, Cheetah being the main buyer is incurring the transport cost, which is a factor that favors farmers and encourages paprika production, but it is unlikely to continue in future years. Although, prices for paprika have been fairly stable, in 2003 and 2004, a decline in prices associated with the scarce in water precipitations caused a fairly big decline in production.

2005 Prices for Paprika

Grade	Full pod	Deseeded
A	115	140
B	95	115
C	55	65
D	20	25
Seed	20	20

Provided by PAMA

According to Cheetah de-seeded is a style of paprika whose seed and seed list have been removed by hand, versus full pod where the farmer removes the stem but leaves the seed. In terms of grade Cheetah has provided the following criteria:

GRADE A: dark red/dark purple free of sand with no spots.

GRADE B: dark red to purple with no disease patches or fungal growth.

GRADE C: red with 25% disease spots.

GRADE D: light red with disease spots.

Unfortunately when grade questions were posed to farmers' answers did not provide a clear sign either way that farmers understood or knew how to correctly grade their paprika. This ambiguity is an obvious threat to the farmer in the sense that without the knowledge to define paprika grades they are unable to effectively argue for the correct paprika price.

Retail prices are determined by supply and demand in international markets. In the United States and Europe Malawian paprika competes with Spanish and Hungarian paprika. The most common forms of paprika in the market are power and dried peppers, both used as natural colorants in the food industry and for individual use in the kitchen. Paprika is also sold in different amounts according to the needs of the final consumer. Research for paprika retail prices was done from electronic sources as follow:

Prices for Paprika as of 5/18/2005

1£=1.2680 dollars

	Price/Amount	**Price/Gm**	**Price/ Oz**	**Type**
Www.agroterra.com	$2.5 kg	$0.00	$0.04	dried peppers
	$1.75 kg	$0.00	$0.05	dried peppers
Www.seasonedpioneers.co.uk	£1.15 – 35gr	£0.032	£0.92	powder
	ORGANIC: £2.25	£0.064	£1.80	powder
Www.cgi.ebay.com	$3.5 – 50g	$0.07	$1.96	powder
Www.chefshop.com	$3.19 – 70g	$0.05	$1.28	powder
Www.balkanbuy.com	$6.99 – 453g	$0.02	$0.43	dried peppers
Www.scandinavianspice.com	$34.25 - 5lb	$0.02	$0.44	powder
Www.amazon.com	$12.95 - 7.5 oz	$0.06	$1.72	power
Www.bulkfoods.com	$37.17 - 5 pounds	$0.02	$0.47	powder
	$24.72 - 5 pounds	$0.02	$0.31	powder
Www.penzeys.com	$6.49 – 8 oz	$0.03	$0.81	dried peppers
	$5.99 – 8 oz	$0.03	$0.74	dried peppers
Www.sfherb.com	$4.20 – 1 lb	$0.01	$0.27	dried peppers
	$4.40 – 1 lb	$0.02	$0.28	dried peppers
Www.purespice.com	$3.75 – 2 oz	$0.06	$1.87	powder

5.1.3. Market Problems

Throughout the course of the study it has become quite apparent that the paprika market in Malawi is on the verge of a change, despite the ability to foresee the direction of this change it is necessary to identify the problems that hamper the paprika market from reaching its fullest potential. The primary problem that continues to plague the paprika market is the monopolistic hold that Cheetah has over the market. Like in any other monopolistic situation, the lack of

competition in the paprika market has given Cheetah a stronghold in Malawi as well as Cheetah's ability to control the prices and grading. During the surveying process several farmers indicated unfair pricing and grading as some of the factors why they abandoned paprika production in years previous to 2002. The effects of Cheetah controlling much of the market, united with the farmer lack of knowledge of grading create reluctance among paprika growers to increase production and even engaging in business with Cheetah. It was observed during the study that several farmers remain skeptical watching the paprika market and waiting for the results before they decide to produce paprika.

Another problem related to Cheetah monopolizing the market has direct relation with its attempts to limit the access to the paprika market. As Cheetah realizes other buyers are entering the market, it has tried to keep them away by arguing that new buyers are purchasing paprika that belongs to Cheetah. In the interviews with Lurene General Dealers and JB General Dealer, both expressed that in several occasions Cheetah called them by phone to persuade them of not buying paprika in this area. Cheetah based its arguments on the fact that the new buyers are not providing any extension, yet harvesting the paprika Cheetah has invested in through extension services.

The Malawian paprika quality in general is a similar concern, which may or not be related to Cheetah exercising its power and under grading paprika. According to PAMA in the late 90's four paprika buyers were present on the Malawian market, however with a change of world prices in 2000 and 2001 three of the buyers could not be persuaded to stay in the Malawian market without the assurance of high grade paprika. In addition to the possibility that Cheetah could be under grading paprika, the study also found that the more than the fifty percent (nine teen farmers out of thirty five interviewed) of the farmers do not practice irrigation (nine farmers have both, irrigated and rain fed paprika). Despite the efforts of Total LandCare to implement irrigation as a way to improve quality within the Chia Lagoon Watershed, most of the farmers still rely on rains.

Another problem that contributes to the inefficiency of the market has to do with the lack of capital some of the new buyers face. As told by JB General Dealer, access to financial resources such as banks loans has limited its capacity to efficiently compete with Cheetah. Even though, JB General Dealers has managed to distribute some seed in small scales in order to secure some paprika next season, it still not enough to compete with Cheetah since transport cost are high and financial entities would not loan money for this type of activities.

The cobweb effect is another possible problem that is starting to appear this year with the high demand for paprika. At the beginning of the year new independent buyers from Zambia came to Lilongwe area looking for paprika. Due to the low yields this year and the majority of the farmers producing paprika for Cheetah, these buyers offered a MK20/kg premium on Cheetah's prices. This situation favors farmers directly, but the real issue might originate when other buyers knowing of the premium price might offer even a lower price giving the Zambian buyers a larger profit margin and lowering the farmer's revenues. Farmers are not aware of the potential problem in the long run and may tend to sell to these buyers instead of maintaining an organized selling network with their existing clubs and buyers. Moreover, PAMA complains that the production data is lost when farmers sell to independent buyers like these from Zambia since they just come and go and do not keep proper track of the amounts sold and bought. This issue affects PAMA capability of estimating production for certain areas and creates a loss of credibility when negotiating amounts of paprika already estimated with its registered buyers.

There is also a danger with a fallacy of an endless demand. Cheetah has stressed their ability to buy up to 3-4 million tons and also said that the world market for paprika is far from saturation. With extension services, more buyers are entering the market, and paprika exports

are increasing. These are signs of a strong market that is just beginning to develop. At the same time a significant number of the farmers interviewed answered that they are planning to increase land dedicated for paprika by fifty and in some cases up to one hundred percent. With such as high demand promising reasonable earnings and production factors pointing in the right direction is attractive enough for many marketers and farmers to start jumping into the paprika business. When it happens a possibly saturation of the market can occur faster than imagined lowering prices quickly and forcing farmers into big losses. Although, oversupply does not represent an immediate threat, a collapse in the market by other unpredictable factors should not be disregarded either.

5.1.4. Overall of the Market

Paprika in terms of the market appears to be more promising than other cash crops such as tobacco or cotton. Twenty four of the thirty five farmers interviewed stated higher income and profitability as the main reasons to produce paprika. Farmers are also starting to realize that better production practices combined with an organized marketing process are important aspects to achieve success in the paprika business. Several NGOs such as Total LandCare (TLC) and other organizations like PAMA also play an important role by facilitating knowledge and technical support to develop a sustainable production and paprika market.

Competition increase is also leading to a more equitable marketplace than the existing one with a near monopoly influencing prices. With the presence of still small competitors, traditional buyers like Cheetah is being pushed to improve services and prices for the farmers. Cheetah and other buyers trying to enter the market are put in a position where they have to start providing seed and other inputs if they want to secure paprika.

Another strong point of the paprika market is that unlike other agricultural goods produced in Malawi, paprika has the advantage of being an export product. Access to international markets in South Africa, the United States and Europe encourage a continuing production of paprika by providing a large market capable of taking up Malawi production.

5.2. PRODUCTION ANALYSIS

5.2.1 Paprika Production Participants

i. Farmers

For the scope the study, thirty five farmers were interviewed from the districts of Nkhotakota, Lilongwe and Dowa. Only three farmers were female. The median household size was seven people. They are in their majority smallholders whose total land cultivated in the various crops ranges between less than two acres (ten farmers), between two and five acres (six farmers) and more than five acres (nine farmers). Of the thirty five interviewees only three were independent farmers and the rest of them expressed affiliation to a club or farmer organization. PAMA is very often identified as the strongest organization that consolidates the presence of small clubs and represents farmers' interests with buyers and government organisms. Some of the club benefits that farmers mentioned in the survey include access to credit, market and production information, extension services such as training, exchange of knowledge and mutual encouragement among others. The median number of members per club was eleven in a total of twenty clubs.

Production Practices

Of the total land cultivated by an average farmer, a median of .4 hectares or one acre is dedicated to paprika production. The median length they have been growing paprika is three, but very few of them have growing it in consecutive years. These farmers grew paprika in 1998, 1999, and 2000, but a series of disagreements on pricing and grading with Cheetah added to the lack of rains discouraged them from continuing paprika production. The majority of the farmers have just come back to produce paprika this year after switching to other cash crops such as tobacco, cotton and ground nuts in previous years. The reasons why they started to grow paprika again include that paprika seems to be more profitable than the alternative cash crops, lower labor requirements and the stable market for it. A few farmers gave no reasons to their return to paprika production other than they were given the seed.

Other reasons they gave for choosing paprika are related to extension services offered by TLC, Cheetah and PAMA. Of the thirty five farmers, nineteen farmers were reintroduced to paprika by a local extension agent (LEA), ten by Cheetah and five by fellow farmers. Despite paprika is gaining popularity there is still skepticism among the farmer community in general due to the bad experiences in the market sector.

Production Findings

Activity	**Median**	**Unit**
Land Preparation	35	Hours
Planting	12	Hours
Weeding	34	Hours
Fertilizing	8	Hours
Pesticide Application	3	Hours
Irrigation	18	Hours

In the production analysis it was found that hired labor in paprika production is very close to zero. In the family structure the man does most of the work but he is also helped by the woman and in often cases children not younger than fourteen years old tend to help with the tasks of irrigation if it is the case. Therefore, hired labor hours and costs did not represent a significant part in the production of paprika:

Six farmers hired labor for land preparation.
Four farmers hired labor for planting.
Two farmers hired labor for weeding.
One farmer hired labor for fertilizing.
None farmer hired labor for pesticide application.
One farmer hired labor for irrigation.

Irrigation is a critical factor of paprika production, but surprisingly throughout the study it was discovered that out of the thirty five farmers interviewed, nineteen farmers still depend on the rains, only six farmers produce under full irrigation and nine farmers use a combination of both rain fed and irrigated paprika. The most common form of irrigation was done with watering cans (eleven farmers), only three farmers are using treadle pumps. Of those farmers who had access to a treadle pump, two cases were found where the farmers were not able to irrigate the

entire paprika area because the hoses were not long enough to cover it, therefore they were depending on the rains.

Under the assumptions that:

- Those farmers currently irrigating also irrigated in the years of 2004 and also assuming that those who are not currently irrigating did not irrigated in 2004,
- The sample size was fourteen divided into two sets of seven farmers each: one set being rain fed (RF) paprika and the other set being irrigated paprika under watering cans (WC) system. Sample size was also small due to the heterogeneity of the whole group,
- Those farmers who did not answer one or more of the four questions because they did not remember, were given the median and average of the entire group of thirty five farmers and they are highlighted in blue,
- The sample was picked with the condition that these farmers have produced paprika during 2004, it was discovered:

MODE	'04 Tot Yield (Kg/1 Acre)	'04 Profit MK	MODE	'04 Tot Yield (Kg/1 Acre)	'04 Profit MK
RF	50	N/A	WC	200 (223.35)	25000
RF	50	N/A	WC	50	2365
RF	200	7000	WC	250	11000
RF	215	11500 (10876.5)	WC	750	15800
RF	100	11500 (10876.5)	WC	160	8600
RF	300	11500 (10876.5)	WC	120	12300
RF	200	11500 (10876.5)	WC	350	14000
Median	**200**	**11500**	**Median**	**200**	**12300**
(Average)	**159.2**	**10101.2**	**(Average)**	**271.9**	**12723.5**

Notice that the assumptions affected mostly the RF '04 Profit MK' section where there was not much data available. The median for the entire group of thirty five farmers (11500) is quite high in relation to the only actual figure provided (7000) for that section. This effect brought the median yield up to be equal to that of the irrigated paprika (200) indicating that there is not a direct correlation between irrigation and yields. However the profits for irrigated paprika were still higher. As expected, the average calculation demonstrated a direct correlation between irrigation and yields. The averages for yields and for profits were higher for paprika under irrigation.

In regards to inputs needed for production, the study found amounts and costs as follow:

Input	Unit	Median Amount	Median Cost (MK)
Seed	Kg	0.5	420
Basal	Kg	50	2175
Top Dress	Kg	50	1900
Pesticide	Kg-ml	0.25	450
Herbicide	Kg	Not Data	336

Thirty farmers received seed from Cheetah, one from TLC, one from a fellow farmer and one farmer bought it locally. Those who received seed from Cheetah expressed that it is given to them in the form of a loan and that when they sell their paprika they have to pay Cheetah back the price of the seed. Farmers have been using treated seed and no cases of seed recycling were found. The seed distributed by Cheetah comes in packets of .25 kg (250 gm) and farmers generally use two packets per acre.

Basal application seemed to very consistent in the group. Twenty six of the farmers applied basal, only one case was found in which the farmer used manure. Six of the farmers who applied basal received it from Cheetah or PAMA, but also local markets like Farmer's World supplied it to a good number of the farmers. On the other hand, top dress application was less than fifty percent (Only 16 farmers). Farmers in their totality acquired the top dress at the local markets with the exception of only one case in which Cheetah provided it.

Pesticide application was very low. Only Seven farmers used small amounts of pesticide varying between 0.025 Kg to 4 Kg maximum and two farmers used liquid pesticides (10ml and 20ml). Herbicide application as well was almost zero. Two farmers applied herbicides (150gm and 500gm). Because of this reason the median for herbicide application becomes irrelevant and will be disregarded in further cost analysis. In six cases Cheetah was identified as the only supplier of pesticides and herbicides.

It seemed evident that the lack of pesticides application was responsible for the amount of disease cases found in paprika production. All of the farmers experienced at least one type of disease and several farmers experienced up to four diseases and pests. Seven different diseases and/or pests were identified including grass hoppers, termites, aphids,anthractnose, early blight leaves (chiwawu), boll worms (mbozi), red spider mites. Aphids, and early blight leaves were the most common. Twelve farmers sprayed pesticides such as karate, dithane, novaspring and copper. There was one case in which the farmer expressed to be using ashes to treat diseases and increase yields. The results of pesticide application were successful according to eight farmers and not very successful in five cases. For two farmers the pesticide was somewhat successful with one disease, but it did not make any difference for other diseases.

At the beginning of this research, it was believed that the majority of the farmers were producing de-seeded paprika because the price is higher. Surprisingly, nineteen farmers (more than 50% of the farmers) do not de-seed their paprika instead they sell it full pod. Farmers realized that the price paid for de-seeding paprika does not compensate for the amount of work they have to put into the de-seeding activities and the weight lost in the seed. Besides, in interviews with Cheetah they said that they prefer full pod paprika for the reasons that they can make de-

seeding process more efficient with machines they own. PAMA is also aware of this issue and it is encouraging farmers to sell their paprika full pod and persuading them to focus on other aspects such as quality improvement to add value to paprika.

In terms of value adding process, TLC, PAMA and Cheetah agree that the best option is increasing yields of better grades. This year, Cheetah estimates a total yield per acre of 300kg and anticipates that 35% will be grade A, 45% grade B, and the remaining 20% will be grade C. No amounts of grade D are expected as in the past only very small amounts of this grade have been produced. A sensitivity analysis was conducted and found that small increases in the A grade production made a significant change in the terms of profits and break even prices (See tables below).

In terms of transportation of paprika, the study found improvements in this area. In the past, meaning three years ago, the farmer had to travel by bike distances of up to 20 or more kilometers to bring his paprika to Cheetah's main warehouse in Lilongwe. Currently, Cheetah has established smaller depots in strategic locations to collect paprika form the bigger production areas. The most common mode of transport is still bikes but the distance farmers travel now is no more than three kilometers. Farmers said that since transport distance is much shorter now, they are willing to increase paprika production. Only five farmers still have to come to Lilongwe to sell their paprika for the reason that they are independent growers and are not affiliated to any club or organization. Farmers that have to travel long distances are the most likely to end up selling their paprika to vendors (middlemen) or at a local markets at lower prices than those paid by Cheetah. This year, Cheetah was unable to reach an agreement on prices with the farmers, and therefore they are incurring all of the transport costs. This situation will not continue after an agreement is reached between the production and market sectors and warehouse delivery and depot pick up prices will be set.

