FORESTRY RESEARCH INSTITUTE OF MALAWI

LAKE CHILWA BASIN CLIMATE CHANGE

ADAPTATION PROGRAMME

AN OVERVIEW OF CONSERVATION AGRICULTURE IN THE LAKE CHILWA BASIN

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SUMMARY

The overall goal of the Lake Chilwa Climate Change Adaptation Program (LCCCAP) is to secure the livelihoods of 1.5 million people in the Lake Chilwa Basin and enhance resilience of the natural resource base. The Basin is located in the three districts of Machinga, Phalombe and Zomba and covers vast stretches of land with resources and populations that are vulnerable to climate change impacts. To contribute towards the goal of the LCCCAP, the Forestry Research Institute of Malawi (FRIM) is engaged in an exercise to facilitate conservation agriculture practices in the basin. Fortunately, conservation Agriculture (CA) is also a "flag carrier" in the Department of Land Resource Conservation (DLRC) which is overseeing different projects that are operating in the Basin. Various CA and farming technologies are being promoted including reduced tillage, crop residue management and incorporation, use of herbicides, and agroforestry.

FRIM conducted a survey to come up with an overview of CA activities in the various hotspots. The survey is aimed at gathering information on CA interventions, key players and promoters and preferred technologies. The survey is also meant to lay a solid ground for facilitating the implementation of Conservation Agriculture in the basin and to establish a basis for assessing the impact of the program. The survey involved discussions with the Department of Land Resource Conservation, site visitations, general landscape observations and interviews with key informants. Among the key informants were District Agricultural Development Officers (DADOs), Agricultural Extension Development Coordinators (AEDCs), District Forestry Officers (DFOs), NGOs that are implementing CA in the area, Lead Farmers (LF), farmers that are practicing CA and those farmers who have not adopted CA.

The survey confirmed that many CA interventions are being promoted in the basin and that some farmers are adopting them in various combinations to maximize their benefits. Adoption of the technologies is with varying intensity between districts. The common technologies that are being practiced are for soil and water conservation, such as use of contour marker ridges and proper ridge alignment. The adoption of CA interventions in some parts of the basin is hindered by the high cost of inputs, excessively poor soil types, small land holding, high labour demands and reluctance of most farmers to practice unknown technologies, project rigidity on specific CA intervention technologies. Poor extension services have also been blamed for low spread of spread of the CA interventions between communities.

INTRODUCTION

Malawi has generally been poor, food insecure and one of the major hunger hotspots in sub-Saharan Africa. Recent statistics indicates that an estimated 65% of the population lives below the poverty line (NSO, 2003). This group is mostly among the 86% of people that live in the rural areas earning their livelihoods from rapidly degrading lands. Despite progressive efforts by the government and its partners to combat food shortages, there are still pockets within the Lake Chilwa Basin and other parts of the country that are hunger spots. Food insecurity is inherently linked to low agriculture yields due to poor soils that are nitrogen and organic matter- deficient. High prices of inorganic fertilizers and poor market value of food agricultural produce such as maize (WAC, 2007) have contributed to poverty and food insecurity. Short-term solutions, such as the provision of subsidized fertilizer to farmers in the basin are not sufficient to eliminate the recurrent poor agricultural production and hunger in the face of climate change and variability. Alternative and complementary approaches are therefore needed to help farmers and their families especially in times of extreme weather events such as drought and flooding.

Conservation Agriculture has three major components, that are being advocated, minimising disturbance of the soil surface (also called Zero or Reduced tillage), managing the soil to create an organic soil cover (such as through mulching) and practicing crop rotation with more than two different crops. These practices are guided by the understanding that CA can help to minimize soil erosion by preventing water loss from the top soil, allow for growth of microorganisms within the soil structure and thus producing high organic matter level which acts as a fertilizer through mineralization through. Thus, CA in the context of LCCCAP could be a timely intervention especially to improve land productivity while assisting to conserve the environment.

The Forestry Research Institute of Malawi intends to promote and facilitate CA technologies in all the hotspots of the basin in order to increase the adoption of CA by 20%.

This is the first brief report of the major findings from an initial survey that has been carried out by FRIM in six hot spots to get an overview of Conservation Agriculture implementation in the basin.

