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A REVIEW OF LESSONS AND SUCCESSES OF IMPLEMENTING UNDP GEF PROJECT ON LAKE TANGANYIKA IN ZAMBIA FROM 2008 TO 2013

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ABSTRACT: *This paper is a summary of lessons learnt and results from the implementation of the UNDP GEF Project on Lake Tanganyika in Zambia implemented between December 2008 and December 2013. The purpose of the project was to reduce sedimentation in the inflowing rivers of the Lake Tanganyika basin through cross-sectoral measures that help limit soil erosion and seek to halt and reverse deforestation. The project had people focus in that it aimed at providing alternative income-generating activities. The key objective of the project was achieved in that the capacity of Stakeholders in the lake catchment to manage and sustainably use agricultural and forest resources to reduce sedimentation and conserve biodiversity was built. Several people in the Mpulungu and Kaputa catchment of the Lake Tanganyika took up alternative income-generating activities such as fish farming, market gardening and chicken rearing. A revolving fund was created and linked to the Zambian National Farmers Union for sustainability reasons. The revolving fund will allow members of the community to borrow and pay back finances for income-generating activities for a long time to come.*

KEYWORDS: UNDP GEF, project, lessons, sucesses, implementation, lake tanganyika, Zambia

INTRODUCTION

Lake Tanganyika is an NNW-SSE trending lake on the border of DRC and Tanzania and is one of the basins of East African Rift System. It is over 700 km long, approximately 50 km wide and up to 1500 meters deep. Its structural evolution is best explained as pull-apart basins that developed along with pre-existing weaknesses of the Proterozoic belt, in an E-W extensional stress regime (Blasband, 2018).

Lake Tanganyika is among Zambia's important fisheries which require protection from adverse impacts. Sedimentation is one of the threats to Lake Tanganyika's biodiversity. This is because the deposition of sediment clogs streams and reduces their capacities (Sichingabula, 1999). Lake Tanganyika can be expected to display sedimentation patterns that are typical of rift basins (Blasband, 2018).

The lake's basin was undergoing deforestation at an alarming rate; rapid erosion as a consequence of this deforestation is resulting in the discharge of large volumes of sediment into normally clear-water littoral and sublittoral environments (Cohen *et al*., 1993). Sediment originates from the disintegration of rocks and is incorporated in the development of soils. The erosion of soil by water which results from the energy developed by the raindrops as they fall to the ground leads to the deposition of sediment into rivers and lakes. The deposition of sediments clogs streams and reduces the capacity of reservoirs and lakes (Sichingabula, 1999).

Pollution by sediment is also one of the major factors causing deterioration in the quality of streams and lakes. The sediment deposited into streams, lakes and reservoirs destroys the habitat for fish and other species (Sichingabula, 1999). Shell-rich substrate (shell beds) in the littoral reaches of Lake Tanganyika, Africa, form a unique substrate that hosts a number of endemic organisms, including sponges and shell-dwelling cichlid fish (Soreghan, 2016).

Once sediment is on the channel it is necessary to know how fast it is moving and what its effects are. It is desirable to analyze individual streams and to determine if high sediment yields are a natural phenomenon (as for example, in a decomposed granitic terrain in which the hydraulic geometry may support few pools). If this is the case, minimal action would be appropriate because instream work to create aquatic habitat would be very expensive with only limited and temporary results. If the sediment yield is higher than the natural or "background" rates, then action should be considered. Instream channel alteration to create aquatic habitat should be reserved as secondary work after the usually less expensive watershed treatment effects are analyzed. If instream action is required, a careful evaluation of treatment solutions should take place (Castro and Reckendorf, 1995).

The Zambian component of the United Nations Development Programme/Global Environmental Facility (UNDP/GEF) –supported Lake Tanganyika Integrated Management Project that was implemented between December 2008 and December 2013 focused on sedimentation control, which was within the framework of priorities of the sub-regional Strategic Action Programme (SAP). In the SAP, the control of sediment inflows from the steep mountainous terrain bordering Lake Tanganyika in both Mpulungu and Kaputa Districts was one of the most important areas for support. Over-fishing had also been identified as a key issue and was being addressed through co-finance and technical cooperation from the African Development Bank, FAO and

other partners of the Lake Tanganyika Integrated Management Programme (GRZ, 2015; Banda *et al*., 2015).

Emphasis in the project was on institutional strengthening with support to community participation in agriculture, forestry, and soil-erosion prevention. Best practice and innovation, as well as regional coordination and dissemination of lessons was assured by linking the project to the World Agro-forestry Centre (ICRAF)'s training and demonstration programmes as a regional activity.