Production Problems

Throughout the interviewing process it was evident from the beginning that the lack of irrigation is a major problem. Paprika requires proper irrigation in order to develop good grades and yields. Tables below show that farmers with irrigated paprika attained more profits than those who did not irrigate. Still more than 50% of the farmers are currently producing rain fed paprika. However, some farmers stated that irrigation itself is not the main problem, but is the lack of resources what creates a whole vicious circle for paprika production. Many farmers cannot even afford a watering can (MK500 or ~USD 3.80) and without irrigation, grades are lower so are profits as well. Being able to cover just the production costs farmers are left with low or none profits to buy irrigation the equipment. In this sense, lack of irrigation is just a result of poverty.

Along the same lines, lack of inputs is among the most frequently mentioned problems during the surveying process. Twenty-three farmers answered that access to inputs especially pesticides is a major barrier in paprika production. The research determined that high rates of diseases and pests in paprika were a direct effect of the low use of pesticides. Again, farmers answered that the lack of funds is the main obstacle to obtain pesticides.

In addition to not using the proper inputs during production, farmers showed to be concerned with the way they are treating diseases because they lack the knowledge in this area. Those few farmers who did some sort of pest control said they were not sure about the way they were applying chemicals or even if they were the appropriate ones for the different kinds of diseases. There were found some cases where the farmers were using the wrong pesticides to control root rot (a disease that attacks the roots of the plant). The lack of information about pests and diseases was more evident when farmers were not even able to name the pest, therefore they

did not do anything to treat it. Farmers in general concluded that they need more training in pests and diseases management.

It is also clear that pest and disease control is not the only area of paprika production farmers lack knowledge in. Only six farmers answered "yes" when asked if the knew how to produce paprika. Through the study was found that there is a need for increasing training in the production area itself to achieve a complete understanding of best production techniques. At the same time, it is also true that farmers need education in how to be more proactive in seeking such production training and effective use of extension services currently available.

Other aspects of production such as grading process and scales were also identified as problematic areas. Only ten farmers said they know how to grade paprika. The rest of them did not answer, hesitated to answer or simply answered "no". The fact that they cannot clearly classify their paprika according to fair grading systems creates other inconveniences in the market sector. This problem affects farmer's capability to argue in his defense in the event that a buyer wants to take advantage of his lack of grading knowledge. As mentioned before, misunderstandings on grading between producers and buyers also discouraged production in the past.

Overall of Production

Despite the problems paprika growers are facing, production trends show a future increase. The majority of the farmers expressed they have experienced more profits in comparison with other cash crops, therefore they are planning to dedicate more land to paprika. The major problems as stated before are access to resources for inputs and training in different areas of production. Fortunately, NGOs like TLC and even buyers are providing farmers with extension services farmers did not receive in the past. Although, paprika quality is below its full potential, farmers seem to understand the need for improvement in the production techniques in order to produce better paprika. Farmers also showed interest in keep participating in organized production clubs. This is an important factor to unable farmers to share knowledge and encourage one another to overcome their production barriers.

Production Cost Analysis

1. ***Table Facts***

- Based on rain fed paprika. Irrigation cost was disregarded since more than 50% of farmers are still under the rain fed system.
- Hired labor was disregarded since it was not common in paprika production.
- Assuming 4 hours of work in a full day (MK24/hr*4=MK96/day). Price adjusted from Cheetah's cost analysis pamphlet.

Current Cost:

PAPRIKA (rain fed)- 2005

Based on 0.4 ha figures

	Unit	Amount	MK/unit	Total MK
REVENUE				
Grade A	Kg	60	140	8,400
Grade B	Kg	76	115	8,740
Grade C	Kg	34	65	2,210
Median Yield & Weighted Avg Price)		170	113.75	
Total revenue				**19,350**
VARIABLE COSTS				
Material inputs				
Seed	.5kg	1.0	420	420
Basal fert.	50kg bag	1.0	2,175	2,175
Topdressing	50 kg bag	1.0	1,950	1,950
Pesticide	Kg	0.3	450	113
Total material inputs				**4,658**
Labor				
Land prep	Hours	35.0	24	830
Planting	Hours	12.0	24	284
Weeding	Hours	34.0	24	806
Fertilizing	Hours	8.0	24	190
Pesticide Application	Hours	3.0	24	71
Total Labor	Hours	**92**		**2,180**
Total Variable Costs				**6,838**
Gross Margin per ha				**12,512**
Break-even yield @ current wtd avg price (MK)		60.11		
Break-even price @ current yield (kg/ha)		40.22		
Total labor required (hours & MK)		92	2,180	
Gross Margin Return to Labor (MK/D)		160		
Gross Margin if yield or price drops by		10%		10,577
Gross Margin if yield or price drops by		30%		6,707

- Percentages of grades expected for 2005: A grade 35%,B grade 45%, C grade 20%. Provided by Cheetah based on historical facts.
- Based on de-seed prices for 2005.

PAPRIKA (rain fed)- 2005

Based on 0.4 ha figures	Unit	Amount	MK/unit	Total MK
REVENUE				
Grade A	Kg	60	140	8,400
Grade B	Kg	76	115	8,740
Grade C	Kg	34	65	2210
Total yield/revenue		**170**	**114**	**19,350**
VARIABLE COSTS				
Material inputs				
Seed	.5kg	1.0	420	420
Basal fert.	50kg bag	1.0	2,175	2,175
Top dressing	50kg bag	1.0	1,950	1,950
Pesticide	Kg	0.3	450	113
Total material inputs				**4,658**
Labor				
Nursery labor	*Hours*	*40*	24	960
Land prep	Hours	35	24	830
Planting	Hours	12	24	284
Weeding	Hours	34	24	806
Fertilizing	Hours	8	24	190
Pesticide Application	Hours	3	24	71
Harvesting	*Hours*	*40*	24	960
Drying and grading	*Hours*	*40*	24	960
Pack & transport to collection point	*Hours*	*12*	24	288
Total Labor	Hours	**224**		**5,348**
Total Variable Costs				**10,006**
Gross Margin per ha				**9,344**
Break-even yield @ current wtd avg price (MK)		87.96		
Break-even price @ current yield (kg/ha)		58.86		
Total labor required (hours & MK)		92		2,180
Gross Margin Return to Labor (MK/D)		125		
Gross Margin if yield or price drops by	10%		7,409	
Gross Margin if yield or price drops by	30%		3,539	

- Based on de-seed prices for 2005.
- Percentages of grades expected for 2005: A grade 35%,B grade 45%, C grade 20%. Provided by Cheetah based on historical facts.
- Estimations of days for omitted activities were provided by Cheetah and hours per day were estimated through the study as:
- Costs omitted are highlighted in blue: **Nursery labor:**4 hrs/day and 10 days in total. **Harvesting:** 2hrs/day and 20 days in total. **Drying and grading:** 2 hrs/day and 20 days in total. **Pack and transport to collection point:** 4hrs/day and 3 days in total.

Sensitivity Analysis

PAPRIKA (rain fed)- 2005

Based on .4 hect figures

	Unit	Amount	MK/unit	Total MK
REVENUE				
Grade A	Kg	135	115	15,525
Grade B	Kg	105	95	9,975
Grade C	Kg	60	55	3,300
Median Yield and Price weighted Avg Price		300	96.00	
Total revenue				**28,800**
VARIABLE COSTS				
Material inputs				
Seed	.5kg	1.0	420	420
Basal fert.	50kg bag	1.0	2,175	2,175
Topdressing	50 kg bag	1.0	1,950	1,950
Pesticide	Kg	0.3	1,175	294
Total material inputs				**4,839**
Labor				
Land prep	Hours	35	24	830
Planting	Hours	12	24	284
Weeding	Hours	34	24	806
Fertilizing	Hours	8	24	190
Pesticide Application	Hours	6	24	142
Total Labor	Hours	**95**		**2,252**
Total Variable Costs				**7,090**
Gross Margin per ha				**21,710**
Break-even yield @ current wtd avg price (MK)		73.86		
Break-even price @ current yield (kg/ha)		23.63		
Total labor required (hours & MK)		95		2,252
Gross Margin Return to Labor (MK/D)		252		
Gross Margin if yield or price drops by		10%		18,830
Gross Margin if yield or price drops by		30%		13,070

- Figures changed are highlighted in blue.
- Based on full pod prices for 2005 due to preference.
- Percentages of grades under sensitivity analysis: Grade A 45%, grade B 35%, grade C 20%. Percentages for each grade expected under pesticide application due to the reduction of diseases and pests.
- Yield per acre for 2005 estimated by Cheetah.
- Median for pesticide price and amount calculated through the study.
- Pesticide application hours were doubled.

2. Table Analysis

For the production cost analysis in general, break even yields and break even prices were figures the study relied on greatly to determine profitability. All of the figures for the current cost table were found through the study. From this table it is observed that there is a fairly low break even yield in comparison with the current yield (calculated from 2002, 2003 and 2004 yields. Profits in terms of yields equaled to a 110 kg. In the same proportion low break even price reached a difference of MK 73.53 with the price currently being paid for the different paprika grades. In regards to material inputs pesticide was considerably low which reduced the costs in general. The gross margin per hectare was high, almost doubled the total variable cost. In conclusion high profits may confirm one of the most important reasons why more farmers are willing to increase production.

The table for cost omitted presents a cost analysis by taking into consideration costs that were disregarded for various reasons. Sufficient data for irrigation cost was not found during the interviewing process since close to 60% of the farmers still produce rain fed paprika. The production process itself represented an obstacle for data collection. Unlike other crops like maize, harvesting in paprika production is done over an extended period of time. Farmers do not collect the entire crop at once but they do it as the peppers ripen and dry to the proper point. In this sense keeping track accurately of the time during harvesting is difficult for farmers. Insufficient data for harvesting was again the reason to omit this cost. Drying and grading activities were found irrelevant for cost analysis. Farmers themselves consider them insignificant since all farmers do after paprika is harvested is lay the peppers on a mat in the sun and they said it only takes minimum amounts of time. Labor for this activity was particularly difficult to estimate. Similarly, Packing and transport to collection point were irrelevant to the study. The only packing materials farmers use are sacks which are reuse many times. Transport is done as farmers pack and accumulate sacks. Later on these sacks are taken to the depot that is located within 1 to 3 kilometers to the majority of the farms. Moreover, Cheetah is currently incurring all of the transport cost once paprika is at the pick up point.

It seemed that the entire process from harvesting up to packing and transport is treated as a production chain done in many intervals for which farmers do not keep track of accurately and therefore they were unable to provide reliable information. In general farmers expressed that paprika has lower labor requirements, nevertheless it does not mean the costs omitted do not exist, instead with the information available it became difficult to precisely estimate these costs.

Labor increased significantly by 132 as the hours for the omitted costs were added. As expected, break even yield and break even price also increased by 26.89kg and MK18.64 respectively. Gross margin per hectare came down by MK3168 in comparison with the gross margin estimated without the costs disregarded. Still paprika production showed to be a profitable crop.

Due to the fact that many farmers complained about pests and diseases affecting paprika production, the sensitivity analysis was based on pesticide application. Given that those farmers who applied pesticides said they were successful in controlling pests, better and higher yields may be expected with pesticide application. The study assumed that paprika yields for A, B, and C will vary to 45%, 35%, and 20% respectively. Yields in gereral will also increase to 300kg per acre. This figure is in fact the amount of paprika Cheetah has anticipated per acre for this year. Since full pod paprika is becoming more popular than de-seeded paprika the prices given are those established for 2005 full pod paprika. The results of the sensitivity analysis were satisfactory in the sense that profits were much higher than those obtained for the current cost analysis. An extra profit of MK9198 could be generated by controlling pests and diseases opportunely with the proper pesticides. Break even yields and break even price were

particularly low considering that only ~one fourth of the amount expected will be used to cover the costs. In the same proportion, less than one fourth of the price paid out per kilogram will be taken by the production costs. In theory, applying pesticides may represent a great opportunity for farmers to improve production and therefore financial benefits.

For the sake of comparison of a cost analysis done by Cheetah is included in this report.

SWOT Analysis

Strengths

- Farmers willing to participate in production if market assured.
- Good conditions for expanding paprika production through organized market and production.
- Paprika production profitable and suitable to small farmers.

Weaknesses

- Near monopoly buyer.
- Limited access to credit limits competition, inputs and production knowledge.
- Quality lower than potential.
- High dependance on international markets.

Opportunities

- Access to buyers and extension services offered by several entities.
- Emergence of buyer competition.
- Increasing world demand for natural goods.
- Paprika is an export product.

Threats

- Market players unable to agree on prices can discourage production.
- Possible oversupply decrease in world prices. Fallacy of endless demand.
- Change in consumptions trends due to unforseen forces.

Annex 2: **Cabbage Production and Marketing in Malawi – An Industry Analysis 2005**

Prepared By

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July – August 2005

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ACKNOWLEDGEMENTS

Conducting a research project in this unfamiliar country of Malawi has been both an exciting and demanding experience for us. Our task of carrying out this project, from creating the questionnaires to writing up a report, seemed overwhelming at first. However, with the kind support from everyone who shared our six weeks together at the Total LandCare office, we are able to present this report in the hope of contributing to TLC's future activities.

Firstly, we send our sincere thanks to Dr. W. Trent Bunderson and Mr. Zwide Jere for their encouragement to us all through the project and for providing us with technical assistance and ideas.

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Everything we have experienced and learned through our stay in Malawi will have a great influence on our future. All the smiles and handshakes we exchanged will remain as part of our invaluable memories. *Zikomo kwambiri* for giving us the great time we had in the warm heart of Africa.

INTRODUCTION

Problem Statement

Malawi is an agriculture-based country. The industry contributes 40% of the gross domestic product, and 88% of the total export earnings[7]. About 90% of its population lives in the rural area and majority of the people engages in farming[8]. Most of those engaged in agriculture are small-scale farmers, and they heavily rely on their production of crops. Since their living standards are directly affected by their agricultural production, it is inevitable to focus on the improvement of their farm productivity to achieve betterment of their lives. Rainfall in Malawi is concentrated during a few months of the year and most farming activity is concentrated during that time. Because of this tendency of heavily relying on rain fed agriculture, Malawian farmers faced problems of food insecurity from having unreliable rains. Therefore, to increase agricultural production, there is a need to embark on irrigation agriculture that makes production in the dry season possible for farmers.

Total LandCare (TLC) in Lilongwe is a non-governmental organization that has been working for improving the production and income levels of small-scale farmers in Malawi. One of TLC's primary focuses has been on promoting irrigation skills to these farmers, which enable them to produce crops in the dry season. In accordance with TLC's interests in improving income levels of farmers through irrigation, an analysis on a certain irrigated crop was needed in order to provide the organization with a clear picture of the profitability of the crop. Among variety of crops grown in Malawi, cabbage is one of the major crops grown under irrigation in the country, thus making it meaningful to conduct a project focusing on its profitability for average farmers.

Purpose

The purpose of this study is to identify small-scale farmers' production needs and demand side opportunities, so as to improve TLC recommendations regarding production and marketing and ultimately raise their living standards.

Interview Method

Producer questions were conducted with farmers who have grown cabbages for more than one year, both those who were cooperating with TLC and not. Also, to identify the current market for cabbages, marketing questions were asked of vendors who have been selling them for more than one year in the market or on the street. After testing the original surveys, several revisions were made. Main study was done in two project sites of TLC namely Buli and Mvera.

In the production survey, questions about irrigation system, environmental risks that can be caused by stream diversion, farm production, cost of inputs, labor, disease control, cabbages sales and information about farmer clubs were asked. In the marketing questionnaire to vendors, questions about supplier, retail prices and selling prices, seasonal changes in supply of cabbages and information about clubs were asked.

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[7] [2] CIA The World Factbook, Malawi at http://www.cia.gov/cia/publications/factbook/geos/mi.html

The total number of interviews made with farmers is 33 including six farmers who were not supported by TLC. Interviews were conducted in Nkhotakota, Dowa and Lilongwe districts with the help of technicians from TLC.

Meanwhile, 16 interviews were made with vendors. Of all the respondents, six of them were from Dowa district and the others were from open market, Area 3 market and Likuni market in Lilongwe district. The marketing questionnaire has smaller number of questions than producer questionnaire because the purpose of the marketing questions was just to investigate the actual conditions of the cabbage market. Emphasis was put more on collecting the information from producers.

CABBAGE MARKET ANALYSIS

Overview

Cabbage is one of the most popular crops under irrigation and it can be seen in every market. It is a source of income to many small holders. It is also used as feed for livestock. There are three participants in cabbage marketing: farmers who grow cabbage, middlemen who buy cabbage from farmers and sell them to vendors, and vendors who sell cabbage to final consumers. However, there are few middlemen since cabbage is produced everywhere in Malawi and it is easy for vendors to get cabbage directly from farmers. Only two vendors in Lilongwe answered they get their cabbage from middlemen.

Sixteen vendors from Dowa and Lilongwe districts answered the questions. Of all the respondents, only two were female. Six vendors answered that they only sell cabbage but the others were selling other crops, too. Most common crops sold with cabbage are tomato and onion. Few vendors answered they sell carrot, Irish potato, green pepper, garlic or watermelon with tomato and onion.

Buyers

The survey perceived three types of cabbage vendors. One is the vendors who sell cabbage on the roadside such as the vendors on the M14 which runs central Malawi between Lilongwe and Salima. The roadside vendors sold cabbages MK5 cheaper than markets in town because neighboring villages provided cabbage so that vendors did not have to worry about the transport cost. However, even though they sold fresh cabbages in reasonable prices, their markets are not reliable because they largely depend on passing cars to stop.