METHODOLOGY

Identification of Hotspots and Survey Sites

The ecosystem approach was used to identify hotspots and areas for the survey. The approach recognized that there are locations within the Basin that have urgent vulnerability and degradation conditions that need addressing. Through a process which involved stakeholder

consultation and expert knowledge, the following sites were selected; Zomba District: Zomba Forest Reserve, Zilindo, Namadidi and Likangala River; Malosa Forest Reserve, Domasi and Lifani rivers; and Ngwelero EPA (Dimusa, Stevin and Mayaka Section) hotspots.

Interviews

Discussions were held with the Department of Land Resource Conservation and using structured questionnaires, interviews were held with key informants in the selected sites to gather information on CA interventions. The questions were aimed at determining the key players and promoters of CA and the preferred technologies by the communities. The key informants were District Agricultural Development Officers (DADOs), Agricultural Extension Development Coordinators (AEDCs), District Forestry Officers (DFOs), NGOs that are facilitating and implementing CA, Lead Farmers (LF), farmers practicing CA and those farmers who have not adopted CA.

MAJOR FINDINGS

Zomba District

A. Challenges and Opportunities

The following were identified as opportunities and challenges facing adoption of CA technologies in the district.

i) Large scale cultivation along river banks, especially along Namadidi, Naziwale, Domasi, and Sunuzu rivers.

ii) Large scale cultivation on marginal and steep slopes of Namadidi hill, around Kasonga Hills.

iii) Frequent forest fires as a means of land clearing is common at Sambaisa Irrigation scheme.

iv) Low agricultural production due to poor soils, soil degradation and poor agricultural practices in Ngwelero Malosa EPAs, Mayaka and Jali

v) Frequent dry spells and erratic rains.

- General slow adoption of CA technologies in the district due to reluctance by farmers to use herbicides due to costs and their impact on important secondary farm products such as indigenous vegetables and other plants; perceived high labour intensity of some of some of the CA technologies; small land holdings per capita; farmers not willing to take risks and poor extension services.

Conservation Agriculture Projects in the District

i) The Irrigation, Rural Livelihood and Agriculture Development Project (IRLADP)

The Irrigation, Rural Livelihood and Agriculture Development Project (IRLADP) is operating in Likangala EPA (Khanda, Njala and Tsegula villages), Thondwe EPA (Namadidi area and Jali). Farmers in these areas are mobilized through village Catchment Conservation Committees. The project is supporting farmers in soil and water conservation measures using various technologies, including use of contour marker ridges, planting of vertiver grass on contour ridges in sloppy fields, agroforestry techniques, manure making and application, application of herbicides to reduced tillage, rain water harvesting are other components, river bank afforestation. Table 1 is a summary of the CA interventions that IRLADP is facilitating in Zomba District. IRLADP has also provided CA training for staff and farmers through informal training sessions, field days, study tours and demonstrations.

The levels of adoption of CA technologies by farmers is said to be low at the moment but promising. Low adoption has been attributed to socioeconomic problems which arise from land shortage and prevalent poverty. Some farmers have not adopted the interventions because of fear taking risks on unknown/untested technologies. Lack of technical knowledge by extension agents has also been cited as the cause for the slow adoption.

Table 1: Conservation Agriculture Interventions Facilitated by IRLADP in Zomba

Intervention	Cumulative Achievement	Number of Beneficiaries		
		Male	Female	Total
Agro-forestry	17 hectares	751	1043	1794
Contour Marker Ridges construction	43 hectares	612	736	1348
Ridge Realignment	114 hectares	751	1043	1794
Vetiver hedgerows	5 km	44	62	106
Farmers adopting soil fertility improvement technologies	1400	751	1043	1794
Farmers adopting soil and water conservation technologies	1400	751	1043	1794

Environmental committees established	3	13	8	21
Catchment areas protected and conserved	114 hectares	751	1043	1794

Source: IRLADP Report of December, 2009

ii) Sub-Saharan Africa Challenge Programme

This is the host of most projects that are being implemented under CIMMYT, FARA (Forum for Agricultural Research in Africa), Biodiversity, CIAT and many others. FARA is the main project that is being implemented in Zomba district and its funding comes through the Zomba District Council. A number of farmers are being supported by the project through provision of seed (mostly maize), herbicides and fertilizers to practice CA.

iii) Save the Children Fund (SCF)