MATERIALS AND METHODS

This is a paper put together to highlight the Zambian component of the United Nations Development Programme/Global Environmental Facility (UNDP/GEF). The spatial distribution of the project area boundary and catchment area was estimated at 365,645 hectares as shown in Figure 1.

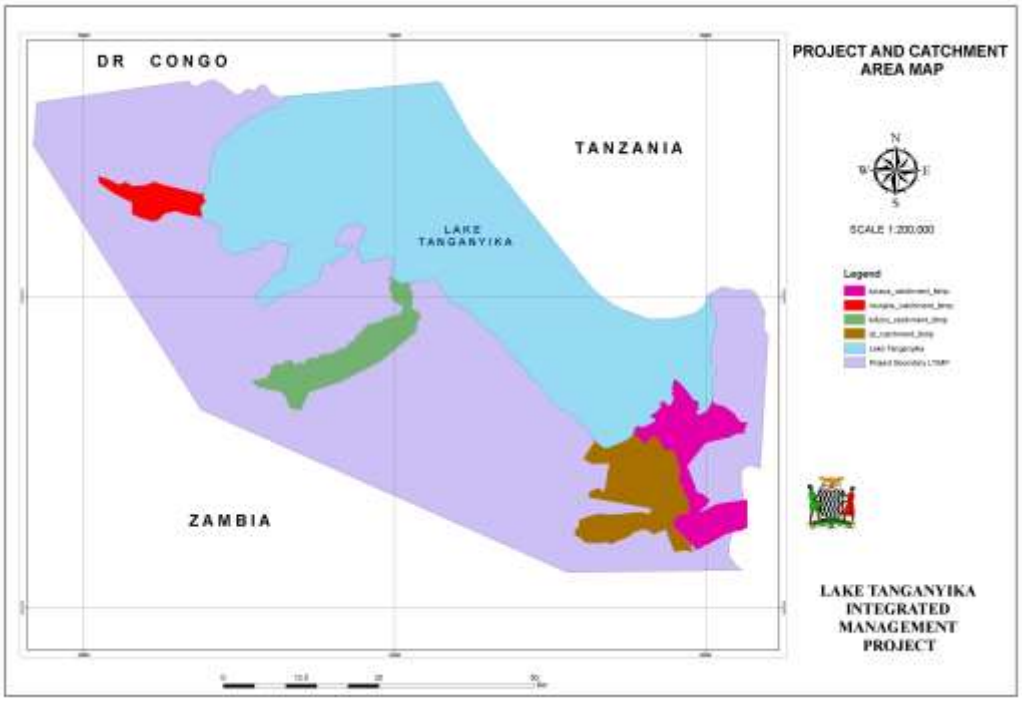

Figure 1: Distribution of project boundary and catchment areas

The rationale behind the research

The rationale behind this research and implementation of the project was to demonstrate that sediment inflows, a major problem in water bodies that are located in mountainous regions

could be reduced through an increase in the land brought under sustainable land use, particularly for agriculture and forestry, through cross-sectoral measures that helped limit soil erosion and seek to halt and reverse deforestation.

The emphasis of the project was on institutional strengthening with support to community participation in agriculture, forestry, and soil-erosion prevention. And its outcome was that stakeholders in the lake catchment were expected to manage and sustainably use agricultural and forest resources to reduce sedimentation and conserve biodiversity.

Additionally, the fact that the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) Zambia office was availing 2.8 million United States Dollars for implementation of the 5 years Catchment management project from 2008 to 2013 availed a good research opportunity. Best practice and innovation, as well as regional coordination and dissemination of lessons was assured by linking the project to the World Agroforestry Centre (ICRAF)'s training and demonstration programmes as a regional activity.

Institutional Arrangements

The UNDP/GEF Project on Lake Tanganyika was implemented by staff recruited by UNDP on behalf of the Ministry of Lands, Natural Resources and Environmental Protection (MLNREP) which was the implementing partner through the Department of Environment and Natural Resources. The Global Environmental Facility (GEF) provided funding and the United Nations Development Programme was the implementing agency. It was worth noting that UNDP Zambia Country office also provided funding amounting to 400,000 USD in addition to the 2,440,000 USD from Global Environmental Facility.