The second type of vendors is those in markets which open weekly or monthly at local trading centers such as Chezi market or Likuni market. In those markets, most of the vendors get their cabbage directly from farmers but they have to use vehicles to collect cabbage and transport them to markets. The final consumers in those markets are people who stop by cars, people on minibuses or local people around the market. Compared to the ones found at roadsides market, local markets seem to have more chances in getting consumers.

The third category of vendors is those in the major cities such as open market or Area 3 market in Lilongwe. Even in those markets, six vendors out of eight answered that they get their cabbages directly from farmers. Only three of them answered that they get their cabbage from the middlemen. The final consumers in town are mainly local people.

Clubs

Of all the places interviewed, only Chezi market had the vendors' club and one vendor in open market answered that she belonged to an informal club. The vendors' club in Chezi market had no name but the club members shared ideas on how to treat customers, and they cleaned up the market together. When asked whether they wanted to belong to clubs or not, most of the vendors who did not belong to one now answered yes (7/10), while three of them said no or not sure.

Alternative crops

To search for the best crop which can benefit all farmers, vendors were asked about whether there are any crops which they want to see an increase in supply. To this question, five of them answered tomatoes, four of them answered onions and rape, and Irish potatoes, green pepper, cucumbers, celery, parsley and spices received one answer each.

PRICING

To have an idea of the current cabbage market situation, questions were put on identifying prices in which cabbage was traded. Retail prices of cabbage and prices at farmer level were asked. Furthermore, information regarding the variability in terms of supply and prices were also asked.

Retail Prices

Retail prices of cabbage for the previous year and the current year were obtained. In 2004, vendors sold cabbage for around MK7 to MK40, and the median price for 16 vendors questioned revealed as MK18. For the current year (2005), however, the price of cabbage ranges from MK10 to MK50 and the median price indicated MK22. This slight rise in cabbage prices is probably attributable to the inflation occurring in Malawi recently.

Prices at Farmer Level

Observations show that majority of vendors obtains cabbage directly from farmers. Buying prices for vendors were identified as prices at which farmers sell their cabbage. When vendors buy cabbage from farmers, it is usually the case that farmers decide the price of cabbage. However, negotiations between vendors and farmers can take place for them to reach an agreeable price.

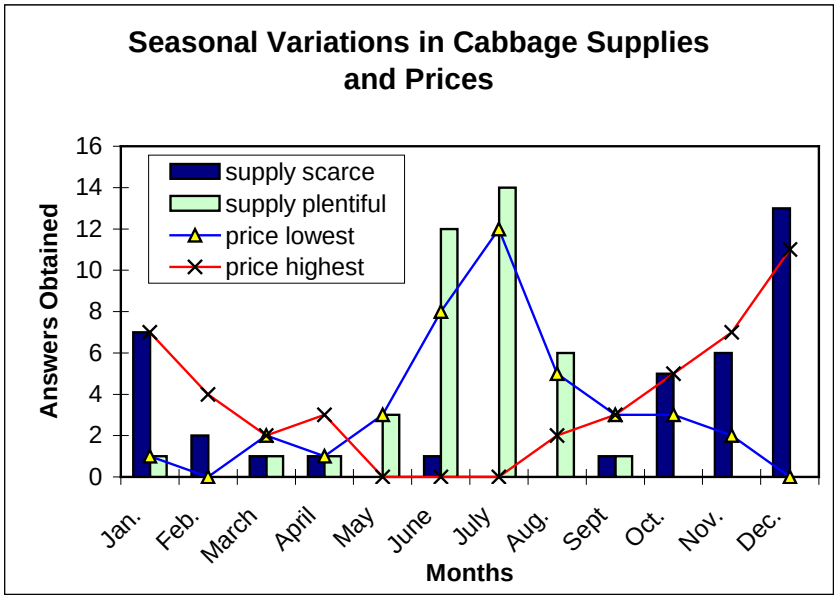
Vendors obtained their cabbage at prices between MK5 to MK30 in 2005, and the median price was identified as MK10.

Seasonal Changes in Cabbage Supplies/Prices

When asked whether vendors had any time of year when they have difficulties in finding the amount of cabbage they wanted, majority of them answered yes (15 out of 16). Most of the vendors explained that the supply of cabbage lowers in the rainy season especially from November to January, and December being the most difficult month to obtain cabbage. The study also shows that the supply of cabbage is most plentiful from June to August, and July being the month when supply reaches its peak.

As a result of these seasonal variations in supply of cabbage, prices at which cabbage is marketed are also affected. Through November to January, prices of cabbage indicate the highest in a year (retail: MK36, farmer level: MK20). June through August was identified as the period when cabbage was traded at its lowest prices (retail: MK17, farmer level: MK9).

Considering the nature of cabbage as a crop grown under irrigation, naturally its supply drops down during the rainy season, thus making the price rise. During the dry season when its production is most active, the price of cabbage decreases.



PROBLEMS

The major problem facing cabbage market is its occasional oversupply of the crop. From the study, most of the producers complained of low market demand as their biggest concerns. The study revealed that 94% of farmers shared the feeling of being unsuccessful in marketing their cabbage. In addition to this, low prices at the market give farmers low returns, which lead to unsuccessful production. Fortunately, however, demand in the market is not always at low level throughout the year. Vendors who sell cabbage commonly deal also with other crops that are grown under irrigation, such as tomato and onion. Therefore, generally the market has problems with low levels of supplies during the rainy season. Our interviews with vendors revealed that there is an increase in the general need of supplies of crops in the market during the rainy season.

STRONG POINTS

After visiting some markets and observing cabbage marketing, it was obvious that cabbage markets were very popular in Malawi, and there are already firm links between farmers and vendors. For both vendors and farmers, it is easy for each to find the other. Therefore, cabbage marketing is fairly well understood by them. Since there are so many vendors in the cabbage market, there is apparently good competition among buyers. In addition, usually those vendors come to farm and take cabbages to the markets places; it is easy and convenient for farmers especially because not many farmers have bicycles or any vehicle to carry cabbages.

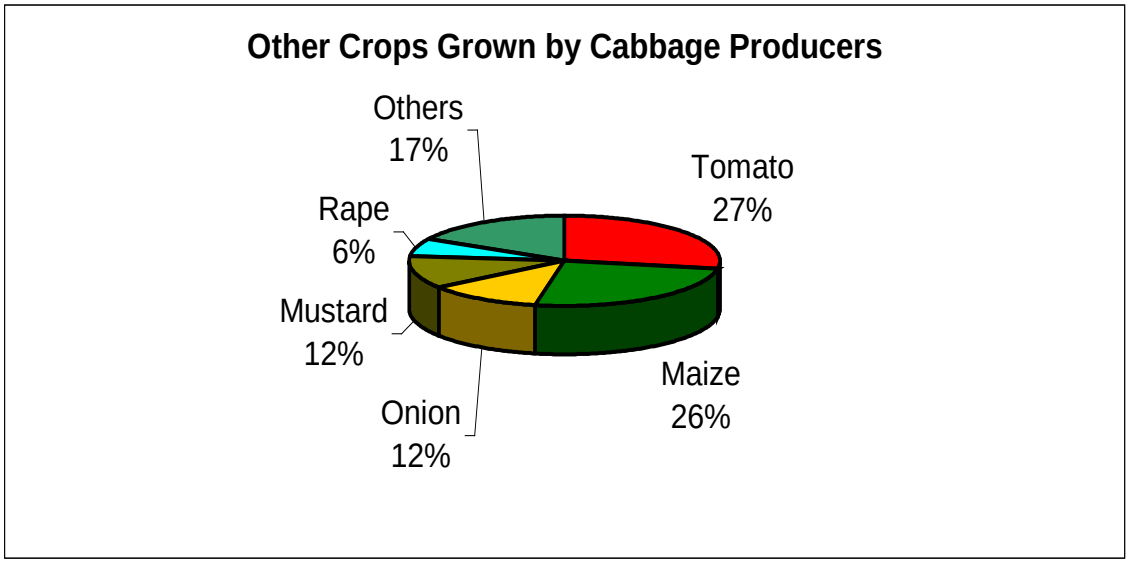
CABBAGE PRODUCTION ANALYSIS

OVERVIEW

The number of surveyed interviews was 33. Of all the respondents, only one was female. Most farmers interviewed were small holders and they rely their cash incomes on their sales of cash crops. The average size of household is six. Some of the farmers have been growing cabbage for about 25 years but the average length of time growing cabbage was three years.

PRODUCTION PRACTICES

Typical Land Size and Other Crops



Cabbage is usually grown in a relatively small area of *dimba*, or the land under irrigation. The average land size for cabbage growing is estimated as 298m^2 from responses given[9]. Within the area, farmers create 83 basins for the crop, and plant 12 cabbages for each basin. Fields are divided into small rectangular basins about 3m x 1.2m and farmers control irrigation by flooding basins one at a time. During the dry season, farmers usually grow cabbage twice. Aside from cabbage, farmers usually produce other crops as well, and those that are common include tomatoes, maize, onions, mustard and rape.

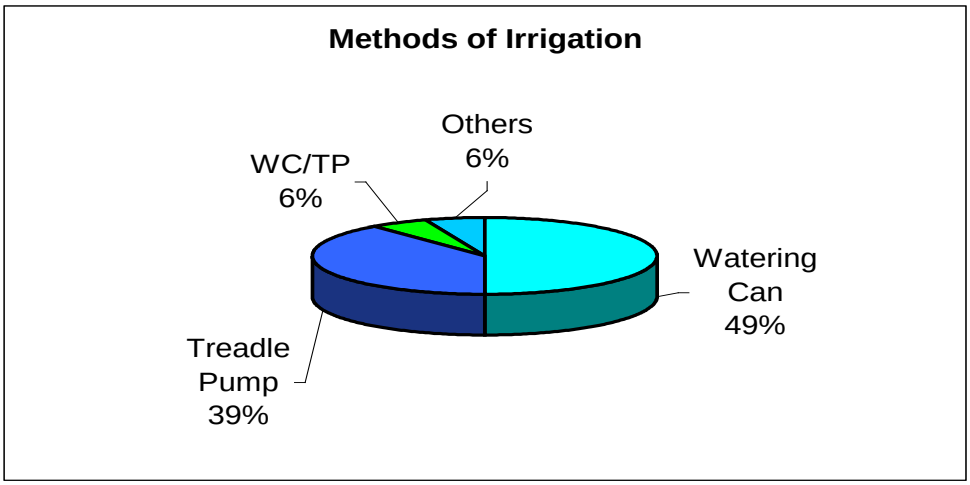
[9] **The Method Used in Estimating Land Size:**

1. First, the average amount of cabbage that a farmer produces in one crop was calculated from the survey results (1000 cabbage heads).
2. Then, the number of basins that a farmer uses for growing cabbage was estimated from dividing the amount of production by the average number of plants that is grown in one basin (12 plants). [1000/12=83.33]
3. Using the standard size for a cabbage basin (3mx1.2m), which is recommended by TLC, the typical size of a cabbage field was obtained. [83x3.6=298.8]

*(figures here were calculated from the collected data using the median)

Irrigation

Since cabbage is an irrigated crop, information on irrigation practices was collected through interviewing farmers.

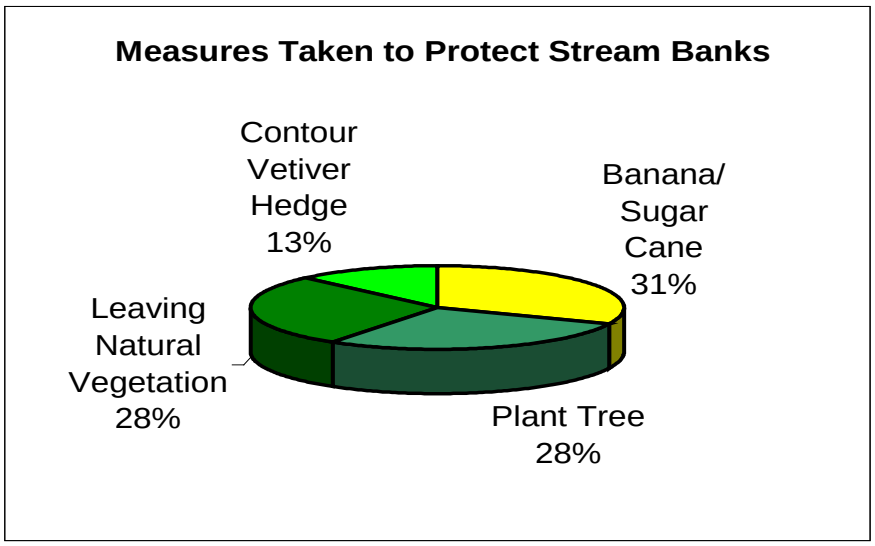


The two most common practices of irrigation are by using watering cans and treadle pumps. Out of the respondents, 18 farmers answered as they used watering cans, while 12 said they used treadle pumps, and two people answered they used both. Other means of irrigation used by farmers were motorized pumps, stream diversion and drip irrigation; however, these types of methods were still less common among producers. Those who used treadle pumps have been commonly using the system for three years. Of those who did not use treadle pumps last year, three people answered they have one now.

Usually, sources of water for irrigation are nearby streams and rivers. Irrigation sites are mostly placed five meters from the edge of the watercourse. Use of shallow wells can also be common, though they are occasionally practiced together with streams and rivers.

To understand how well the farmers were informed about environmental issues concerning their water sources, questions were asked about them. To the question asking whether farmers were aware of downstream problems caused by diverting water from streams, 43% of them said they were aware. All given answers expressed that these practices can cause environmental problems such as decreased water for irrigation use in the downstream area. However, only six farmers responded to have had actual problems concerning this issue.

Among the respondents, 90% of them answered as being aware of environmental risks of cultivating too close to stream banks. Erosion of banks and flooding were the risks most widely known among these farmers. As interviews revealed farmers' high awareness concerning environmental aspects of irrigation, collected information shows that some farmers are taking certain measures to protect their stream banks. In fact, 77% of farmers explained that they are acting to protect their environment.



Major measures taken by farmers are shown above in the chart. It is common for farmers to take more than one measure, and they combine different methods, such as using both contour vetiver hedges and banana trees/sugar canes. When taking these measures, farmers often create three rows of planted vegetation, or make them eight meters wide.

From the interview, 52% of the respondents said that there were certain kinds of agreements or bylaws concerning their environment surrounding water sources, which they had to follow. These rules were set by actors like village headman (eight answers), TLC (five answers), extension agents (five answers) and chairman of club (two answers). Such agreements make farmers leave some distance from stream when cultivating land, or plant vegetation to keep good condition of the environment.

From interviewing farmers' irrigating methods, farmers' interest in having treadle pumps for their land was identified. Using watering cans for irrigation is labor demanding, and some farmers expressed their wishes to obtain treadle pumps in order to ease the hard work.

Cost of Inputs

NURSERY (per crop)	**quantity used**	**cost (MK)**
Seed	20 g	250
(Basal Fertilizer) **23:21:0**	1kg	60
(Top Dressing) ***CAN***	0.25kg	13
(Pesticide) **Dimethoate**	50ml	60
(Pesticide) **Cypermethylene**	9ml	9
	Total Cost:	MK392

The table above shows the quantity and cost that farmers used on their inputs for each nursery management during the dry season. From interviewing 33 farmers, different types of inputs were identified, and they all used different quantity for cabbage nursery. Therefore, most common types of fertilizers and pesticides were drawn from the collected data, and amount of quantity was calculated from taking out the median for each input. Costs were estimated from standard prices for each input sold at Lilongwe district: seed (10g = MK125), 23:21:0 (50kg = MK3,010), CAN (50kg = MK2,590), Dimethoate (1L = MK1,200), Cypermethylene (0.5L = MK500).

FIELD (298m^2) (per crop)	**quantity used**	**cost (MK)**
Seed	XXXXXX	XXXXXX
(Basal Fertilizer) **23:21:0**	33.5kg	2,017
(Top Dressing) **CAN**	25kg	1,295
(Pesticide) **Dimethoate**	875ml	1,050
(Pesticide) **Cypermethylene**	250ml	250
	Total Cost:	MK4,612

Similarly, quantity and cost of inputs for an average size of cabbage field (298m^2) after transplanting were calculated, using the same method for estimating inputs on nursery management. The table above shows the information. From these two tables on inputs for nursery and actual field, the total cost for the expenditure is estimated as MK 5,004 for an average cabbage producer per crop. This cost for inputs is a burden to many farmers. Twenty-seven out of 29 respondents answered as they had difficulties buying these necessities, and almost all of these were caused by their lack of finances.

In fact, the survey results indicate that farmers are grossly over applying fertilizer at least. Currently, farmers are applying 33.5kg of 23:21:0 and 25kg of CAN for a field of 298m^2. However, in the *Field Manual for Treadle Pump Irrigation*, the recommended rate of basal fertilizer is shown as 267kg/ha, and 80kg/ha for CAN. Therefore, farmers should be using just 8kg of basal fertilizer and 2.4kg of CAN. Farmers are understandably complaining about their lack of finances in obtaining these inputs, for they seem to be spending much more on them than necessary. If they used the recommended amount of fertilizers, farmers would be spending just MK481 on 23:21:0 and MK124 on CAN for their fields, which make their cost on inputs for the field MK1,905. Although information regarding the right amount of pesticides was not obtained, it might be possible that farmers are also over applying the chemicals for their cabbage fields.