Save the Children Fund (SCF) is implementing irrigated agriculture in Mbeluwa Village in Namadidi area. The area is within the Likangala river watershed, an area identified by the LCCCAP as a hotspot. The watershed has been continuously encroached by villagers from Mbeluwa Village and what is left is bare land with a few patches of grassland and isolated trees. According to the communities, the encroachment and degradation problem began in the 1990's when the Wood industries Corporation (WICO) under a concession agreement with the Department of Forestry fell mature trees in the watershed without replanting. Save the Children is promoting irrigation farming targeting 50 farming households on 5 hectares of farm land. The role of the project is to provide technical support and demonstrate implementation of irrigation farming technologies.

iv) Emmanuel International- WALA Project

Emmanuel International is planning to implement a Pit-Planting as a CA technology in project that will commence during the next farming season in the Malosa area. The target is farmer producer groups of 15-20 members who will be engaged through farmer-extension facilitation.

v) Soil Fertility Consortium for Southern Africa (SOFECSA)

This is one of the four projects under the Sub-Saharan Africa Challenge Programme but hosted by CIMMYT (International Centre for Maize and Wheat Improvement). SOFESCA's main interest is CA and soil fertility improvement. The project has been operational for two years and targets farmers in Likangala, Dzaone, Malosa and Mpokwa EPAs. In Malosa EPA the project is promoting Pit Planting (also called Basin Planting). The project promotes soil fertility enhancement technologies by providing legume seeds to farmers. This is being done on pilot

basis so that after continued testing of the different legumes by the farmers, the best legume will be chosen for soil enrichment, income and food security. Farmers are encouraged to use pit planting and the biomass from the leguminous crops are used for mulching.

The project has on farm research component which are implemented by farmers themselves. Model groups have been established to experiment organic manure and inorganic fertilizers for maize production. Legumes that are being promoted include beans, pigeon peas and groundnuts. These are grown either in a mixed cropping with maize or as a mono crop. The farmers also practice agroforestry for firewood or animal fodder.

vi) International Centre for Maize and Wheat Improvement (CIMMYT)

CIMMYT is promoting CA and soil fertility enhancement programs using legumes. The latter is being implemented through SOFECSA. CIMMYT projects are being implemented through extension workers in Malosa EPA. The project promotes two main principles zero/ reduced tillage and mulching in a mono crop stand especially for maize production. The system relies heavily on use of crop residues that are spread on the top soil before planting and herbicides such as bullet and roundup to reduce tillage. Some farmers have adopted the technology. Slow rate of adoption has been attributed to high costs of herbicides and fear by some farmers that too many chemicals such as herbicides might lead to crop yield loss in future.

vii) Total Land Care (TLC)

Total Land Care (TLC) has been facilitating CA in Chingale and Malosa EPAs, now for one complete farming season. The CA interventions that TLC is promoting include the use of herbicides to reduce tillage, incorporation of crop residue into the soil, and use of agroforestry techniques. In agroforestry, the following tree species are being promoted; *Fadherbia albida, Accacia polyacantha, Albizzia lebbeck* and *Accacia galpinii*. TLC is also promoting river bank tree planting in the Lisanjala area using *Khaya anthotheca*. The various tree species are raised at village tree nurseries and shared among the members.

The most promoted and favoured technology that is being promoted by TLC is the use of herbicides. This system is said to reduce labour costs by almost 50% and also to reduce top soil erosion through reduced tillage. Each farmer is supported with inputs provided on soft loan amounting to K5, 000. This money is given upon a farmer depositing K2,000 as a collateral. Each participating farmer is provided with herbicides (bullet and round up), five kilogram of hybrid maize seed and 0.5kg of *Tephrosia vogelli* to be used on 0.4 hectare plot. The loan is supposed to be paid after harvest and loan recovery from the last farming season hovers at 70%. The plot also serves as an on-farm demonstrations and for training plot. Participating farmers are provided with extension services every fortnight. Reports indicate that there has been a remarkable improvement in the yield of maize in those plots under CA. Adoption of CA is slow,

supposedly due to poverty and negative attitude towards CA interventions especially on use of herbicides.