At district level, MTENR was delegated government oversight of the project to the District Development Coordinating Committee (DDCC) chaired by the District Commissioner's office in Mpulungu. To ensure that the project was entrenched and sustained, the project team staff worked with counterparts on the government side in the relevant government institutions in Mpulungu and Kaputa Districts. That facilitated effective exchange of information and put in place operational phase out modalities that ensured the continuation of project activities beyond the life of that Project. The Institutions that the project worked with at district level were Ministry of Agriculture; Forestry Department; Zambia Wildlife Authority; Water Affairs Department; Ministry of Community Development and Social Welfare; Department of Fisheries; the Local Authorities (Mpulungu and Kaputa District Councils) and District Commissioners offices in Mpulungu and Kaputa.

The steps employed to achieve the project objectives were:

1. Verification and Validation of Sites
    a. Visit sites
    b. Confirm locations
    c. Validate available data/Information on the Sites
2. Create Awareness about the Project
    a. Meet influential people in communities (councilors, village headmen)
    b. Meet the Chief
    c. Meet the community
    d. Facilitation of formation of Village Development Conservation Committees (VDCC) and Catchment Conservation Committees (CCC)
3. Conduct Baseline Surveys
    a. Participatory through a questionnaire
    b. Technical through consultants/PRA
4. Formulate Natural Resource Management (NRM) plans
    a. Take stock of resources
    b. Establish status of resources
    c. Establish root causes of observed conditions
    d. Propose remedial measures through formulation of an action plan
    e. Formulate by-laws
    f. Identify Alternative income generating activities
    g. Consolidate commodity groups
5. Capacity Building
    a. Conducting training needs assessment
    b. Conducting trainings
6. Implementation of Natural Resources management (NRM) plans and funding identified alternative income generating activities

7. Monitoring and evaluation (M&E): Although M&E appeared as a last step; it was being conducted throughout the implementation from step 1

PROJECT OBJECTIVE AND PROJECT OUTCOME

The Objective of the project was - **"**Levels of siltation/sedimentation in rivers flowing into Lake Tanganyika reduced in the pilot sites"; and the single Outcome was "Stakeholders in the Lake's catchment manage and sustainably utilize agricultural and forest resources to reduce sedimentation and conserve biodiversity"[GRZ, 2012] This was also in line with the Millennium Development Goal number 7: Ensure environmental sustainability (LTIMP, 1941; UNDP, 2011).

Project Components

Output 1: Sustainable natural resource use practices established

Output 2: Alternative income generating activities (AIGAs) developed

Output 3: Awareness of stakeholders on the importance of sustainable natural resource management raised

Output 4: Capacity of local governance structures for sustainable natural resource management enhanced

Output 5: Project efficiently and effectively managed, monitored and evaluated

3.2 Other noted achievements per output:

Output 1: Sustainable natural resource management practices

- Natural resources management plans and by-laws were developed by communities in the project sites
- Agriculture demonstration sites where low input agriculture was show cased benefiting 13,400 Farmers (5,360 women and 8,040 males)
- Establishment of tree nurseries in 10 schools
- Demonstration plots for fruits (11 plots for bananas and 3 plots for Oranges) were set up
- Community sensitizations on enforcement of natural resources by-laws resulting in several arrests. Chipote Community confiscated 286 pieces of illegal timber while Kabyolwe confiscated 27 and the VCDCs are working hand in hand with the DFO. By-law enforcement seen through reports within the community of illegal activities which was not happening before. The number of cases handled by the communities (26 cases reported most of them on illegal charcoal production and a few on illegal timber harvesting by trained community forest rangers) was significant.

- Protection of 200 hectares of natural forests; Trees planted in 50 hectares in Commercial woodlots and 100 hectares on individual farmer plots.
- Water quality monitoring
- Mainstreamed HIV/AIDs, Gender and Climate change in all the trainings as cross-cutting issues during the woodlot nursery establishment training were held in 2011.

Considering that the overall objective of the project was to reduce the sediment load in rivers flowing into Lake Tanganyika in the pilot sites by 30%. In aquatic environments, sediment impairs the dissolved oxygen balance and obscures the light needed for aquatic growth, both of which are detrimental to aquatic life forms. Additionally, heavier sediment particles blanket fish spawning areas and cover food supplies for many species (Sichingabula, 1999). Tanganyika deposits are dominated by organic-rich, biogenic muds. Steep fault-escarpments and uniform slopes along-shelf platform and rift-axis lake margins promote the efficient transport of sands into profundal settings (Cohen, 1989).

The major outcome was to be achieved through the management and sustainable use of agricultural and forest resources which would also conserve biodiversity.