Through the interviews, interesting answers were given from farmers about types of fertilizers and pesticides they used. There were two farmers who responded that they were using manure for fertilizing their lands, and three farmers said they used traditional pesticides called *jere-jere*[10] instead of chemicals. These organic substances may cost them less than applying chemical fertilizers and pesticides, and are more environmentally friendly.

[10] *Sesbania sesban* and *Tephrosia vogelii* are the two possible types of trees that are referred as *jere-jere* by farmers.

Diseases/Pests

Diseases and pests problems are concerns for cabbage growers. Seventy-six percent of farmers answered that they had some kind of problems with these; however, by applying pesticides, farmers were able to reduce the effects caused by such problems. Among the respondents, 71% of them said that only less than half of the crops are affected by pests and diseases. Common types of pests are aphid, grasshopper, boll worm and caterpillar, which altogether consist 77% of the problems caused by pests. Diseases that were frequently mentioned were root gall and leaf blight. Especially in areas around Mvera in Dowa district, root galls seemed to have severe effect on cabbage production. To treat diseases and pests, farmers commonly apply chemicals as mentioned earlier.

Labor

To understand how much labor was used for cabbage production, farmers were asked about labor they used last year both in nursery and field. The tasks were divided into land preparation, planting, weeding, fertilizing, pesticide application and irrigation. The table below shows how many hours it took for farmers who grow cabbage to complete each task. Sample sizes for this section is 14 in total, eight farmers for watering can and six farmers for treadle pump. The field size is estimated as 298m^2 and all the numbers here including the field size are based on median of the answers.

Labor Hours for Cabbage Production under Irrigation (Watering Can and Treadle Pump)

Tasks	Labor hours under WC	Labor hours under TP
Land preparation	1.5	0.3
Planting	0.7	1
Weeding	1.5	1
Fertilizing	0.5	0.1
Pesticide application	0.2	0.1
Watering	12	4.5
Total Labor (nursery)	**16**	**7**
Transplanting	10	4
Land preparation	60	24
Weeding	10	10
Fertilizing	2	7
Pesticide application	4	2
Irrigating	279	46
Harvesting	4	4
Transporting	1	1
Total Labor (field)	**370**	**98**
Total Labor (nursery + field)	**386**	**105**

It is evident that watering is the hardest part in cabbage production especially for the farmer who does not have treadle pump or other irrigation method than watering can. For the farmer who uses a treadle pump, it takes 46 hours to irrigate the field and for the farmer who uses a watering can, the task takes 279 hours, or 6 times longer. In addition, land preparation of the field is another hard task. This is because most of the farmers have to re-cultivate their *dimba* land at the beginning of the dry season after leaving them unused during the rainy season. Pesticide application is the shortest task because spraying pesticide with sprayer does not take much time. On the other hand, some farmers were saying that they cannot apply pesticide as much as they need because they do not have enough pesticide, which can be another reason for the short hours for applying pesticide.

Labor hours for harvesting cabbage were difficult to figure out because the best time of harvesting varies from plant to plant depending on conditions. Moreover, there was no farmer who used a treadle pump who gave the information about the labor hours for harvesting. Therefore, the table uses the same number for farmers who use treadle pumps and watering cans regarding the hours on harvesting. Usually, it takes about one month or one month and a half to harvest all the cabbage; however, it only takes about ten minutes for farmers to harvest cabbage each time. Farmers do not necessarily harvest their crops everyday, for they have to wait for their cabbage to be matured. Furthermore, farmers also have to find people who would buy their cabbage before harvesting them.

About transport hours, the number on the table is based on the median distance to the market (3km) and the main mode of transport (bicycle). When people carry cabbages on the rear rack of the bicycle, they put their cabbages in a big plastic bag (about 1.3m x 0.5m x 0.5 m) full to the brim, and tie it with a string or a wire. On the assumption that it takes half an hour for farmers to bike from their fields to markets, it might take an hour in total including packing and binding.

The use of hired labor was very rare in cabbage production. Of all the 33 farmers, four people answered that they used hired labor for last season. Two farmers hired people for preparing their fields and they paid MK12/hour/person. The other two farmers hired people for transplanting and they paid MK225 for the task. One farmer also hired people for harvesting and he paid MK1 for harvesting one cabbage, MK500 in total. Interestingly, two farmers answered that they didn't harvest themselves but vendors harvested for them.

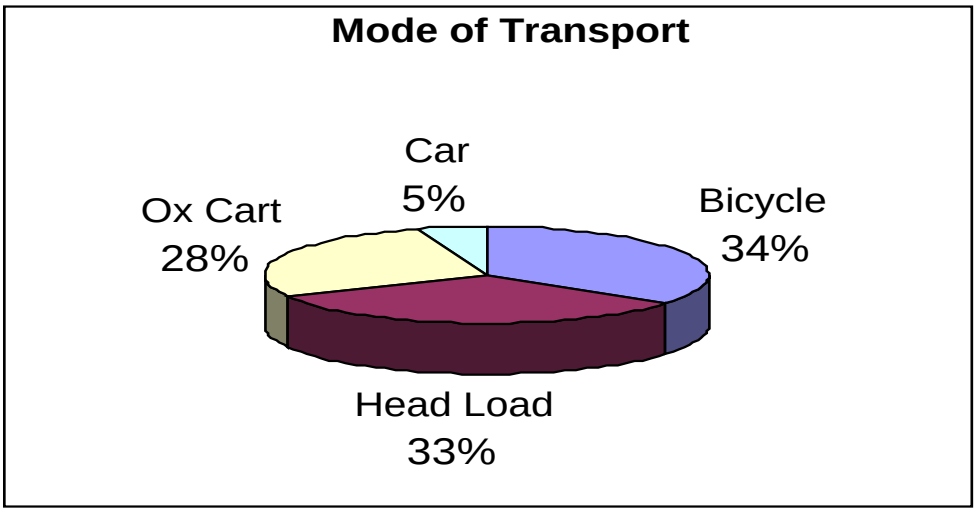
Child labor was also rare in cabbage production. In this section, children are classified as those under 14-year-old. Five people said that they worked with their children last season in preparing land, transplanting, weeding, fertilizing and irrigating. The most common task for children was weeding. Only one farmer answered that he irrigated his land with his children and it became 540 hours in total. Except for that case, however, farmers tend to make their children help their work in easier parts of tasks.

Selling and Transporting

In this section, the questions concerned cabbage marketing aside from prices. Farmers were asked about types of their buyers, the location they sold their cabbages and the distance, mode and cost of transport that took them for selling cabbage.

Of the total numbers of the respondents, 62% of the farmers answered that they sold their cabbage to consumers by themselves. The others sold their cabbages to vendors. The difference between these two groups was identified in the quantity they sold. The median amount of cabbage which was sold to vendors was 1,521 heads while that of cabbage which

was sold to the final consumers was 784 heads. This number shows that there are more chances for farmers to sell cabbage when they sell cabbage to vendors. Moreover, since half of the farmers who sell cabbage by themselves go to the nearest markets to look for consumers, they have to carry cabbage all the way to those market places. The chart below shows the mode of transport that farmers used to get to the market place.



Sixty-seven percent of them used bicycle, ox car or car to carry cabbage but the rest of them would have to carry cabbage on head load, which is another tough labor for farmers. The median distance to market is 3km while same distance for those who walk to market is 2km, suggesting that the farmers who walk have more limited market opportunities because they cannot afford to buy or borrow bicycles. On the other hand, most farmers who use vehicles to carry cabbage have to pay for a rental fee, and it costs MK400 for a round-trip in median.

The table below indicates the gross margin of cabbage production per crop for two types of farmers, one is the farmer who has a treadle pump and the other is the farmer who uses a watering can. Estimated land size for cabbage is 298m^2. In this report, one crop is defined as one harvest, for example, if a farmer grows cabbage twice in a dry season, it means the farmer has two crops in that season. All the numbers here are medians calculated from the collected data.

Gross Margins (Cabbage under Watering Can and Treadle Pump, based on 298m^2)

			Under Watering Can		Under Treadle Pump	
REVENUE	Unit	MK/unit	Amount	Total MK	Amount	Total MK
Total yield (heads) revenue (MK)		**8**	**1,000**	**8,000**	**1,000**	**8,000**
VARIABLE COSTS – NURSERY						
Seed	10g	125	2	250	125	250
Fertilizer A (23:21:0)	50kg	3,010	0.02	60	3,010	60
Fertilizer B (CAN)	50kg	2,590	0.005	13	2,590	13
Pesticide A (Dimethoate)	1L	1,200	0.05	60	1,200	60
Pesticide B (Cypermethylene)	0.5L	500	0.018	9	500	9
Total material inputs (nursery)				**392**		**392**
Land preparation	Hours	7	1.5	11	0.3	2
Planting	Hours	7	0.7	5	1	7
Weeding	Hours	7	1.5	11	1	7
Fertilizing	Hours	7	0.5	4	0.1	1
Pesticide application	Hours	7	0.2	1	0.1	1
Watering	Hours	7	12	84	4.5	32
Total Labor (nursery)	Hours		**16**	**116**	**7**	**49**
Total Variable Costs (nursery)				**508**		**441**
VARIABLE COSTS – FIELD						
Fertilizer A (23:21:0)	50kg	3,010	0.67	2,017	0.67	2,017
Fertilizer B (CAN)	50kg	2,590	0.5	1,295	0.5	1,295
Pesticide A (Dimethoate)	1L	1,200	0.875	1,050	0.875	1,050
Pesticide B (Cypermethylene)	0.5L	500	0.5	250	0.5	250
Total material inputs (field)				**4,612**		**4,612**
Transplanting	Hours	9	10	90	4	360
Land preparation	Hours	9	60	540	24	216
Weeding	Hours	9	10	90	10	90
Fertilizing	Hours	9	2	18	7	63
Pesticide application	Hours	9	4	36	2	18
Irrigating	Hours	9	279	2,511	46	414
Harvesting	Hours	9	4	36	4	36
Transporting	Hours	9	1	9	1	9
Total Labor (field)	Hours		370	**3,330**	98	**882**
Treadle pump costs						
Depreciation	10 years			-	968	97
Maintenance (20% capital cost)	20%			-		194
Total treadle pump costs	Hours			**-**	46	**290**
Total Variable Costs (field)				**7,942**		**5,784**
Total Variable Costs (nursery + field)				**8,450**		**6,225**
Gross Margin per 298m^2				**(450)**		**1,775**
Break-even yield @ current wtd price (MK)				1,056.23		778.16
Break-even price @ current yield (kg/298m^2)				8.45		6.23
Total labor required (hours & MK)			386	3,446	105	931
Gross Margin Return to Labor (MK/D)				7.75		25.77
Gross Margin if yield or price drops by 10%				(1,250)		975
Gross Margin if yield or price drops by 30%				(2,850)		(625)

The amount of cabbage the median farmer sold last season was 1,000 heads and it earned revenue of MK8,000. After subtracting the total variable costs from the profit, MK1,775 remains for the farmer with a treadle pump. On the other hand, for the farmer with a watering can, the gross margin indicates negative profit of –MK450. However, gross margin here includes labor cost as an expense, which farmers do not actually pay in reality. Considering that point, the farmer with treadle pump receives **MK2,706** and the farmer using watering can earns **MK2,996** as their cash income. Even though the difference of gross margin is under 10%, the return to labor per hour is much less when using a watering can. Currently, it looks difficult for farmers to make money from producing cabbage. However, considering that most of the farmers grow cabbage twice up to three times in a dry season, the margin can be multiplied according to times they grow cabbage.

The profit earned from growing cabbage is relatively small compared to other cash crops. However, if the farmers used the recommended amounts of fertilizer, the gross margin would be MK2,257 for watering can and MK4,482 for treadle pump, so financing for purchasing inputs would be much easier.

CLUB MEMBERSHIP AND BENEFITS

Throughout the interviews, clubs which form farmer associations were identified as being beneficial to farmers. The survey revealed that 73% of 33 farmers questioned belonged to clubs that supported their farming activities. Normally such clubs are fairly small in terms of their membership, the median being 13 members per club. Clubs are basically formed of farmers from the same village; however, people from other villages are also involved in these clubs. It is estimated that three members in each club typically come from different villages.

Most frequent opinions heard from those who belonged to clubs were that they were satisfied with various services that clubs provided for their farming activities. 88% of those who are members of clubs enjoyed their benefits. Clubs functioned for farmers as places of sharing ideas and encouraging each other. Furthermore, farmers had better access to extension services and credit facilities. Those who did not belong to clubs were also interested in joining them if they had a chance. They were also aware of the benefits and supports they can have which are of advantage to their production.

SWOT ANALYSIS

The following table summarizes some of the findings of this report. Strengths and weaknesses are internal to the industry and largely under its control. Opportunities and threats are external to the industry. While out of its direct control, the industry – meaning farmers and vendors here – are able to manage their operations to take advantage of the opportunities and minimize the effect of the threats.

STRENGTHS	WEAKNESSES
• Popular among farmers and vendors. Production and marketing fairly well understood by farmers and vendors. • Demand steady and reliable (but see weakness regarding supply). • Generally good growing conditions. • Good quality production.	• Market oversupplied in some areas and some seasons (but see strength regarding demand.) • Insufficient profit for farmers who do not watch costs. • Farmers in need of training regarding fertilizing rates and disease and pest control. • Some farmers are short of cash for buying necessary inputs
OPPORTUNITIES	**THREATS**
• Increase in access to treadle pumps and other extension services make cabbage production more efficient. • Balancing production with other crops make farmers' living more sustainable.	• Not recognized as an export crop. • Industry demand growing slowly.

OPTIONS FOR ACTION

Further Training of Cabbage Production

The study found that average length of time that producers have spent for growing cabbage was three years. Among the 33 farmers, majority of them answered that the number of years they have been growing cabbage was five years or less, and only nine respondents said that their experience in growing cabbage amounted above five years. Regardless of the differences in their experience with cabbage production, however, farmers expressed their desire to have more training in production skills. Of those who answered, 81% said they needed more training in producing cabbage, and different areas needing improvement were identified.

As mentioned earlier in the report, farmers' responses suggest that they are now grossly over applying fertilizer. They are using four times as much basal fertilizer that is needed, and 10 times as much CAN that is recommended in the *Field Manual for Treadle Pump Irrigation.* There should be some actions made to improve this current situation.

Furthermore, responses from farmers show that training in pest and disease control are also needed, for treating these problems require careful management of pesticides. Another area that farmers needed further instruction is the nursery management of cabbage. Interestingly enough, farmers who already had good experience in growing cabbage were also eager to know any new technology of cabbage production when it is introduced. Therefore, it is important for TLC to inform farmers the skills and suitable management of cabbage in order to improve their production.

Time Production when Supply is Low/ Promote Alternative Crops in the Dry Season

As indicated earlier in the study, the market is currently oversupplied with cabbage during the dry season. Prices during that period are very low, which make farmers' profit from their

cabbage production small. There are two options that TLC can take to improve small-scale farmers' profitability.

One is recommending that farmers grow cabbage also during the rainy season if they have enough land and labor at that time. Interviews with the vendors revealed that prices of cabbage rise during the rainy season when its supplies are scarce in the market. Because cabbage is usually grown under irrigation, special treatments that protect it from pest infestation and diseases are required when it is grown rain fed. This additional care that is needed for production may cost more expenses for farmers. However, the possibility of promoting farmers to grow cabbage in the rainy season should not be disregarded, for supply in the market is low during the period.

Another possible action for TLC is to promote farmers to grow alternative crops during the dry season, which have better chance in the market than cabbage. It is important to search for crops that are more compatible with the market. Since it is unrealistic to hope for the demand in the market to improve for cabbage in the near future, earnings from producing cabbage will basically stay around at the current level. Therefore, in order to give farmers the chance to improve their incomes, there should be further investigations for the search of crops that have possibilities of attracting the market.

Exploit Treadle Pumps in Cabbage Production

The study showed the difference in terms of labor hours between farmers who used treadle pumps for irrigation and those who used watering cans. Total hours for irrigating the cabbage field using treadle pumps are estimated as 46 hours, which are significantly shorter than the 279 hours required for watering can irrigation. Although the additional costs for using treadle pumps affect farmers' gross margin slightly, considering the difference in amount of labor hours, it is evident that treadle pumps benefit farmers in their production of cabbage. Furthermore, treadle pumps can give a positive effect on the production of other crops that farmers grow, for treadle pumps enable them to irrigate wider area of their *dimba* land.

Promote Organic Fertilizers/Pesticides in Cabbage Production

It has been indicated that the cost of inputs is a major factor for cabbage growers. Total costs of inputs for nursery and the field were calculated as MK5,004, which amount to 62% of an average farmer's total revenue per crop, though admittedly the amount of fertilizer use reported is far above than what is recommended. Certain measures should be taken to reduce farmers' expenditures on inputs such as chemical fertilizers and pesticides. As introduced earlier in the study, farmers who used organic substances such as manure and *jere-jere* instead of chemicals were found through the interviews. Such use of organic substances may be more suitable for farmers, for they are obtained at much lower prices than chemicals. Furthermore, the use of organic substances does less harm to the environment.