B. PHALOMBE DISTRICT

Challenges and Opportunities

The following were identified as challenges and opportunities for promotion and adoption of CA technologies in the district.

i) Threat to fish resources, biodiversity, water resources and agricultural production

ii) High levels of land degradation due to deforestation, overgrazing, and encroachment into marginal lands for farming activities,

iii) Soil erosion, loss of arable land due to soil erosion (eg gully formation along Chisengeleni River), and siltation of marshes in and around Lake Chilwa,

iv) Frequent drying up of rivers and many areas being prone to drought and floods,

v) Poor adaptation of CA technologies due to;

- cultural and societal orientation towards new technologies
- Poor extension services in the district (e.g. Mpinda EPA at Chaima Village)
- inadequate awareness and mobilization of communities for adoption of CA.
- High labour intensity of some CA technologies has led to some farmers losing interest and commitment.
- The high cost of herbicides and their unavailability in local outlets discourages farmers from adopting their use in CA technologies.

Conservation Agriculture Projects in Phalombe District

i) Department of Land Resources Conservation (DLRC) and the Irrigation, Rural Livelihood and Agriculture Development Project (IRLADP)

The DLRC and IRLAD are promoting the efficient, diversified and sustainable use of land based resources. The technologies that are being promoted are presented in table 3. DLRC has also provided CA training for staff and farmers through informal training sessions, field days, study tours and demonstrations. To date, 73 farm families are practicing CA in Phalombe.

Table 3: Conservation Agriculture Interventions Facilitated by DLRC in Phalombe

	Intervention	Cumulative Achievement	Number of Beneficiaries		
			Male	Female	Total
1	Compost manure making	89,622 heaps/pits	21825	32418	54243
2	Manure application	3438.1 hectares	10490	13042	23532
3	Crop residue incorporation	21919 hectares	29015	35208	56001
4	Agroforestry	91,789 seedlings out planted			
5	Swales	191metres	3	0	3
6	Reduced tillage	9.35 hectares	19	16	35
7	Phased out ridging	6.2 hectares	17	15	32
8	Use of herbicides	6.05 hectares	17	15	32
9	Pit planting	.4 hectare	4	2	6
10	Area under ridge realignment	447.9 hectares	1439	1820	3217
12	Contour Marker ridges	269.5 hectares	831	1198	2028
13	Box ridges	1441 hectares	2365	2514	4878
14	Area under Vetiver hedgerow	25.7 hectares	301	528	829

Source: LRC Report of July 2009 - June, 2010

ii) Evangelical Lutheran Development Services (ELDS)

ELDS IS PROMOTING CA in six villages of Kachala, Ndungu, Masanza, Manase and Machemba. The CA interventions that are being promoted are reduced tillage, crop residue management / incorporation and Agroforestry practices. The main objective is to improve soil status for agricultural production and make the communities food-secure even in drought prone areas. Phalombe river bank has also been planted with *Khaya anthotheca* and *Pterocarpus. angolensis* as part of river bank protection. Communal woodlots are being established in the villages to provide forest products and services to the people. Reports indicate that ELDS is making inroads through lead farmers who were taken to Zimbabwe for training on CA. Through these lead farmers individuals and local institutions such as conservation clubs are promoting the CA concept. ELDS has been working with 38 farmers for the past farming season on a land area of about 5.8 hectares. Various farmer trainings have been organized in order to facilitate adoption of CA. Video shows from the success stories that have been accomplished under CA and from lessons learnt from Zimbabwe are used to train farmers.

iii) Other CA Promotion Initiatives by NGOs

The Mkhumba Livelihoods Support Programme, world Vision International and Blantyre Synod are also supporting adoption of CA in Phalombe district. World Vision International is facilitating river bank rehabilitation through reforestation.

2.3 MACHINGA DISTRICT

The following were identified as opportunities and challenges for the promotion and adoption of CA technologies in the district

i) Unproductive heavy alluvial soils with patches of heavy sand soils which make farming imperatively difficult.
ii) Frequent flooding and water-logged conditions
iii) Rapid loss of water during drought and prolonged dry spells.
iv) Deforestation due to opening of gardens under irrigation farming;
v) River bank erosion and reduction of the river channel due to siltation;
vi) Encroachment of Chikala forest reserve and conversion of marshland due to expansion of agriculture land;
vii) Conversion of marshes into vegetable and rice growing fields; and
viii) High fuel wood demand