Four rivers were targeted by the project and extensive work carried out in their catchment and with their communities. The results that have been gleaned from various documents reviewed by the evaluator are in the table below.

Tabl 1: Reductions in sediment load achieved (from Philip Tortell, August 2012 Terminal Evaluation Report)

RIVER	BASELINE LOAD in 2010	ACHIEVED LOAD in 2011	REDUCTION	COMMENT
Izi	4.85 tonnes per day	0.84 tonnes per day	83%	Excellent reduction but the amounts were very small to begin with.
Lufubu	158.99 tonnes per day	114.76 tonnes per day	28%	Good reduction. This was the highest load of the ones measured and addressed and it could be more productive for future catchment work to be focused on this catchment where the gains could be greatest.
Lunzua	23.48 tonnes per day	1.94 tonnes per day	92%	Excellent reduction was achieved here.
Munjela	na	na	na	Various sources indicate that the sediment load in the Munjela has not been reduced despite the project's work in the catchment. The actual amounts are not reported, the project has not analyzed the results and the reasons for this anomaly are not known.

One of the weaknesses of the above-indicated results was that sampling took place quarterly over an 18-month period to assess the impact of catchment activities even if the project was for 60 months. We will discuss this a bit when we look at the implication of future research towards the end of the paper. Unfortunately, the absolute results were not entirely reliable because of the

short period of sampling. However, and in spite of these caveats, the results achieved in the Izi, Lufubu and Lunzua Rivers are very satisfying and, in spite of the fact that anecdotal reports indicated that the situation in the Munjela River was not so auspicious, the effectiveness of project execution was considered to have been very good and reasonable.

OUTPUT 2: Alternative income generating activities researched, piloted, and disseminated:

- The revolving fund was established by 2010
- Loan applications were processed by Village conservation development committee (VCDC) level to DDCC level for desk and field appraisal
- In terms of number of beneficiaries 847 households had benefited by close of 2011, 471 of which male headed households while 366 were females headed households. A total of 308,000 USD was disbursed to the 847 households.
- The project adopted the policy of helping vulnerable but viable farmers and it trained the beneficiaries of the revolving fund in Business skills etc
- As of 31st December 2011, the fund had grown from 308,000USD (1.54 Billion ZMK) originally provided by GEF and UNDP Country office from December 2009 to 323,000 USD (1.615 Billion ZMK)
- 24 individuals closely monitored by the project had grown their income from an average of 157 USD dollars per year to 5000 USD by investing in vegetable growing; bee-keeping; fish farming and growing seasonal crops

Output 3: Awareness of stakeholders on the importance of sustainable natural resources management raised

- Several awareness meetings were held for communities in all the 11 VCDCs leading to change of attitudes of community members by giving up practices such as charcoal burning; poaching and destructive clearing of forests for agriculture purposes and energy.
- Awareness meetings on tree nursery establishment and management were held at the 10 schools in the project area leading to almost 100% adoption of tree nursery nurturing and tress planting efforts by the schools.
- Awareness meetings for leaders (Chiefs, Councilors and Headmen) were held leading to improved perception about natural resources conservation
- Capacity of Village Conservation Development Committees, headmen, and chiefs to manage themselves, hold constructive meetings, enforce natural resources by laws was enhanced.
- Areas for natural resources regeneration were identified and demarcated in Mpulungu and Chambanenge local forests

Output 4: Capacity of local governance structure for sustainable natural resource management enhanced

- 11 VCDC have been established and capacity enhanced
- All 11 VCDC have enacted by-laws and are enforcing them

Output 5: Project efficiently and effectively managed, monitored and evaluated

- Mid-term Evaluation was undertaken in September 2011 and it highlighted that the Project Management Unit for the Zambian component had been very effective in its work (UNDP, 2011).

CHALLENGES:

- Limited parcel of land for woodlot establishment. To resolve this challenge, the project worked closely with the traditional leaders to get more land for commercial woodlots.
- Rigidity among some local community members to give up destructive tendencies to natural resources such as charcoal burning, illegal fishing and timber harvesting.
- The non-disbursement of revolving fund loans to community members due to delays in signing the memorandum of understanding (MOU) with Zambia National Farmers Union, a farmers' membership group organization as part of the project exit strategy, discouraged the farmers and dampened their morale as they had not anticipated the situation in 2012
- Political Interference and wrong promises to farmers not to repay back loans affected the recovery rate in 2011. Zambia held Presidential and Parliamentary elections in 2011. To resolve this challenge the project has been engaging the Politicians and District Level Leaders to urge communities to pay back.