Heighten the Awareness Concerning the Environment

The majority of the farmers are aware of environmental risks of cultivating too close to their water sources, and they have already been taking certain measures to protect their environment. This is a favorable result, and TLC should keep educating farmers with the appropriate knowledge concerning management of their environment. Contrary to this outcome, farmers' awareness about problems concerning diverting water from streams was low. It should be noted that in order to prevent any future conflicts concerning stream diversion, further

measures to educate these farmers should be taken. The training may consists of teaching farmers about the right amount of water they need for their fields, to prevent over usage of water from streams.

Strengthen the Services of Farmers Club

Through looking at clubs what the farmers have so far, it seems necessary for farmers to cooperate each other both in production and marketing. This is not limited to cabbage production and marketing but to improve conditions for the other cash crops, too. Clubs they have now seems to be working mainly as providing loans for buying treadle pumps but not much else. If they want to have more potential in growing cash crops or more power relative to the vendors who buy their crops, they need to be united and work as a farmer club or farmer organization rather than individually. It will save them time and labor to produce their crops and then make the marketing easier. For example, if farmers cooperate in marketing, they can bring their cabbages to one person who represents them and the represented person can trade with vendors as one. In that case, a vendor will be pleased to see a bigger producer because there is no need for vendor to go around the village to visit every farmer. At the same time, the farmers can save time they used for negotiating with vendors.

Annex 3: **Ecotourism[11] Management Plan, Chia Watershed Management Project**

Researched, Compiled And Produced By Vincent Achikulire Kaitano

March 2007, Lilongwe, Malawi

ABBREVIATIONS

CLW	-	Community Liaison Worker
CLWP	-	Chia Lagoon Watershed Project
CPA	-	Conservation Planning Area
DA	-	District Assembly
DNPW	-	Department of National Parks and Wildlife
EMP	-	Ecotourism Management Plan
PSE	-	Preliminary Site Evaluation
PEIA	-	Preliminary Environmental Impact Assessment
PA	-	Protected Areas
TMC	-	Tourism Management Capacity
TANAREMA	-	Takondwa Natural Resources Management Association
WESM	-	Wildlife and Environmental Society of Malawi

[11] Ecotourism generates funds for conservation, reduces threats to wildlife, and benefits communities.

A. EXECUTIVE SUMMARY

1. THE ASSIGNMENT

The task was to conduct a **Preliminary Site Evaluation** (PSE) of the proposed locations and communities for the implementation of ecotourism activities. To this end, a three pronged approach was followed:

1.1 Ecotourism and conservation finance: to develop and test strategies for using tourism as a source of funding for conservation;
1.2 Ecotourism and threat reduction: managing tourism for nature's benefits by measuring tourism impact in Protected Areas (PAs);
1.3 Community-Based Tourism: by engaging local communities so they benefit from conservation, economic development and education.

2. METHODOLOGY

The exercise involved the following activities:

2.1 Interviews and discussions with Ecotourism stakeholders including community organizations and individuals, private sector tourism industry, District Assembly (DA) officials and Chiefs;
2.2 Comprehensive evaluation of the area's natural and cultural resource base;
2.3 Determination of the stresses, their sources, and real threats to the area's natural and cultural integrity, as well as strategies to reduce these threats;
2.4 Define the area's long-term management objectives and zoning – scheme to identify where certain activities will take place.

3. OUTCOME: EMP

The expected outcome is this document that clearly spells out the details of what needs to be done in order to implement an Ecotourism – based public use program in Chia Lagoon and surrounding communities. We have defined the parameters within which all management and administrative actions must take place.

The EMP consists of two sections.

The background section or **Diagnostic** describes and analyses the status of the lagoon and the variables at play, which will affect the implementation of an Ecotourism program in the area.

The last section deals with the recommendations: describing in an organized, systematic manner how to implement the Ecotourism program in Chia Lagoon area. This is the **Strategic Plan**- examining Tourism Management Capacity (TMC), Business planning component and Preliminary Environmental Impact Assessment (PEIA) on the proposed Conservation Planning Area (CPA).

B. DIAGNOSTIC ANALYSIS

1. Project Management Appraisal

Wildlife and Environmental Society of Malawi (WESM) Dwangwa Branch was tasked as project managers to implement the project. WESM has been fully involved as the main actor. The following activities were conducted/carried out by WESM since 2005:

1.1 Stakeholders meeting to determine key players in Ecotourism facilitated by WESM and attended by DA officials, hospitality businesses, and community organizations representatives, Department of National Parks and Wildlife (DNPW), Fisheries, Total Land Care.

Key outcomes and critical success factors from this briefing:

- Boat construction
- Construction of hides
- Clearing of canal at Luwi river
- Bird and game watching
- Concern was raised on the role and commitment of established hospitality business in taking tourists to Ecotourism sites.

1.2 Identification and briefing of Tour Guides in conjunction with DNPW.

1.3 Identification and establishment of working groups in communities around the PA. These included Makuzi, Ntanga two and Chopela one as core villages for Ecotourism. The following were instituted:

- Sensitization rallies;
- Formation of Ecotourism clubs;
- Orientation tours to other established Ecotourism/tourism sites in Salima and Liwonde.

1.4 Communities with assistance from WESM initiated the following:

- Cultural community hall (Makuzi);
- Cultural performances;
- Bird and game watching Hide (Makuzi).

Appraisal

1. It is clear from listening to WESM that they feel Ecotourism has been relegated to the sidelines in the overall CLWP. Factors to support this argument:

- Lack of adequate financial resources flowing down to the communities to implement their activities;
- Lack of cooperation, support and appreciation for the work, effort and time that WESM has injected into the project;
- No tourist has this far visited any of the Ecotourism villages/sites;
- No training in any field has been given to the communities.

2. However, it must be pointed out that the capacity of WESM in terms of human and other resources must be questioned. It is evident that:

- There has been lack of continuity and consistency at leadership level;
- Organizational capacity to handle a project of such complexity involving a matrix of variables and parameters is clearly not there.

2. Community-Based Tourism

Ecotourism can be seen as one way by which communities can resume and strengthen their traditional stewardship role in the Chia lagoon. It was recognized earlier on in the project's life cycle of the critical role rural communities will play in conserving biodiversity and hence their incorporation in Ecotourism is good for business and conservation.

2.1 Makuzi Eco-tourism group – an appraisal

Community Views

1. Community Concerns

Amongst major concerns, the most outstanding one has been *"WESM leadership has lacked capacity and direction to take us forward."*

- Things have not been moving forward since last year as no one goes into the community to evaluate progress and give encouragement;
- They were given a vision of something without any training and capacity building;
- They are just like a wagon being pulled along without any participation in decision making;
- Need to see fruits from their efforts;
- Their ideas and views were never implemented.

2. Activities

- Cultural performances;
- Handicrafts and handiwork.

3. Income generating activities – planned

- Cultural performances;
- Handicrafts;
- Tour guiding;
- Traditional foods;
- Amarula production;
- Guinea fowl rearing;
- Paper recycling.

4. Training Needs

- How to receive visitors;
- Group dynamics;
- Business management;
- Marketing of their products;
- Financial accounting and management;
- Tour guiding.

5. Financial Requirements

- Chalets construction;
- Boat construction;
- Community hall – proper structure;
- Restaurant;
- Dishes, pots, plates, cups;
- Uniforms;
- Engine Boat;
- Mats and mattresses;
- Paraffin Lamps;
- Pit latrine and bathrooms;
- Port and beach construction on the lagoon.

Appraisal of current structures

1. Community Hall

The community constructed this in February 2006 with WESM providing the necessary resources and guidance. Its main function is to act as a reception for visitors and showcase cultural dances. This was a temporary structure with expectations to construct a permanent one.

It is recommended that this structure be demolished as it is sub-standard, was poorly designed and not conducive to giving international tourists comfort.

2. Hide – watching bay at lagoon:

- Needs proper, professional thatching;
- Proper ladder with handles;
- Roof must be raised up;
- Walls should be wooden;
- Proper viewing bay with arm rests.

C. Comments

Although the community is committed to the project, high expectations at the beginning have led to frustrations and disappointment with WESM leadership. Moreover, reports of corruption, favoritism and divisions within the group are of concern to its future operations.

2.2 Ntanga One Eco-tourism Club – Assessment

A. Community Views

1. Community Concerns

- The project has not benefited them at all;
- No training provided in different activities;
- There have been no cultural exchange and skills transfer;
- The problem is with WESM office;
- Lack of materials and funding for activities.

2. Activities

- Still practicing dancing of cultural performances;
- Clay pots making can advance if markets are available;
- Construction of boat and community hall has not happened although bricks were molded.

3. Training Needs

- Group dynamics;
- Tour guiding;
- Business management;
- Financial management.

4. Financial Requirements

- Materials;
- Training;
- Shop for handicrafts.

B. Comments

There is a strong commitment on the part of the communities to see the project take off completely. However, several major bottlenecks are evident:

- Lack of initial training in various disciplines pertaining to the project;
- WESM's inability, lack of vision and capacity to implement the various activities and follow-up to professional standards;
- Community is frustrated by lack of progress.

2.3 Luwi Ecotourism Club

A. Community Views

1. Concerns

- Don't know where WESM office is;
- Infrequent visits by WESM to follow-up;
- Lack of group dynamics.

2. Current status

- Prepared area for viewing hippo, Crocodiles and birds;
- Poles ready for hide construction;
- Have a canoe for hire to cruise up and down Luwi river and lagoon;
- Selected 30 hectares as Forest Reserve where small game such as Insa, Kudu, Mbawala, Mchezi, wild Guinea Fowl and a 15-meter long python reside. The reserve lies in between Chia Lagoon and Nkhotakota game reserve, which the community has set aside as a PA. The game present here were the ones which could not be zoned into the main game reserve;
- Have prepared PA for tourists;
- Along Luwi river is abundant hippo, crocodiles and birds.

3. Income generation activities

- Fee paying for tourists;
- Hides;
- Crafts work;
- Handicrafts;
- Cultural performances.

4. Financial Requirements

- Fencing of PA;
- Engine boat;
- Hide construction;
- Equipment to clear/maintain PA, trail clearing (slashers, wheel barrow, timber, hoes);
- Security house for PA;
- Torch;
- Gum boots.

5. Training Needs

- Organizational management;
- Wildlife management;
- Tourist management;
- Tour guiding;
- Financial and business management.

B. Comments

This area offers the most exciting and dynamic opportunities to develop an integrated Ecotourism project. Several factors are in its favour:

1. The community has established a PA that lies in between Chia lagoon and Nkhotakota game reserve. This area is rich in small game that was not zoned into the main reserve;
2. Abundant hippo, crocodile and bird life along Luwi river;
3. The almost 15 Meter long python that is ancient and comes out daily to drink water along Mpambazi river offers unique tourist attraction;
4. The community has a clear insight and vision of what they want and is totally committed to seeing the PA under proper protection, conservation and management and encourages animal breeding and selected hunting.

3. Conservation Planning Area (CPA) – Biodiversity Analysis

A Baseline survey conducted by WESM, discussions with Fisheries, Department of Environment and DNPW revealed the following:

3.1 Mammals

Hippo, Katundu, Mbawe, Khasi, Mtchezi, Kudu, Mbawala, Insa, Elands, Water buck.

3.2 Reptiles

Crocodiles, Snakes (pythons, etc), monitor lizards

3.3 Birds

Duck families, Gees, Darter, Fish Eagle, King Fisher, Giant King Fisher, Mkutuwindi, Kakowa, Khongwe, Mantchetekwe, Ngalu, Mphipi, Mphilipita, Mpheta, Akante, Mphilipidzi, Mkhulukudzu, Khongwe, Mshankhono, and Kamachokolo.

3.4 Fish

- Chambo species: Oreohromis (squamipinnis, lidole, karongae, saka)
- Ningwitchale – Tilapia rendalli
- Makumba/Nkhutuku – Oreochromis Shiranus
- Samwamowa – mormyrus longistris
- Utaka – copadichromis Chrysonotus
- Kambuzi – Halochromis similis
- Kampango – Bagrus meridionalis
- Usipa – Engraulicypris Sardella
- Ntcheni, Batala – Rhampho caromis lonhiceps
- Mpasa – Opsaridium microlepsis
- Sanjika – Opsaridium macrocephalus
- Mlamba – Clarias gariepinus
- Sapuwa – Bathydarias longibarbis
- Nkholokolo – Synodontis nyassae
- Mphuta – murmyrus SPP
- Ningwi – labeo cylindricus

3.5 Vegetation

Palm trees, grass, water lilies, Ndengandenga, Bingisi, Mayingwe, Kabu, Gumbusa, Tihale, Mkoka – bwato, Namasupuni, Zerejere, Tshabe, and Mbingwe.

C. RECOMMENDATIONS AND STRATEGIC PLAN

1. Project Management

WESM has proved unable, lacked vision and inadequate human and resource capacity to implement the various activities to professional standards. As such, the following are recommended:

- WESM must continue to be a partner at the level of community liaison and monitoring. As such current community workers [CLW] should become project managers in their areas of jurisdiction.
- Communities should be empowered to implement their activities with the guidance of CLW.
- An overall Coordinator, independent, to enforce, monitor and evaluate the implementation of the proposed activities and plans as outlined in this EMP for the specific period of time. The Coordinator or overall project Manager must act as a link between the clubs/ communities, on the one hand, and sponsors, hospitality business operators and tourists, on the other.

2. Community – Based Tourism and Capacity Building

2.1 The usual problems associated with village level, community – based empowerment can be manifested, viz.;

- The creation of high expectations in the communities which have not been fulfilled;
- Lack of business acumen amongst communities to properly manage the Ecotourism as a profit making enterprise;
- High illiteracy levels;
- The reality that village committees cannot work coherently as a unit where issues of money, power and influence are concerned.

All the above factors need careful examination and the following recommendations are to be considered:

- Makuzi and Ntanga must be phased out as Ecotourism villages and be incorporated into fishing/mushroom farming or other enterprises within the broader CLWP.
- Focus on Luwi Ecotourism club in Chopela one as a core area for Ecotourism development.
- The following capacity building training exercises should be conducted in all communities:

- group dynamics and organizational management;
- business management;
- marketing skills;
- financial accounting and management;
- tour guiding;
- wildlife management.

3. Zoning – Scheme: Identified Locations Where Certain Activities Will Take Place

Luwi club in Chopela one village to be the major Ecotourism operator in the area. The following locations and activities have been identified as of great tourist attraction but also conservation of wildlife and environment:

3.1 Fencing of the 30 hectares of PA to safeguard animal safety and breeding. In this area the following activities will take place:

- Hiking trails for game and bird viewing;
- A hide for game and bird viewing;
- A security house for a 24 –hour security to guard the PA;
- Create a camping site.

3.2 Luwi River: That flows into the Chia Lagoon. Along the banks of this River, a huge population of hippos, crocodiles, bird life and natural vegetation resides. As such:

- An engine boat to cruise up and down for game and bird viewing;
- Clearing of some parts of the River of reeds and hyacinth;
- Rod fishing in the River by canoe.

3.3 Mpambazi River: this is where the 15m long python comes to drink and lives within its vicinity. Therefore it is recommended that:

- Irish bridge construction across the river to where the python can be viewed;
- A hide to view python and other game.

3.4 Chia Lagoon: in the Lagoon itself, several other activities such as water skiing, fishing, hippo and bird watching can take place.

4. Visitor Site Plan

It is recommended that in Chopela One village, within the community, the following structures should be constructed for tourists:

4.1 Traditional houses for tourists' accommodation.
4.2 Decent ventilated pit latrine and bathrooms.
4.3 A reception area where visitors are welcomed and can be entertained to traditional performances. This can be in front of the guesthouses.
4.4 Crafts shop to merchandise handicrafts etc.

5. Income Generating Activities and Methods

5.1 Tourists to pay a flat fee for all services:

- cultural performances;
- boat cruises;
- game and bird viewing;
- food and accommodation;
- camping.

5.2 Selling of handicrafts, wood carvings and other traditional/ cultural products.

6. Impact Monitoring: Impact of Tourism Activities on Community Life and Environment

It is inevitable that the influx of tourists into the area will have adverse impact and consequences on both the people and environment. The following are potential threats:

- Cultural disturbances and pollution: this may be a negative impact as local population start to copy mannerisms and style of tourists who are mainly foreigners.
- Prices of commodities may go drastically up, leading to inflation.
- Interaction between tourists and local girls and women may lead to prostitution and increased prevalence levels of HIV/AIDS.
- Littering of waste around the area leading to environment degradation.

It is critical that monitoring mechanisms be put in place to curtail the above. Above all, civic education to the local communities and potential tourists would help.

On the positive side, opportunities due to tourism will arise for communities and conservation of environment:

- environmental education to communities and tourists;
- generate funds for conservation of wildlife;
- employment and income generation for local communities;
- bio diversity maintenance and improvement;
- cultural exchange;
- increased trade for local businesses;
- increased household incomes;
- revenue collection for DA;
- local people exposed to foreigners and hence able to relate to a changing world.

D. BUSINESS PLANNING

1.Feasibility Study

1.1 Potential Business Opportunities

The communities have identified various business opportunities. These are income-generating activities utilizing local resources and personnel.

- Revenue collections from cultural performances, river cruises, camping, game and bird viewing, food, beverage and accommodation.
- Making and selling of handicrafts and art works.
- Potential to market natural resource based products such as honey, mushrooms, rice and fish.