Conservation Agriculture Projects in Machinga District

Machinga district has 111 farmers who are practicing CA. The Food and Agricultural Organisation (FAO), Malawi Environmental Endowment Trust (MEET) and Sub-Saharan Africa Challenge Programme are facilitating the adoption of CA in the district. FAO and Sub-Saharan Africa Challenge Programme are using DLRC structures to reach out to the farmers. So far 71 farmers covering 14.2 hectares and 20 farmers covering 4 hectares respectively have been assisted with fertilizer, hybrid seed and herbicides. FAO is promoting reduced tillage, crop residue management, basin planting and construction of swales (Appendix II). Basic training on water and soil conservation measures and field implementation of the measures is a preliquisite for a farmer to benefit from FAO's CA technical support. Apart from other forms of technical support FAO has provided farmer groups with sprayers for herbicides application. Sub-Saharan Africa Challenge Programme is focusing its effort on the promotion of crop residue management and reduced tillage. On the other hand MEET is working with 10 farmers through demonstration plots covering a total land area of one hectare.

World Vision Malawi (WVM)

The NGO targets households in its Nayuchi Area Development Programme (ADP) and so far 2000 households are doing irrigation farming. These households overlap in Nampeya and Nanyumbu EPAs. This area is within the Nacala Corridor and Namanja Beach Hotspot. WVM promotes crop residue management which is being used for manure making and agroforestry for soil enrichment. The implementation strategies include use of lead farmers, farmer groups and clubs. Campaigns, sensitization of communities and on-farm demonstrations are conducted leading to good adoption rate. The project has been running in the area for the past three years and has managed to boost food security levels from as low as 50% to as high as 75%.

Adoption rate is mainly affected by poor quality of soil with some parts of the area having much clayey while others have much sand in their soils. This results in flooding when it rains and soil drying up fast during dry spell respectively. Effective maize production in these areas is therefore done during the dry season using irrigation farming. WVM has provided motorized irrigation pumps, treadle pumps, seeds (hybrid seed and agroforestry tree seed) and extension services to communities benefiting from the project.

Greenline Movement

The NGO started facilitating CA due to loss of soil fertility and poor social economic status of the farmers in their area of jurisdiction besides enhancing water infiltration. Greenline Movement advocates for use of agroforestry trees in cropping systems as the benefits outweigh those when using inorganic fertilizers.

The NGO has started facilitation of CA and is currently trying out with four farmers who are practicing reduced tillage and crop residue management; and 10 are practicing some agroforestry techniques using *Gliricidia sepium*. Under reduced tillage, the NGO has not yet started using herbicides. However, the NGO also provides extension services to farmers on ridge realignment and contour marker ridges construction for soil and water conservation. However, the NGO bemoans slow adoption due to people's perception of wanting immediate benefits instead of investing for tomorrow.

Leadership in Environment and Development (LEAD)

Lead has embarked on a project to assist farmers in Domasi EPA with agroforestry and riverine tree seeds amounting to over 30,000. The project has also supplied 30,000 polythene tubes and other nursery equipment for the exercise. The tree seed species include *Fadherbia albida, Gliricidia sepium, Accacia polyacantha* and *Khaya anthotheca.* Apart from river bank

rehabilitation and agroforestry, the project is also promoting homestead woodlots to lessen the impact of wood demand from other sources in four villages.
Adoption of these interventions is slow. This is being attributed to high labour demand in rice fields which is the most common economic activity in the area.

Total Land Care (TLC)

In Machinga, Total Land Care is facilitating CA in Mtumbwi and Nsanama EPAs since last farming season. The CA interventions include use of herbicides, crop residue management, reduced tillage and Agroforestry techniques. The agroforestry tree species being promoted are *Fadherbia albida, Accacia polyacantha, Albizzia lebbeck* and *Accacia galpinii.* The various tree species are raised at village tree nurseries and shared among the community members.

The farmers are provided with extension services every fortnight and there has been a remarkable improvement in yield in those plots under CA. Even though TLC is operating outside the programme's hotspots in the district, their CA activities may still influence adoption by other community members within the designated hotspots.

Farmers perception on Conservation Agriculture

Most farmers have not been able to adopt CA due to varying reasons. Some farmers are not so keen to adopt now but would rather wait and see until later when the CA interventions will be a common practice; others are not comfortable to apply chemicals such as herbicides in their fields. However, fears on the use of herbicides were dismissed by one agricultural official in Machinga. It was argued with proper hands – on training there is nothing to be afraid of, and again when CA using herbicide is adopted after implementing soil and water conservation measures risks of chemicals washing away are avoided. This is compounded by the few number of extension workers as awareness and mobilization for adoption relies on them. This calls for intensive sensitization campaigns to be carried out within the basin hotspots to make many people aware of the benefits of CA.