LESSONS LEARNT, JUSTIFICATION AND CONCLUSION

Lessons Learnt

An appropriate place to begin when discussing sedimentation is at its source. Sheet & rill, gully, and ephemeral gully erosion from hillslopes are the major sources of most sediment introduced into stream channels. Exceptions to this are where sediment is substantially produced by landslides, debris flows, streambanks, irrigation, and roadsides. The hillslopes are the portions of the landscape that are zones of sediment production. The movement of sediment from the hillslopes may be transport and/or supply (weathering) limited (Castro and Reckendorf, 1995). Some of the important lessons learnt during this project implementation and study were as follows:

- Sedimentation can be controlled through effective community mobilization. The success of the pilot project in Zambia justifies the need for replication of the results in an up-scaled project intervention
- Positive input and backstopping from the funding agency and the implementing agency is crucial in the success of an intervention. UNDP Zambia and The Zambian Government have been very supportive to the Project Management Unit.
- Team building through motivating team members and clear planning play a key role in successful project implementation.
- Positive altitude change is one of the most important steps towards livelihood improvement
- Organizing Communities through groups raises their ability to borrow and pay back
- Women are more likely to pay back loans than men
- Government Officers are very supportive and if properly motivated can deliver meaningful results comparable to short term Consultants.
- Communities can learn if facilitators are patient despite the literacy barrier
- Political Interference can negatively affect a successful intervention,
- Much as the UNDP GEF Project on Lake Tanganyika has had success in helping establish income generating activities that are an important alternative to fishing, the community attitude towards fisheries resources did not improve neither did the need for collaborative management of fisheries resources seriously register on people's minds. (Banda *et al*., 2015). This might be because of the mismatch in terms of starting time with the African Development Bank funded sister Project that was focusing on fish conservation that only took off in 2011, way after the mid-term evaluation of the UNDP GEF funded project which was ending in 2012. The earlier arrangement was that the two projects should have started at the same time in 2009.

Justification with regards to novelty in this paper and Implications on future research

From the literature review undertaken during the project preparation phase, it was clear that catchment management had been implemented in some parts of the world. However, there was no record of an attempt at observing the direct impact of project interventions that improved land use management to reduction in sediment load in a mountainous landscape like the Lake Tanganyika area of Zambia where communities were sensitized and taking on new income-generating activities as they were giving up bad land-use practices such as poor cultivation on steep slopes. Naiman *et al*., (2005) noted that much remained to be learned about the relationship between improved land-use interventions and ecological responses such as a reduction in sediment load.

As indicated above, one of the weaknesses of the results of this study was that sampling took place quarterly over an 18-month period to assess the impact of catchment activities even if the project was for 60 months. Unfortunately, the absolute results were not entirely reliable because

of the short period of sampling. There was a need for more research in order to properly attribute and correlate the sediment load with the project catchment activities. There could also be seasonal differences, rainfall variations, and other external influences. Detailed research which is without serious time limitations would elucidate all the grey areas and provide more clarity from a longer sampling period.

CONCLUSION

The key objective of the project was achieved in that the capacity of stakeholders in the lake catchment to manage and sustainably use agricultural and forest resources to reduce sedimentation and conserve biodiversity was built. The monitoring done at the pilot sites proved that Levels of siltation/sedimentation in rivers flowing into Lake Tanganyika reduced in the pilot sites. The independent terminal evaluation consultant gave the project an overall rating of satisfactory (GRZ, 2012; UNDP, 2011); which is equivalent to very good in Global Environmental Facility (GEF) classification. Note that the highest rating in GEF classification is Highly Satisfactory and is equivalent to Excellent. Several people in the Mpulungu and Kaputa catchment of the Lake Tanganyika took up alternative income generating activities such as fish farming, market gardening and chicken raring. A revolving fund was created and linked to the Zambian National Farmers Union for sustainability reasons. This was in line with recommendations of the mid-term evaluation report that recommended that the revolving fund be handed over to a competent entity (UNDP, 2011). The revolving fund will allow members of the community to borrow and pay back finances for income generating activities for a long time to come. It is worth noting that much as the UNDP GEF Project on Lake Tanganyika has had great success in helping establish income generating activities that are an important alternative to fishing, the community attitude towards fisheries resources did not improve neither did the need for collaborative management of fisheries resources seriously register on people's minds (Banda *et al*., 2015).

Examples of Individuals whose lives changed because of The UNDP GEF Project interventions.