1.2 Competition Analysis

The TANAREMA [Takondwa Natural Resources Management Association], Kazirira Ecotourism project is one which has already started attracting tourists to its project. In addition, it has established links and partnerships with Nkhotakota pottery in a scheme to share tourists.

Discussions with the owners of Nkhotakota Pottery Lodge [Chris and his wife] revealed the following:

- The tourist market is not large enough to sustain two Ecotourism projects within the district;
- Expressed fears of community owned enterprises as regards their propensity to failure once donors move out;
- Unless the Ecotourism project is managed in a professional, business like – manner, there's little or no hope of sustainability;
- No visitor or tourists has been to the Chia Lagoon Ecotourism yet hence no yardstick to measure its suitability as a tourist attraction;
- The Chia Ecotourism group must go and learn from Kazirira. However, fears of copying are real.

From the above analysis, it is evident that a hard task awaits the selected Ecotourism club in terms of attracting tourists and competing with Kazirira. The following recommendations are suggested:

- A partnership between Luwi and Kazirira Ecotourism groups to co-share tourists, work together in complimenting their activities and negotiating with the hospitality businesses for tourists.
- Luwi club to provide UNIQUE services in order to add value to existing tourism attractions.
- There's need for a commercially – oriented, business – minded approach to the management and of the project.
- Strong leadership to negotiate with tourism industry and devise marketing strategies for the project.

2. Marketing Plan

It is imperative that a strong and competitive marketing strategy is designed for the project to attract tourists locally and internationally. To achieve this, the following recommendations are made:

- Strategic alliance with Kazirira Ecotourism and Nkhotakota game reserve in co – sharing arrangement for tourists;
- Strategic partnerships with hospitality businesses in Nkhotakota, Salima and Lilongwe;
- Brochures at airports and hotels;
- Publicity in media;
- Inviting media, hospitality biz executives to visit the project;
- Internet marketing;
- Registration with local and international Ecotourism/ tourism bodies.

3. Financial Projections

Detailed cash flow projections have to be prepared for the business for a three-year period to determine:

- Break – even analysis.
- Sources of income.
- Expenditures.
- Possible profits.

E. BIODIVERSITY CONSERVATION AND PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

1. Priorities

1.1 Identified Targets For Conservation

Priority Species for Conservation

- **Animals:** hippo, crocodiles, snakes [python] monitor lizards
- **Fish**: Ningwitchale [Tilapia rendalli] rare species found only in Chia Lagoon. Chambo species – as they use the Lagoon for breeding. Nkholokolo – synodontis nyassae, Samwamowa – mormyrus longisostris, mphuta – mormyrus SPP, Makumba – Oreochromis Shiranus
- **Birds**: the duck families, geese, darter, fish eagle, giant King fisher, Jacaranda
- **Vegetation**: palm trees, water lilies are a good habitat for birds, reeds and grass.
- **Trees**: Nsambamfumu {indigenous}, fever tree, acacia theolinofolia

1.2 Priority Areas of Conservation

- Canal connecting to the Lake.
- Rivers into Lagoon and their banks.
- Habitats for birds where there are water lilies.
- Sand beach areas – where crocodiles lay eggs.
- 20m from the banks of the Lake must be left to natural habitats.

2. Preliminary Assessment

2.1 Stresses on Environment and Conservation Areas

- Pollution through silt deposition through rivers into Chia Lagoon causing sedimentation.
- Increased number of fishermen causing a threat to diminished fish species.
- Chemical pollution such as fertilizer, pesticides from up stream communities.
- Land clearing – cutting down of trees and natural vegetation.

2.2 Sources Of Threats

- Poor farming practices.
- Human attitude towards natural resources due to high illiteracy levels and fixed mindset.
- Lack of an integrated management plan for the area.

2.3 Success Indicators:

Implementation of this project should balance environmental and wildlife conservation and business development. It is therefore inevitable for the following to be considered:

- Wild life protected in their areas.
- Communities take active role in protection, and conservation and management of wild life and environment.
- Communities around are main beneficiaries from tourist visits.
- Zoning of PAs and security measures.
- Improved farming methods by communities through training and land management.
- Capacity of partners in project management and implementation.
- Capacity building of communities to manage enterprise as business and financial management.

F. CONCLUSIONS

The potential for Ecotourism in the proposed site is huge although the various variables at play need to be taken into consideration when implementing the project. Linkages with existing hospitality industry are critical as is the need to integrate the various stakeholders in tourism for a seamless and coordinated approach in implementation.

Annex 4: **Crop Diversification with Improved Varieties of Beans and Rice**

Prepared by:

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INTRODUCTION

A central objective of the Chia Project is to increase household food security, nutrition and incomes through opportunities to diversify and market high value crops. A key component is to add value to the production and marketing of rice and beans in the lowland areas of the Chia Watershed. The aim is to introduce high yielding, disease resistant varieties of these crops, which are in high demand among communities in the district, and which fetch good prices in local and regional markets.

The practice being promoted by the project involves growing rice under rainfed conditions, followed by beans under residual soil moisture during the winter season. Beans are a special focus not only for income and nutrition, but as a soil-improving legume rotation with cereals.

Varieties being promoted at present include Kilombero and Superfaya rice and Kalima beans. Results on these crops are presented below.

RICE

The usual practice involves growing rice under rainfed conditions on the alluvial lowlands, with a second crop during the dry season under irrigation. There is currently little opportunity for the latter following the collapse of the major irrigation schemes in the area – Mpamantha, Lifuliza and Likowa. Although efforts are underway to rehabilitate one or more of these schemes, the results reported here deal strictly with rainfed rice.

Before the start of the rains, arrangements were made to secure and deliver 1 ton of Kilombero and 5.7 tons of Super Faya rice seed from the Bwanje Valley Irrigation Scheme. The seed was delivered to 24 villages in Linga and Zidyana EPAs involving 398 participants for planting on a target area of 61 ha.

Planting and Yield Results:

Data on seed distribution, planting rates, production and yields are shown in **Tables 1 and 2**.

Problems with the erratic and late onset of the rains affected nursery establishment and delayed transplanting. Only 72% of the farmers who received seed produced a crop because some farmers were not serious about growing rice. Many of these farmers failed to even plant, suggesting the need for greater care in selecting participants based on genuine interest and ability. Despite this unfortunate waste of time and resources, production and sales of rice showed excellent results with potential for significant improvement.

Of the 398 farmers who received seed, 286 planted and produced a crop. Results for each variety were very similar. Seed planted per farmer averaged 10.9 kg on 0.08 ha at a rate of 133

kg per ha. This seed rate was more than 2 times higher than originally planned, which clearly reduced the area planted to the crop – a drop from a target of 61 to 33 ha (**Table 2)**.

Table 1: Seed Distribution and Planting Rates of Kilombero & Super Faya Rice, Chia Watrshed

	Distribution of Seed			Farmers who	Seed Planting Rates	
Variety	Farmers	Kg/Farmer	Total Kg	Planted	Area/kg	Kg/ha
Kilombero	59	10.2	1,000	42	75.8	131.9
Super Faya	339	11.6	5,700	244	74.6	134.1
Totals/Avg	**398**	**10.9**	**6,700**	**286**	**75.2**	**133.0**

Table 2: Production and Harvest of Kilombero and Super Faya Rice in Chia Lagoon

	Ha Planted		Yield kg/ha *		Kg Produced	
Variety	Per Farmer	Total	Avg/Farmer	Weighted	Per Farmer	Total
Kilombero	0.070	4.16	3,384	2,672	188	11,112
Super Faya	0.085	28.81	3,398	2,712	231	78,135
Totals/Avg	**0.078**	**32.97**	**3,391**	**2,692**	**210**	**89,247**

* The average yield of 3391 kg/ha per farmer was higher than the weighted mean of 2692 kg (total production / total area planted) due to high yields obtained by small vs large farmers.

Farmers averaged an excellent yield of 3.4 tons/ha for each variety (see **Table 2)**, but yields were generally higher among smaller farmers, perhaps because they were better able to care for the crop. This differential skewed the true average of 2692 kg/ha based on total production ÷ the total area under production (89,247 kg ÷ 32.97 ha).

Disposition and Sales of Rice

The disposition of the 2 rice varieties by farmers to date is shown in **Figures 1 and 2**. The results differed considerably between varieties, with higher sales and lower levels of consumption for Kilombero (presumably due to its income potential). There was also little or no balance after keeping seed for next year.

Table 3 shows sales and prices as of September 30. Although demand for both rice varieties is high, prices and marketability of Kilombero are clearly superior. The project helped to identify a buyer from Blantyre, Rice and Milling Company, which offered K40/kg for unmilled Kilombero rice. This compares with a price of MK22/kg by local vendors, MK30 by ADMARC, and MK35 by NASFAM (although NASFAM later offered a price of MK 40). Gross returns per ha were $1013 for Kilombero vs. $714 for Super Faya with gross margins of $881 and $575 respectively. Gross margins were calculated from the rainfed values in **Table 4** based on variable use of fertilizer.

Table 3: Income from Sales of Kilombero and Super Faya Rice in Chia Lagoon (as of 09/30/06)

	Avg Price/kg		Income from Sales of Unmilled Rice				Returns (USD per Ha)	
			Per Farmer		Total			
Variety	MK	USD	MK	USD	MK	USD	Revenue	Gr. Margin
Kilombero	40.40	0.30	5,343	40	315,231	2,335	1,013	881
Super Faya	28.80	0.21	2,747	20	930,217	6,890	714	575
Totals/Avg	**35**	**0.26**	**4,045**	**30**	**1,245,448**	**9,226**	**863**	**728**

Figure 1: Disposition of Kilombero Rice by Farmers

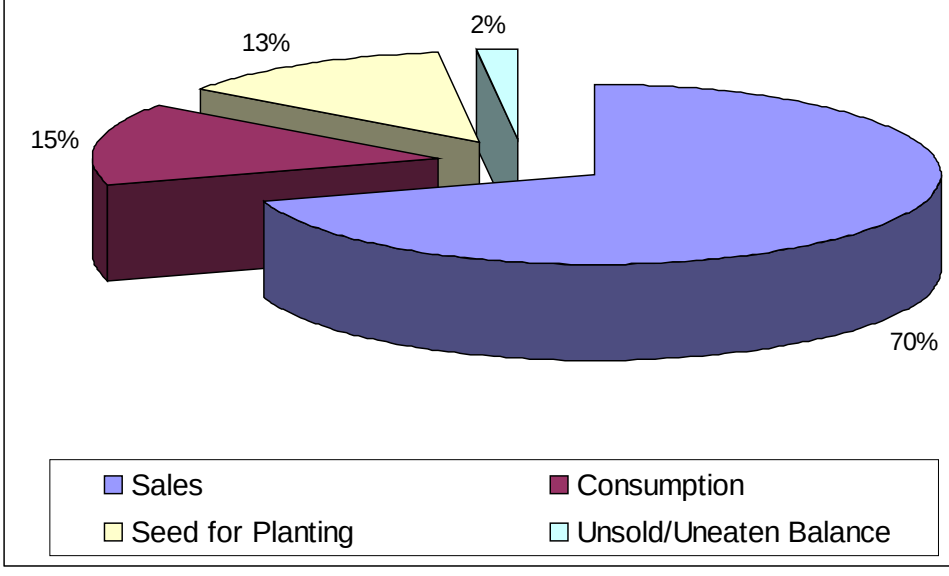
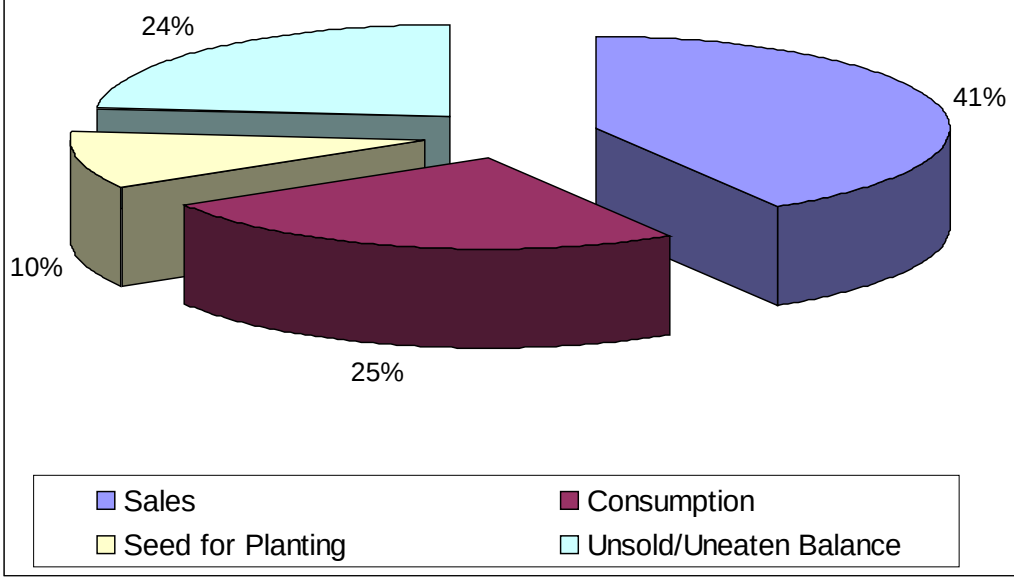


Figure 2: Disposition of Super Faya Rice by Farmers



Market surveys indicate that Kilombero is preferred due to its flavor, texture and aroma. Supermarkets in urban areas favor Kilombero over others and sell it at a higher price. There also appears to be good export potential in Zimbabwe and South Africa. To date, the Rice and Milling Company has purchased 32 tons of Kilombero rice from Chia farmers - including those who obtained seed from sources outside the project. Sales of Super Faya rice by farmers supported by the project total over 33 tons. Together, the income generated among rice farmers totals over MK2.5 million (USD 18,116).

Farmer Impacts, Challenges and Plans

Surveys of farmers revealed high interest and demand for seed, especially Kilombero, which was favored slightly over Super Faya mainly because of its marketability and price. Project support for these varieties had also affected farming practices. For example, early maturing and high yielding characteristics allowed more time for other crops and use of less fertilizer. Some farmers had even switched to planting in rows instead of randomly.

A meeting held in August with ~80 rice farmers discussed issues related to 1) sustainability after the end of the project; 2) seed self-sufficiency; 3) structure of the rice association; and 4) findings of the rice survey (see above). Desired actions to address points 1-3 include:

- Provide low cost irrigation to alleviate problems of variable rainfall for a good crop.
- Prepare land early with timely delivery of more seed to ensure higher production and yields.
- Select a group of good farmers to multiply basic seed for self-sufficiency.
- Establish direct links between the association and good buyers/markets.
- Arrange formal access to credit for loans on inputs and irrigation.
- Support and encourage rice clubs to promote problem solving within groups.
- Encourage protection of rice nurseries.

Selected success stories and photographs are attached.

BEANS

The Chia Project and TLC are collaborating with Bunda College in the multiplication and production of Kalima beans by smallholder farmers. The initiative is being implemented in collaboration with the Bean and Cowpea Collaborative Research Support Program (CRSP) managed by Bunda College and Washington State University with USAID funding.

A major thrust of this program is not only to increase incomes and nutrition, but to diversify farm production with a soil-enhancing legume crop that can be rotated with cereals, notably maize in upland areas, and rice in the lowlands of the watershed. The program involves 2 elements:

1) multiplication of certified seed, and
2) production of grain for sale and consumption.

Multiplication of Certified Seed

Planting and Yield Results:

Data on the distribution and planting rates of basic Kalima seed are shown in **Table 5** for 2004, 2005 and 2006, with production and yields in **Table 6**. The initial small number of farmers was due to a shortage of basic and certified seed, hence the justification for this program. After promising results in 2004 with irrigation in Lilongwe District, the multiplication of certified seed was expanded in 2005 to include Kasungu and the Chia Watershed.

In 2006, production of certified seed was continued with 30 farmers in Chia. Problems with erratic and late rains affected production of basic seed by the CRSP and its subsequent collection and delivery by the project to farmers in Chia. This problem was compounded by the late harvest and sale of rainfed rice which affected land preparation for beans.

Planting rates were reduced in 2005 and 2006 due to the high population stand from planting 2 seeds per station. Yields were highest under irrigation with fertilizer and pest control (1774 kg/ha), although reasonable yields were also obtained under residual soil moisture in Chia (1072-1300 kg/ha). Interviews with Chia farmers indicated little use of fertilizer in 2005 and 2006. The increased yield in 2006 is thought to be a result of the experience gained by farmers, with potential for higher yields with early planting.