Agroforestry techniques have also become popular among farmers through the activities of government organizations and NGOs. Trees are grown in a mixed stand together with crops or tree grown separately and apply the biomass in the maize crop stand. These interventions therefore assist in saving time and input costs thereby maximizing the gains considering that they are also low labour demanding.

Few farmers who have adopted various CA interventions indicated that with field days, on-farm demonstration plots and massive sensitization campaigns, many people will come to accept the CA interventions after seeing the benefits. Thus they emphasized on the significance of technical support from extension agents who are few on the ground.

3.0 RECOMMENDATIONS

Based on the facts raised in this report CA is at least being practiced in most of the areas visited but at varying scales and using different interventions and approaches. To synchronize these approaches to suit the appropriate features of CA, the following implementation criteria are proposed based on area and community characteristics and people's readiness to adopt CA. To facilitate high adoption rate, a multifaceted approach is thus recommended as follows:

(1) Use of existing structures at village level to mobilize communities. This could be ADC, VDC or committees like VNRMC and conservation committees. This approach provides a good entry point and ensures participation of all interested farming families. Community structures need be empowered with relevant skills and avoid handouts. Any technical support provided especially inputs should be meant for smooth facilitation of hands-on field training and adoption of CA practices and not hand outs. This will enhance the adoption rate and sustainability of CA;

(2) Involvement of model farms, groups, villages or lead farmers to set up field demonstrations about specific CA technologies. This will ensure use of the available resources efficiently while reaching out to many farmers. The field demonstrations in this case will be field classrooms for practical learning;

(3) Lead farmers who are already being groomed in various EPAs within the basin hotspots should be used to facilitate CA adoption to the advantage of the programme. These farmers should be well trained in specific CA interventions who in turn will transfer that knowledge onto their farms where a learning laboratory will have been established. From there other farmers will be able to learn from them and adopt the CA intervention;

(4) For sustainability of CA interventions, some quarters have proposed that efforts should be made to have CA in the agriculture subject curriculum taught in primary and secondary schools as there is no such provision at the moment. For short term results there is a need to put up demonstration plots in the schools within the programme's hotspots. This is expected to lay a good foundation for CA practices among the youths who can influence their households to adopt the interventions as well as inculcating CA spirit within them and take the practice even for their future families.

(5) Based on the three principles of CA highlighted earlier, this study has revealed that reduced / zero tillage, crop residue management / incorporation, use of herbicides and agroforestry should be promoted through this programme. Reduced tillage can best be practiced in areas where flooding occurs most such as in Ngwelero EPA. Mulching or crop residue management can best be implemented in areas where there is moisture stress or in loam soils, coupled with reduced tillage. It should be noted that the use of herbicides

is applicable to both cases to maximize the gains with an additional crop-tree mix either in sequential or temporal arrangement;

(6) To make the CA adoption self sustaining the programme should create a credit facility from which communities can source funds for income generating ventures whose proceeds can be used to buy agricultural inputs for CA. This will also reduce the over exploitation of natural resources through environmental degrading activities such as charcoal making. Through this additional intervention, peoples' livelihoods in the basin will be enhanced and sustainable;

(7) The project should establish strong linkages with other stakeholders in the field of CA so that efforts can be pooled together for greater impacts on people's livelihoods. With limited capacity in extension services, resulting from shortage of staff and lack of technical skills for CA, a multisectoral approach in the facilitation process will effectively promote adoption of CA;

(8) The project should keep track and record all CA practices through monitoring strategies for timely backstopping and replication to other sites. This will help detect community's adaptive capacity to climate change and variability through adoption of new technologies as coping mechanisms;

(9) In each hotspot there is a need to facilitate formulation of byelaws that may govern CA practices. The formulation of byelaws will make possible demarcation of those fragile areas that should be strictly cultivated using CA practices;

(10) Farmer exchange visits has also been touted as one of the successful means of promoting adoption of CA. Through exchange visits farmers will be able to see and learn from the successful practices of CA. Balaka could be one such district to visit considering how the farmers there have adapted to climate change by practicing CA which has resulted in improved household food security especially in the drought prone areas.