6.1 Mr. Sichilima: Patrick Sichilima of Munjela in Kaputa District used to have an annual income of about K2, 500 per year before the project. He got an initial loan of K1, 800,000 that he paid back and got a second loan of K6, 000. He is working very hard to become a real household name in vegetable growing in the Nsumbu community and the nearby tourist lodges. His annual income so far has increased ZMK to K 25,000 ZMK per year after investing in vegetable production. Mr. Sichilima pays attention to measures against sedimentation.

Plate 1: Mr. and Mrs. Sichilima of Munjela village in their rain fed tomato field. The crop was grown using a loan from the revolving fund (January 2011). This farmer is doing well both on the production side and putting sedimentation measures in place (ridges ploughed across the slope and storm drains).

Plate 2: David Silunjili of Mbete Village developed from a mere fisherman with little income of just under 160 USD per year to an onion exporter to the neighbouring Democratic Republic of Congo.

6.2 Plate 2 shows David Silunjili (in blue T shirt and gumboots) with a friend in his onion field. The picture was taken in August 2011. He was expected to harvest 20 x 90kg bags of onion, whilst in 2010 he harvested 14 x 90kg bags which he sold in Kasumbalesa and realized K 10,000 (2000 USD).

6.3 Plate 3 shows Mr. Simwinga, a farmer in Mwanamboko area nearly the Lunzua power station, who had been farming for more than 12 years before the start of the UNDP funded Project. He would grow just enough Maize for home consumption. After the start of the project, he expressed a lot of interest of working with the project. He got a loan of K1, 500 from the Project revolving fund and grew a crop of Maize in 2009/2010 farming season. Armed with knowledge on good farming techniques from several lessons he had received from the UNDP/Lake Tanganyika Project, he ploughed his field meticulously and paid attention to the required spacing between plants. Mindful of mitigation measures against sedimentation, Mr Simwinga put in place contour ridges around his field. He produced enough Maize for home consumption for the whole of 2010 and sold the surplus and generated K8, 000 (1400 USD) from his crop of Maize. He used the money he generated to meet household bills such as schools, hospital bills and recapitalization of his farming enterprise through buying agricultural inputs.

Plate 3: Mr. Simwinga in his maize field

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6.4 Plate 4 shows Mrs. Simwinga, a hard-working house wife.

Plate 4: Mrs. Simwinga and her grandson at the fish ponds (January 2011)

Before the start of the project, she had already set her eyes on starting fish farming but did not have the required capital and therefore was entirely dependent on her husband for all her financial requirements. At the start of the UNDP/Lake Tanganyika Project, Mrs Simwinga joined the Fish farming commodity group, went through a lot of learning sessions and practical demonstration organized by the project. In April 2010, Mrs Simwinga applied for a loan of **K10, 000 (2000 USD)** to set up her dream business. She expanded her fish ponds, bought fingerlings from Misamfu Research station and local materials for making feed. Apart from planning to sell table size fish, Mrs Simwinga's intention was also to be a source of fingerlings for other fish farmers in her community. Mrs Simwinga stocked 4 large fish ponds with 15,000 fingerlings.

The expected production under management then, made by Department of fisheries in Mpulungu was 763 Kgs of table size @K20,000 per kg implies having an income of **K15,260** per six months for a long time to come since the cycle will be repeated over and over using fingerlings kept in a holding pond in each life cycle. The estimate from sell of fingerlings per six months was K3, 000. This implies that Mrs Simwinga had been empowered and was going to have have a total income of **K18, 260** every six months for a long time. With this money, she can meet the school and medical bills and her many other personal requirements independent of her husband.

6.5 Plate 5, shows one of the farmers at Mbete village.

Plate 5: One of the farmers in Mbete Village of Mpulungu

The Farmers in Mbete Village of Mpulungu were taught to plant their garden crops on raised ridges. These ridges stop soil erosion and make it easy to carry out furrow irrigation as they help the water to soak in the planted area. As result, production of onion, tomato and Okra increased in the area. The annual average income in households involved in Vegetable production increased from about ZMK 3,000 (600 USD) mainly from fishing at the start of the project in 2009 to ZMK 30,000 (5000 USD) in 2011. The farmers sold their produce to Mpulungu and Mbala towns and even the Copperbelt towns of Ndola and Kitwe in the case of Onion. This intervention also helped reduce sedimentation into Lake Tanganyika; relieved the Fish resources of further pressure of being further decimated and improved the farmers 's disposable income for hospital bills; school fees and household feeding.

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