Table 5: Production of Certified Kalima Seed from Basic Seed - Seed Distribution and Planting Rates

			Distribution of Seed		Seed Planting Rates		
Year	Location	System	Farmers	Seed Kg	Kg/Farmer	M^2/kg	Kg/ha
2004	Lilongwe District	Irrigation + Chem	11	70	6.4	74.0	135.1
2005	Lilongwe / Kasungu / Chia	Irrigation +1/2 Chem	25	300	4.0	100.0	100.0
2005	Chia Lagoon	Res. Moisture + 1/2 Chem	90	900	10.0	122.0	82.0
2006	Chia Lagoon	Res. Moisture + 1/2 Chem	30	264	8.8	113.6	88.0
		Averages	**39**	**383.5**	**7.3**	**102.4**	**101.3**

Table 6: Production of Certified Kalima Seed from Basic Seed - Production and Harvest

			Ha Planted		Yield kg/ha	Kg Produced	
Year	Site Location	System	Per Farmer	Total	Avg/Farmer	Per Farmer	Total
2004	Lilongwe District	Irrigation + Chem	0.047	0.52	1,774	84	920
2005	Lilongwe / Kasungu / Chia	Irrigation +1/2 Chem	0.040	1.00	1,425	57	1,425
2005	Chia Lagoon	Res. Moisture + 1/2 Chem	0.122	11.00	1,072	131	11,794
2006	Chia Lagoon	Res. Moisture + 1/2 Chem	0.100	3.00	1,301	130	3,900
		Averages	**0.08**	**3.88**	**1,393**	**100**	**4,510**

Sales and Income:

The price of $1.00/kg of certified seed was maintained for all 3 years. Production and sales were clearly linked to the area planted, but the revenue and gross margins per ha were excellent for all sites and for all years (see **Tables 7 and 8**), with an average of $1394/ha and $1206/ha respectively. This could be improved with early planting combined with experience and better management.

Table 7: Production of Certified Kalima Seed from Basic Seed - Income from Sales

Year	Location	System	Avg Price/kg	Proceeds from Sales		Returns (USD per Ha)	
				Per Farmer	Total		
			USD	USD	USD	Revenue	Gr. Margin
2004	Lilongwe District	Irrigation + Chem	1.00	84	920	1,780	1,574
2005	Lilongwe / Kasungu / Chia	Irrigation +1/2 Chem	1.00	57	1,425	1,425	1,218
2005	Chia Lagoon	Res. Moisture + 1/2 Chem	1.00	131	11,794	1,072	902
2006	Chia Lagoon	Res. Moisture + 1/2 Chem	1.00	130	3,900	1,300	1,130
		Averages	**1.00**	**100**	**4,510**	**1,394**	**1,206**

Table 8: Revenue and Gross Margins for Multiplying Certified Kalima Seed (US$ / hectare)

			System of Production							
			Irrigation & Chemicals		Residual Moisture & Chemicals		Irrigation w/o Chemicals		Residual Moisture w/o Chemicals	
	Unit	US$/ unit	Amount	Total US$	Amount	Total US$	Amount	Total US$	Amount	Total US$
REVENUE										
Total revenue	**Kg**	**1.00**	**2,250**	**2,000.00**	**1,200**	**1,200.00**	**1,500**	**1,500.00**	**650**	**650.00**
VARIABLE COSTS										
Material inputs										
Seed	Kg	1.07	80	85.60	80	85.60	80	85.60	80	85.60
D compound	50kg bag	26.46	4	105.84	4	105.84	0	-	0	-
CAN	50kg bag	19.39	0	-	0	-	0	-	0	-
Pesticide	500 ml	4.29	10	42.90	10	42.90	0	-	0	-
Total material inputs				**234.34**		**234.34**		**85.60**		**85.60**
Labor (field)										
Land prep	Day	1.00	15	15.00	15	15.00	15	15.00	15	15.00
Weeding	Day	1.00	9	9.00	4.8	4.80	6	6.00	2.6	2.60
Fertilising (D compound)	Day	1.00	0.5	0.50	0.5	0.50	0	-	0	-
Fertilising (CAN)	Day	1.00	0	-	0	-	0	-	0	-
Pesticide application	Day	1.00	2	2.00	2	2.00	0	-	0	-
Irrigating	Day	1.00	20	20.00	0	-	20	20.00	0	-
Harvesting	Day	1.00	9	9.00	4.8	4.80	6	6.00	2.6	2.60
Pack and transport to collection point	Day	1.00	4	4.00	2	2.00	2.5	2.50	1	1.00
Total Labor (field)	Days		**44.5**	**44.50**	**14.1**	**14.10**	**34.5**	**34.50**	**6.2**	**6.20**
Treadle pump costs										
Depreciation (based on total days use)	500 days	120.00	20	4.80	0	-	20	4.80	0	-
Maintenance (half depreciation)	500 days	120.00	10	2.40	0	-	10	2.40	0	-
Total treadle pump costs				**7.20**		**-**		**7.20**		**-**
Total cost				**286.04**		**248.44**		**127.30**		**91.80**
Gross Margin per hectare				**1,713.96**		**951.56**		**1,372.70**		**558.20**
Break-even yield @ current wtd avg price (kg/ha)				286.04		248.44		127.30		91.80
Break-even price @ current yield (US$/kg)				0.13		0.21		0.08		0.14
Total labour required (days & US$)			44.5	44.5	14.1	14.1	34.5	34.5	6.2	6.2
Gross Margin Return to Labour (US$/day)				39.52		68.49		40.79		91.03
Gross Margin if yield or price drops by			10%	1,513.96	10%	831.56	10%	1,222.70	0.1	493.20
Gross Margin if yield or price drops by			30%	1,113.96	30%	591.56	30%	922.70	0.3	363.20

Impacts, Challenges and Plans

- Income generated from sales of beans is being used to support 365 people in the area based on an average household size of 12.2 which includes extended family members.
- All farmers have great interest in growing Kalima beans next year.
- Major challenges faced were related to late planting from late land preparation after the rice harvest, and late delivery of seed. Yields were consequently reduced from lower soil moisture levels. The problem was compounded by a minor aphid infestation, which was treated using local pesticides with limited efficacy.
- Training on sound agronomic practices for multiplication was provided by Bunda College.
- Chia Project and TLC staff provided regular backup extension support in the agronomy and processing of seed. They also conducted quantitative assessments of yields.
- Bunda College evaluated the seed produced for certification.
- Prices paid to farmers were tied to the dollar exchange rate at $1.00/kg.
- The Chia Project and TLC purchased most of the certified seed from farmers for onward delivery to other interested farmers to expand the program and its benefits.
- Constraints to multiplication are noted below, which are being addressed as follows:
    - Sustainability from limited availability and capacity to multiply basic seed – investigations are underway to secure greater quantities of basic and certified seed. The latter includes the 3.9 tons of seed purchased from farmers this season. The Project is also exploring the acquisition of parental lines of Kalima beans for producing basic seed among a select group of Chia farmers so that the area can become more self-sufficient.
    - Quality of training and extension support needs to be provided to other interested parties/organizations, a challenge which the Project is willing to undertake.
    - Markets need to be identified for certified seed, especially when the program expands beyond the capabilities of the Project and TLC.
    - Continued promotion and production of Kalima and other improved bean varieties must consider changes in prices depending on quality and increased seed availability.

Production of Grain from Certified Bean Seed

Promotion of Kalima bean seed has been highly successful, predominantly because yields and cash returns are high and farmers like the variety. As a result, neighboring farmers formed more clubs in 2006, increasing the membership from 90 to 560. This increase in demand triggered the project to supply 6.16 tons of certified seed in June and July this season for producing and selling grain. The seed provided included certified seed purchased from Chia farmers last season.

Production of Bean Grain

Data on the production and disposition of grain from certified Kalima seed are shown in **Table 9** and **Figure 3**. The average and total area planted was 0.14 ha and 78.4 ha respectively. Total production was 50.6 tons, averaging 90.4 kg per farmer with a yield of 646 kg/ha.

Disposition of Bean Grain

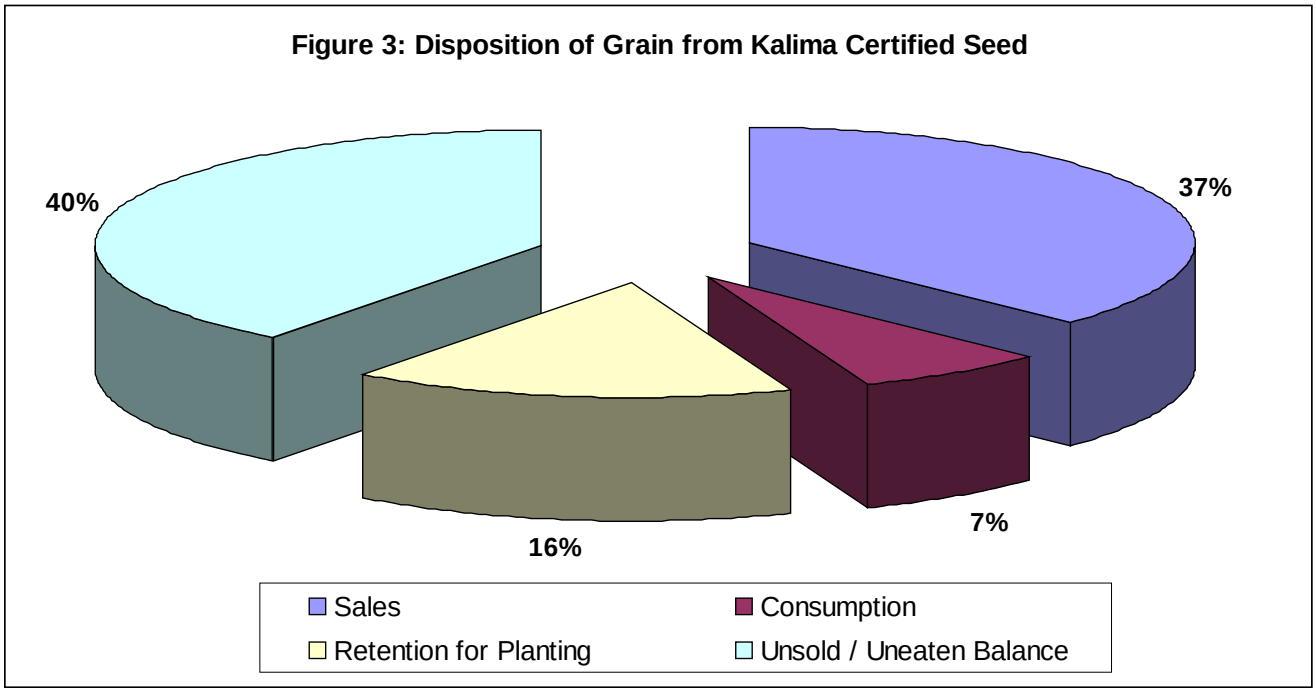
By October 19th 2006, some farmers had sold their harvest in local markets. This totaled 18.8 tons or 37% of the bean harvest at an average price of MK 60.34/kg. These sales generated MK 1,152,000 (USD 8,348) at an average income per farmer of MK 4,114 (USD 30). Other farmers are waiting to sell their produce at higher prices.

Revenues to date have contributed towards the purchase of sheep and goats, fishing nets, bicycles, clothes, timber, and soap. Sales have also helped pay school fees and hospital bills.

70% of the farmers had consumed 7% of the bean harvest as of mid October. In addition, 92% of farmers plan to retain an average of 14.6 kg for planting next season, although the Project is recommending new certified seed to ensure quality with higher yields and prices.

Table 9: Production and Disposition of Grain from Certified Kalima Seed

Distribution of Seed	**Quantity**
No. Farmers	560
Kg/Farmer	11
Total Seed kg	6,160
Seed Planting Rates	
M^2/kg	127.3
Kg/ha	78.6
Area Planted (ha)	
Per Farmer	0.14
Total	78.4
Production (kg)	
Per Farmer	90.4
Total	50,624
Avg Yield Kg/ha	646
Disposition to Date of Grain (kg)	
Sales	18,802
Consumption	3,544
Retention for Planting	8,176
Unsold / Uneaten Balance	20,102
Income to Date from Sales ($)	
Price per Kg	0.44
Per Farmer	29.81
Total	8,348
Potential Returns ($ per Ha)	
Revenue (if all sold)	282.34
Gross Margin (with no chemicals)	190.34



Impacts, Challenges and Plans

These are similar to those observed with planting basic seed.

- Income from bean sales will help support 4370 people in the watershed based on a household size averaging 7.8 people which includes extended family members.
- The average yield of 646 kg/ha is considerably lower than the yield of 1300 kg/ha achieved with basic seed. This is likely due to the selection of best farmers and the agronomic support given for multiplying basic seed.
- Although harvests were lower than expected, there was strong interest in growing kalima beans next year due to the high yielding capability of Kalima vs. local varieties.
- Major challenges faced were related to late planting from late land preparation after the rice harvest, and late delivery of seed. Yields were consequently reduced from lower soil moisture levels. The problem was compounded by a minor aphid infestation, which was treated using local pesticides with limited efficacy. Early delivery of seed will be a priority next season.
- Most farmers have not repaid seed provided by the project, which can either be done in cash or in kind with the grain produced. Due to the lower than expected harvest, the issue will be resolved next growing season.
- Plans for the 2006/07 season include the supply of 10 tons of certified Kalima seed to 600 bean farmers in the Chia Watershed (about 15 kg/farmer).

Selected success stories and photographs are attached.

Selected Rice and Bean Stories with Photographs

Many farmers experienced great success with the production and marketing of beans and rice this year. Selected stories are presented below.

Rice

Mr. Tito Mtalanje of Zidyana EPA harvested 650 kilogrames of Kilombero rice, which he sold at K40.00/kg realizing K26,000. With the proceeds, he bought iron sheets for his house. “During the previous 20 years of growing rice, I was unable to realize my dream to own a house with a roof of iron sheets. I have finally realized this dream, praises to the Chia Project!” Mr Mtalanje said in a jovial mood.

Village Headman Yolomani II purchased a TV set and 25 iron sheets after raising and selling rice and beans. He produced 500 kg of rice and sold 375 kg at MK40 per Kg. He also sold 360 kg of beans at MK60 per kg. “In my experience, this was a very rare opportunity. With the income from the sales of rice and beans, I was able to watch the World Cup in 2006. I will live to remember Chia Project for this success” the Village Headman said.

Beans

Mr. Dalabu Tsinde of Likowa supports 18 people from his farm in the village of Namakwati. In 2005, Dalabu planted 20 kg of Kalima bean seed received from Total LandCare. Following a successful yield of 200 kg of certified seed, Dalabu was very pleased with the outcome of the sale. Before encountering TLC, Dalabu could not afford to send two of his four children to school. After the sale of his Kalima crop, these two children were able to attend school. Life changed for the rest of the family as well. The increased income allowed Dalabu’s wife to buy greater amounts of varied foods to improve family nutrition. Improvements of this nature directly impact the health and general well-being of the whole family. For example, two of Dalabu’s extended family members were ill at the time of harvest, but with his support, they were able to receive much needed medical attention. This and many similar stories have had significant impacts on people’s lives, such as buying iron sheets for roofing, bicycles for transport, goats and chickens animal protein and income, and farm inputs.

In 2006, Mr. Darabu Tsinde produced 900 kg beans from which he sold 360 kg realising K24.000. “Since I was born, I have never seen an income like this. I am molding bricks right away to build a good house for myself and family.”

Production of Kilombero rice in Mpamantha and Likowa, Chia Watershed

Harvesting and Marketing of Kilombero Rice, Chia Watershed

Land preparation and newly planted crop of Kalima beans, Likowa, Chia Watershed

Kalima beans: Immature crop (top) and mature crop (bottom), Chia Watershed

Visit to Chia farmers: From left, Alan Eastham, US Ambassador to Malawi; Autman Tembo, USAID, Trent Bunderson, Chief of Party Chia Project, Curt Reintsma, USAID Director, Diane Gooch & Alex Damaliphetsa, Project Coordinator & Manager

Farmer club for growing rice and beans, Chia Watershed

Annex 5: **Chia Lagoon Watershed Management Project: Success Stories**

Introduction

The Chia Lagoon Watershed Project, as seen from the beneficiaries' point of view, continues to register successes in its effort to uplift the living standards of rural communities through sustainable management of natural resources. In the past year, some beneficiaries contributed stories about their successes with support from the project. A few of these are narrated below with inserts of the actual quotes and words of appreciation by the individuals concerned.

Crop diversification and Agro-based Enterprises

- Success have been registered in bean and rice production and marketing. In rice marketing a Mr Tito Mtalanje of Zidyana EPA harvested 650 kilogrames of Kilombero rice, which he sold at K40.00/kg realizing K26,000. With the proceeds, he managed to buy iron sheets for his house. "For the past 20 years of growing rice, I failed to realize my dream of owning an iron roofed house. This year I have overcome that, praises to Chia Project!" Mr Mtalanje said in a jovial mood.

- In another development, Village Headman Yolomani II purchased a TV set and 25 iron sheets after successfully producing and selling rice and beans. He produced 500 kg of rice and sold 375 kg at MK40 per Kg. In addition he sold 360 kg of beans at MK60 per kg. "This is a very rare chance of my lifetime. I was able to watch the World Cup 2006. I will live to remember Chia Project for this success" the Village Headman said.

- Dalabu Tsinde supports 18 people from his farm in the village of Namakwati. In 2005, Dalabu planted 20 kilograms of Kalima bean seed received from Total LandCare. Following a successful yield of 200 kilograms of certified seed, Dalabu was very pleased with the outcome of the sale. Before encountering TLC, Dalabu could not afford to send two of his four children to school. After the sale of his Kalima crop, these two children were able to attend school. Life changed for the rest of the family as well. The increased income allowed Dalabu's wife to buy greater amounts of varied foods to improve family nutrition. Improvements of this nature directly impact the health and general well-being of the whole family. For example, two of Dalabu's extended family members were ill at the time of harvest, but with his support, they were able to receive much needed medical attention. This and many similar stories have had significant impacts on people's lives, such as buying iron sheets for roofing, bicycles for transport, goats and chickens animal protein and income, and farm inputs.