(11) The programme needs to come up with a jingle that should be aired in the local radio as one way of sensitizing farmers especially those within the Lake Chilwa basin to adopt CA to ensure resilience to climate change.

4.0 CONCLUSION

This report has tried to establish a baseline overview of Conservation Agriculture in the Lake Chilwa Basin under the Lake Chilwa Climate Change Adaptation Programme. The baseline overview of CA in the Lake Chilwa basin will be a guide in the facilitation process and establish a basis for assessing the impact of the programme. CA interventions such as reduced tillage, crop

residue incorporation / management, pit planting and Agroforestry practice have come out as popular among the stakeholders that were consulted. People have actually experienced the benefits of CA interventions during extreme weather events that have come with climate change and variability. Farmers are likely to benefit more from improved crop production resulting from tree-crop interaction. It has been proven beyond doubt that trees support agriculture production by replenishing degraded lands, nutrients recycling, maintaining soil structures, contributing to water cycles and protecting watershed. Currently many players such as NGOs are coming in to facilitate the adoption process after seeing the success of CA from pilot demonstrations. More farmers are willing to do CA on their farms and others have already registered with various institutions working in their areas. A lot of effort is there to promote CA spearheaded by Land Resource Conservation department in the Ministry of Agriculture and food security. Many government supported projects have been initiated to support and facilitate adoption of CA. This will raise the profile of CA because the practice is a flag carrier for the LRC department. Realizing the soil degradation issues, NGOs are also facilitating the adoption of CA in their catchment area even though their impact is still not yet felt as the interventions are still at planning stage or confined to specific areas at a small scale. Currently it has been noted that there are some difficulties in trying to get actual number of adopters at district level because of lack of coordination among various facilitating agents. However, through the Lake Chilwa Basin Climate Change Adaptation Programme facilitation and coordination will be improved to allow more people adopt the interventions. Fears on the use of herbicides in CA need to be further researched because others fear that chemical wash-aways may end up in the Lake Chilwa hence a threat to aquatic life. Presently, facilitation will go on with an understanding that soil and water conservation should be the first stage before use of herbicides under CA to control chemical leakages from CA systems. This also augurs well with the fact that bye-laws should be formulated to designate areas which should be cultivated under strict CA. The findings from this study, therefore, will help to make CA facilitation successful because the entry points for facilitating implementation have been identified. This is possible considering that stakeholders indicated their desire to practice CA and the required technical support to achieve high adoption rates within the basin hotspots.

APPENDIX

Appendix I.

***CONSERVATION AGRICULTURE*- Interview Guide for Baseline Overview of CA Practices in the Lake Chilwa Basin**

Category	General Questions	Specific Questions
Key Informants: Agriculture- DADO	• What CA interventions are being implemented in the district and target population? • Who does the interventions and where? • What were the guiding factors for such an intervention? • How do you conceive of the adoption of such interventions by the farmers and the community at large? • How do you link CA to forest management especially in river banks and catchment areas?	• What were the merits/successes or demerits/failures of the CA interventions. • What would you advise as the best approach, best methods and specific CA interventions and why? • How can CA be sustainably supported to improve the rate of adoption?
-AEDC	• Are there any CA interventions in your area? If yes, what are they? • How many people are being targeted and what is the extent in terms of land use? • If no, what would the best approach to introduce CA interventions in this area? • How can CA adoption be facilitated to contribute meaningfully to people's livelihoods? • What is the capacity of local institutions promoting CA?	• What have been the people's perceptions about CA interventions (before, during and after introduction on their farms)? • What could be the present land area under CA? • Do you carry out field trainings on CA practices? How often and what is the main focus of such training? (Probe on participation in terms of gender, HIV affected households) • What is the general status of the smallholders in terms of food security? • What could be the right approach to facilitate CA interventions that involve many people in your area?