  In 2006, Mr. Darabu Tsinde produced 900 kg beans from which he sold 360 kg realizing K24.000. "Since I was born, I have never seen an income like this. I am molding bricks right away to build a good house for myself and family."

The success of the bean seed multiplication and marketing of the produce has attracted hundreds of farmers to join the enterprise such that membership has grown by nearly 700% from 90 to 560 farmers! The different clubs have now formed an Association to better coordinate their activities.

The success story behind the Zidyana Bean Growers Association's increasing membership lies in the following principles:

- High transparency in the running of the whole program
- Good management of resources by association executive
- Good leadership skills being implemented by association executive
- High quality seed that is high yielding and in high demanded among buyers
- High economic returns

To ensure sustainability of the economic benefits for growing beans, each member contributes an annual fee of MK100 to the association. This equates to a deposit of K56,000 per annum with the Associations account in Malawi Savings Bank. Farmers say that they are willing to pay the membership fee to guarantee the sustainability of the bean program beyond the support provided by the CLWP.

Furthermore, farmers have a feeling that they are being empowered because problems that previously looked too large to sort out, have now been made simple through various subcommittees, courtesy of CLWP facilitated business management training. For example, the Marketing Committee has been trained and is responsible for looking into all affairs concerning marketing, while the Production Committee has been established to control the product quality. At present, the Association plans to plant 11MT of certified Kalima bean variety.

Irrigation

Anderson Graham lives in the Nkongo village of central Malawi. He supports nine people with his farm income - eight of those living in his household. Anderson indicated to TLC staff that prior to interventions with irrigation, he was regularly forced to rely on borrowing money from relatives, a burdensome and unreliable coping mechanism at best. In 2004, Anderson was relying solely on a rainfed rice. After receiving his TLC treadle pump in 2005, Anderson feels fortunate to report that his life has improved significantly. Even one extra harvest per year has meant to him "…much less struggle in life". His children are going to school, and now has plenty onions and tomatoes for his meals. While for some, the treadle pump can mean survival, it also means an increase in the *quality* of life. Farmers indicated that they were happier now, and that life is simply easier- a significant step in any holistic view of poverty reduction. People reported that for the first time they are able to eat green maize in the summer. Others stated that "there is no longer any famine in my house".

The success of the TLC irrigation farmers does not end with the impact from the increased income to individuals and their families. Inock Goliat has owned his treadle pump for only five months but has successfully irrigated two crops of maize, tomatoes, onions and beans. Inock was anxious to tell our staff that he was strongly motivated by his successes. He indicated that while he previously relied on irrigation using a watering can in the dry season (which was difficult and limited his potential), he now has the ability to harvest twice in the dry season and would like to increase it to three. This case demonstrates that providing the right people with the right inputs can not only provide food security and increased income, it can also help people become aware of their own potential. Mr. Goliat has seen a new financial potential for him and his family- and is very eager to reach it.

Community Involvement in the Management of the Chia Lagoon Fishery

Capacity development in the field of natural resources management is a fundamental principle of achieving success in economic empowerment through sustainable ultilization and management. Decentralization forms the springboard for creating the sense of ownership of the natural resources for the communities within the process.

The management of the Chia Lagoon fishery has been hindered in the past due to the consequences of being an open access type of resource. This has made it difficult to put in place management strategies such as restriction of entry into the fishery, establishing fishing quota and the establishment of sanctuaries for fish breeding.

Until recently, the management of the fishery in the lagoon was the responsibility of the Government of Malawi (Fisheries Department). Fishermen caught fishing during the closed seasons were viewed as “stealing” as the fish resources belonged to the government. In 1999, the Fisheries Department (1999) reported a decline in catches from over 500 tons between in the early to mid 90’s to well under 300 tons 2004. This has been accompanied by changes in the species composition of fish. Several factors have contributed to this problem notably:

- Little or no control of fishing by the communities (which includes use of inappropriate fishing gear and poisonous plants to kill fish, over-fishing, and depletion of breeding stocks).
- Decline in water quality and quantity due to siltation and chemical pollution from poor or inappropriate land use practices upstream.

Since the establishment of the Chia Lagoon Fisheries Management Association, communities are directly involved in managing the fishery and have begun to understand that the resource belongs to them as primary beneficiaries. By-laws have been put in place to guide the management process, with enforcement working in collaboration between the government and the communities.

In order to ensure sustainability of the lagoon resources as a source of livelihoods, the project facilitated the strengthening of community participation as follows:

1. Registration of the Chia Lagoon Fisheries Management Association as a legally constituted Trust.
2. Development of a collaborative management agreement with the Department of Fisheries which entails observation of a closed season, restrictions on fishing gear, and establishment of a breeding sanctuary in the Chia Channel.
3. Development and enforcement of a constitution with bye-laws governing the management of the fishery resource which includes monitoring fish catches and sales and imposing penalties for infringements.
4. Construction of a fish vendors market with cold room facilities and associated structures.
5. Piloting of fish cages.

During the three years of the project, fish catches are increasing, currently estimated at 300 tons per year. In 2007, 222.08 tons were sold earning MK 23.33 million with an average of MK 23,708/HH. This has been possible due to the involvement of communities in the development and implementation of the management plan which has greatly contributed towards creating a conducive environment for fish to breed and multiply. Fish catches have potential to increase further when fish cages become fully operational. It is estimated that about one ton of fish will be

harvested from each cage per two cycles. Establishment of fish cages will not only improve fish catches but also ensure a stable supply even when the season is closed.

Between September 2005 and March 2006, ten *Nkacha*[12] seine nets and a mosquito net were confiscated collaboratively between the communities and the Department of Fisheries. Six offenders have already been tried by the quasi-judicial forum and fined. This earned the Association an amount of MK25,000 of which MK19,000 was used to open an account for the Chia Lagoon Fisheries Management Association with Malawi Savings Bank. The money will be used for advancing the objectives of the association (in general terms, sustainable fisheries resource ultilization and management).

Seven more offenders (all Nkacha owners) confiscated within the month of March, are yet to be tried and fined. The proceeds will be deposited in the Association's account.

At the General Meeting of Chia Lagoon Fisheries Management Association on the 21st of September 2006, which was attended by 115 members, ***Mr. Nkhumbwa Chikulumangala***, a fisherman for 24 years in Chia Lagoon, had this to say "Ladies and gentlemen, my fellow fishermen, I am standing here to applaud the Chia Association for its efforts in managing fish resources in the lagoon so that we, as fishermen, start reaping the benefits from our hard work. Those who are old enough will agree that fish in the lagoon had all but disappeared, but after the association established controls on illegal gears like Nkacha and the designation of a sanctuary, trends in the past few months show there is light at the end of the tunnel. Where we could not earn even a K100, we are now able to earn K5000. My plea to all of you my colleagues is that we assist especially in observing the gear and sanctuary regulations. We should all know that tangible benefits cannot just come today nor on a silver platter"

The establishment of the Chia Lagoon Fisheries Management Association has assisted in instilling discipline amongst the fishing communities in managing fishery resources. It has come to the attention of most fishermen that the fishery resources have to be harvested sustainably through the use of recommended types of gear and observance of both closed seasons and areas.

Another motivation for community participation is the establishment of the Chia Lagoon fish vendors market. The market will serve about 70 vendors. The market will contribute to improved fish handling, processing and storage with reduced post harvest losses, improved hygiene, and reduced risks of road accidents. The overall impact is that, it will provide a stronger and more consistent price for fish sales with healthy competition among vendors based on product quality. Increased fish catches will not only benefit households in terms of incomes but also in terms of improved nutrition. Furthermore, the provision of a transformer by the project to run the cold room for the market will trigger other development activities within the small Chia community town such as improved communication, general trading and milling facilities. The Department of Fisheries has described the market project as the first of its kind in Malawi and would like to have it replicated in programs supported by other development partners.

Of importance is the fact that the association continues to be empowered such that it is able to run the affairs of the lagoon on its own which fits well with one of the project's result areas: Effective Devolution of Nkhotakota District Assembly.

[12] This an open encircling bottom seine net which is illegal in the lagoon.

Forestry Resources

The interventions in the Project catchment area have benefited many people collectively as well as individually. It is worth praising when the community sees the benefits with actions by individuals to change the trend of events.

Yolomani II is a village that attracts the attention of many neighbours and even visitors for its active participation in various interventions promoted by the project. They realized they are deficient in fuel energy and started to plant trees communally. To date, trees have been planted around every household, along roadsides and in communal woodlots.

The village also adopted the use of fuel-saving stoves as an efficient way of using fuel wood, as well as to save labor in gathering it. The village is also adopting ecological sanitation latrines to reduce the risk of contracting diseases. V.H. Yolomani II in his words said, “I know it will take time for my people to start benefiting from the trees we are planting but for sure no body will use this “gold” except ourselves and grand children. We are proud to be part of the campaign to restore the nakedness we have caused to our neighborhood. You know, there is no pride in seeing nakedness!”

Champhutsi Natural Resource Management Association

Communities under Group Village Headman Bamba, TA Mwadzama in Nkhotakota formed an Association in 2005. The aim is to participate in Natural Resources management of Nkhotakota wildlife reserve and surrounding areas as well as improving their livelihoods. Before the association was formed, they recall to have been involved in illegal hunting and sawing of planks in the reserve.

Communities are happy to be registered as a legal entity, and within one year of their establishment, three boreholes were drilled to provide safe drinking water. Different departments and organizations are visiting them to offer advice on their desired enterprises. Some of the enterprises are Beekeeping, Mushroom farming, Aquaculture and Afforestation. In collaboration with Parks and Wildlife, they have drafted a collaborative management plan, with roles and indicators of successful partnership management.

Encouraging results have been recorded. For example, the Association members are monitoring illegal entry into the reserve and have cycled on 10 occasions to Parks and Wildlife Office in Nkhotakota to report poaching and tree cutting. As a result, 3 arrests were made and a total of 150 planks confiscated. The communities also have assisted in border patrols to locate wire snares. This has resulted in the removal of 120 wire snares that could have killed more than 120 animals.

The approach to collaborative management being adopted was well supported by Extension and Education senior staff during the recent meeting of the NP&W department held at Mponela in August 2006. All participants are looking forward to results from this approach which if proved successful can be replicated in other areas.

Notable points of difference with this approach include:

- *Community institutions are not dependent on the department so they can seek assistance from any organization.*

- *Since harvesting of natural resources in a Protected Area may not be sustainable, communities are encouraged to explore alternatives from other sectors; as such, the institutions formed are not dependent solely on harvesting such resources.*

- *Not based on revenue sharing considering the impact of the realized revenue.*

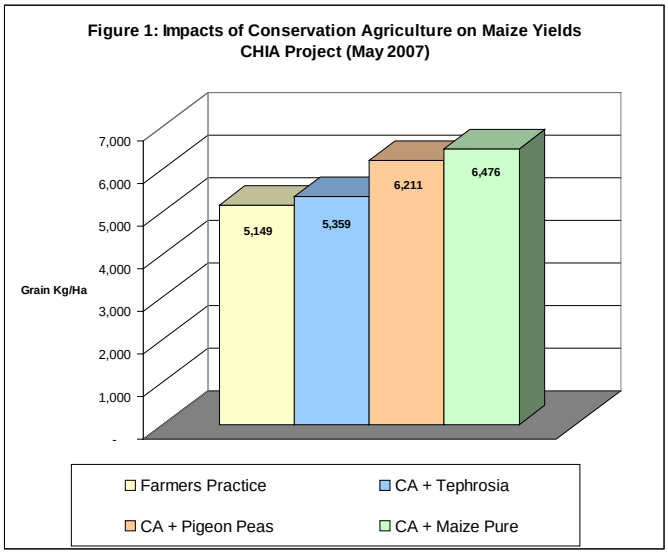
The challenge is to establish viable enterprises that can sustain their livelihoods. Communities close to the Association have approached the members to seek advice on how they can form similar institutions in their areas, for example people of GVH Simwini in Traditional Authority Mwansambo.

Adaptation to Climate Change – Conservation Agriculture in Chia Lagoon Watershed

Climate change is affecting a cross-section of sectors in Malawi ranging from agriculture to transport. The hardest-hit are smallholder farmers whose livelihood is entirely dependent on agriculture. Projections show that global warming in Malawi will result in increased temperatures (by 2-3°C) and reduced rainfall and water availability by 2050. This translates into reductions in soil moisture, thereby lowering crop production. The Chia Lagoon Watershed Project has demonstrated that conservation farming (CA) is the best-bet option for smallholder farmers in Malawi. It offers a unique opportunity among rural households by providing increased and more stable yields, particularly in dry years, increasing profits and reducing demand for labor, time and production costs. Globally, conservation farming helps in carbon sequestration, reduces erosion, minimizes leaching of nutrients and recharges aquifers through better infiltration.

Conservation agriculture or zero/minimum tillage as it is called in a layman's language aims to conserve, improve and make more efficient use of natural resources through integrated management of soil, water and biological resources combined with selected organic inputs, farm planning and crop rotations. Soil compaction, erosion and run-off are significant problems of tilling the soil. These problems are associated with traditional land preparation methods which involve annual construction of ridges about 90 cm apart.

Impacts of CA on maize yields from only one current season under the Chia Lagoon Watershed Management Project are illustrated in **Figure 1** relative to the standard farmer practice. Over a period of 3 years and more, the differences will be substantially greater. The effects also exclude the value of the products from Tephrosia and Pigeon peas. The yields of CA plots under pure stands of maize were 26% higher than under the standard sole maize practice. The project has successfully demonstrated that maize yields as high as 5000 kg/ha can be achieved under CA.



Source: Chia Lagoon Watershed Management Project – 5th Semi-Annual Report

Farmer Success Stories with Conservation Agriculture

Previously, farmers failed to harvest enough grain from 1.6 ha to take them through to the next harvest. Production from only 0.3 ha under CA exceeded this level with much less labor, not to mention future improvements in soil fertility. Farmers exposed to this practice expressed great interest to adopt it across their entire farms. Furthermore, in the majority of cases, uptake of the practice has been spontaneous as neighboring households request the services on CA on their own after having seen the benefits from fellow farmers.

Exlina Azeli: One farmer who has benefited from the practice is Exlina Azeli. Exlina Azeli is an elderly woman, widowed early last year, from Thawale Village under Traditional Authority Mwadzama within the Chia Watershed. When first introduced to the project in 2005, Exlina exclaimed, "Oh my God! This is the type of project I have been looking for since my retirement from the Ministry of Education." As an influential person in the community, Exlina is on the forefront of adopting and promoting technologies initiated by the project. This story focuses on her results with conservation farming and *Tephrosia* fallows as low-cost measures to conserve soil moisture, to reduce soil erosion, to improve soil fertility and to save labor in cultivation practices.

Exlina's success is that she is one of the pioneer adopters of the technology in the District of Nkhotakota. In 2005, Exlina was one of 10 farmers who agreed to test conservation agriculture on their own farms. She managed the practice so well that a field day was held at her field which attracted more than 200 farmers. Savings in labor enabled Exlina to diversify crops on other parts of her land with a focus on Kilombero rice, also supported by the Chia project. Exlina has also integrated the use of *Tephrosia* with conservation agriculture. *Tephrosia* is a fast growing, deep rooted nitrogen-fixing shrub that can be intercropped with annual crops to improve soil fertility from its prolific green biomass as well as soil structure from its deep rooted nature (pictures attached).

The combined results of these practices enabled Exlina to invest in the construction of a new house of burnt bricks and a metal roof. The success of this amazing woman is that she is a star performer with influence in the community. This has helped enormously to promote conservation agriculture and *Tephrosia* with many other farmers.

Grace Malaitcha: Another success story is Grace Malaitcha. Grace is married and has 4 children. She is one of the 68 farmers who had adopted CA in 2006. Her interest was captured during a field day mounted at Exlina's farm which showed impressive results. After realizing the benefits on her farm, she was compelled to convince 101 fellow community members who adopted the technology in 2007. She also volunteered to work as a community extension worker with the project which allows her to disseminate the practice in her area.

Use of CA practices in the Chia Lagoon Project started in 2005 with only 10 farmers. These served as model demonstrators to promote greater awareness about the technology among neighboring communities. The results from the previous two seasons have generated great interest among farmers such that in the 2007/08 season, the number of farmers practicing CA increased to 236. The Chia Lagoon Watershed Project's success story on CA has motivated other projects to integrate CA as one of the key intervention within their overall programs. The project has become a leader in the implementation of CA in Malawi and is recognized by the Ministry of Agriculture through the Agriculture Development Program (ADP) and the World Bank. Recently, it was visited by 30 agriculture staff from all the districts of Malawi and has also been visited by many other organizations. Furthermore, the implementing partner, Total Landcare has been incorporated into the National Task Force on Conservation Agriculture as one of the key members.

Grace Malaitcha and her farm with Conservation Agriculture

***Above**: Distribution of Stover after harvest: Protects the soil and prevents runoff*
***Below**: Maize 3 weeks after planting among crop residues*

Above: ***Conservation Agriculture at left vs. Conventional Farming at right***

Below: ***Tephrosia intercropped with maize – Conservation Agriculture***

Exlina above with Tephrosia fallow at 6 months

Chia staff above with Tephrosia at 15 months