Forestry- DFO	• Do you know of any conservation agriculture interventions in the district? If yes, what do they do? • What do you think are the impacts of such interventions to the environment and forest management?	• What tree species/crop mix would you recommend for the specific hotspots in the district? • Has CA ever been regarded one way of ensuring forest/environmental management? Why?
NGOs/ Projects	• What are your areas of intervention in regard to CA? • What led you to undertaking such an intervention? • What have been the gains in CA so far? • What are implementation gaps? • Where should extra support be directed to further promote CA in this area? • Do you link CA to forest/ environment management in any way? • What is the capacity of local institutions promoting CA?	• What is your target population and land area for CA? • What difficulties did you note regarding adoption of the CA technologies? • What is the state of food security in this area? • What should be done to the hotspot community to further facilitate adoption of CA? (Hotspots to be named based on district where interview is being conducted) • Why do you think this approach is viable?
Lead Farmer	• What have been the people's perceptions (including yours) about CA interventions (before, during and after introduction on their farms)? • How many people have adopted CA and on what land size? • How has CA contributed to people's livelihoods in this area? • How often do you get extension services or training on good CA practices? • What tree species/ crop or animal mix would you want within CA?	• What are you practicing on your farm under CA? • How have you benefited from this intervention? (Probe for yield/Ha) • What type of support would be required to make many SH farmers adopt CA in this community? • What other CA practice would you want tried in this area and why? • Do you belong to any local institution which promotes CA?
Farmer 1 (beneficiary)	• What CA intervention are you undertaking? • How suitable is this intervention to your area? • Do you know of any other CA interventions?	• How did you come to know about this CA intervention? • What biophysical and social issues are you addressing in implementing CA practices? • What are the successes and failures of the current CA systems? • What type of support do you need to successfully

		practice CA in this community? • What is your general perception about CA with regard to farming systems and environmental management? • Do you belong to any local institution which promotes CA?
Farmer 2 (Non-beneficiary)	• Do you know of any CA interventions being implemented in your area? • Have you ever benefitted from such CA interventions? • What would motivate you to practice CA? Why? • Do you think CA interventions can improve livelihoods in this area? Why?	• What would say is the best CA practice in your area and why? • Are you ready to adopt new CA interventions in the coming farming season? What type? • What type of support do you need to practice CA in this community? • Do you belong to any local institution in this community? If no, why?

Appendix II.

Summary of identified issues of concern, CA practices and constraints in the Basin hotspots.

District	Identified Issue	Ranked CA practices	Constraints
Zomba	Soil degradation (erosion)	Contour marker ridges Ridge realignment Manure making Agroforestry techniques Planting of vetiver Check dams	Few extension workers Lack of line levels Inadequate supply of vetiver cultivars Lack of Agroforestry seed Lack of polythene tubes
	Drought/ Flooding	Crop residue management Reduced tillage Pit / basin planting Swales Rain Water Harvesting	Few extension workers Cost of herbicides and other inputs such as inorganic fertilizer and hybrid seed Unreliable water sources for irrigation Labour intensity
	River siltation	River bank planting	Lack of riverine tree seed Lack of polythene tubes
	Small land holding per capita	Intensive CA	Poor extension services Low incomes
Phalombe	Flooding/ Drought	Crop residue management Reduced tillage Pit / basin planting Ridge realignment Swales Catchment rehabilitation Vetiver planting on slopes River bank planting Rain Water Harvesting	Lack tree seeds Inadequate supply of vetiver cultivars Lack of polythene tubes Few extension workers Lack of line levels and other instruments
	Small land holding per capita	Intensive CA	Poor extension services Lack of farm inputs
	River siltation	Catchment rehabilitation Vetiver planting on slopes River bank planting	Inadequate supply of vetiver cultivars Inadequate tree seeds, Lack of polythene tubes Few extension workers
Machinga	Flooding	Catchment rehabilitation Vetiver planting on slopes River bank planting Rain water harvesting	Inadequate supply of vetiver cultivars Inadequate tree seeds, Lack of polythene tubes

			Few extension workers
	Drought	Rain water harvesting Irrigated farming Construction of swales	Clayey soils Sandy soils Lack of irrigation facilities and equipment
	siltation	River bank planting Ridge realignment Planting of vetiver Check dams	Inadequate supply of vetiver cultivars Inadequate tree seeds, Lack of polythene tubes Few extension workers
	Soil degradation (erosion)	Crop residue management Basin Planting Reduced tillage Contour marker ridges Ridge realignment Manure making Agroforestry techniques	Few extension workers Inadequate farm inputs Lack of line levels Inadequate supply of vetiver cultivars Lack of Agroforestry seed Lack of polythene tubes