Project Update: March 2022

1. PROJECT INCEPTION

I received funds for project implementation in June 2021. The project was executed in selected nine (9) villages located in two districts which are Babati rural (five villages) and Monduli (four villages) districts. The villages were selected because they are directly adjacent to lake Manyara. We began project activities by launching the inception event from 7th to 21st September 2021 which aimed at introducing the project to key stakeholders. Using indoor focus group meetings we invited and meet with village leaders, fisheries officers, forest officers, representatives of farmers, fishers, and pastoralists and other stake holders. In these meetings we presented the objectives and envisaged activities of the project. We also discussed existing challenges pertaining to conservation of Manyara Tilapia and on how our project setup can be improved subject to the prevailing economic challenges and land use practices. The goal of the inception stage was to make stakeholders fully aware of the project, its main activities and expected benefits. I also visited district administrative secretaries (DAS) of Monduli and Babati districts to familiarize them with the project. In general, the project was well received by the local community.

After having discussed issues and challenges related to the project, we then had an opportunity to introduce our main funder "Rufford Foundation" to the stakeholders. We acknowledged the great support we got from the Rufford Foundation and discussed in detail about The Rufford Foundation and its main role in conservation of biodiversity in Tanzania and globally. Below are some pictures that were took during project inception.

Above: The project leader is presenting the project the event which was accompanied by breakfast. Others are village leaders and representatives of different social groups from four villages in Monduli district, i.e., Oltukai, Loswila, Migombani, and Eslalei villages.

Above: The project leader is presenting the project the event which was accompanied by refreshments. Others are village leaders and representatives of different social groups from five villages in Babati rural district, i.e., Minjingu, Magara, Mdori, Vilima vitatu, and Ngolei villages.

2. ASSESSING STOCK SIZE OF MANYARA TILAPIA AND CONDITION OF ITS ECOLOGICAL HABITAT

The field survey to assess the population of Manyara Tilapia and condition of its habitat in lake Manyara was carried out from 29th September to 30th October 2021. Reconnaissance survey identified 16 fish landing sites (fishing camps) on the shore of lake Manyara of which only eight were visited. To facilitate easy implementation of the study, the entire lake was divided into eight (8) study zones each made up of two (2) fish landing sites. In each zone one representative site was visited three (3) times a month. The first visit was for landings estimation, second visit for measuring fish length and third visit for measuring habitat condition parameters. During the visits, fishing boats, fishermen, type, and number of fishing gears along the lake shore were enumerated. Population of people engaging in other fisheries related activities were also counted. Two fishing boats were hired for collection of fisheries dependent data. Upon landing to the shore all fishes in these boats were counted and some were sub-sampled for measuring their standard lengths (SL) using a ruler and the records logged into field logbooks. Photographic records were also taken. Measurement of standard length was important for assessing the structure of population of fishes in lake Manyara and the subsequent effect of the dominant fishing gear on sizes of fish in the lake. This stock assessment of fish in lake Manyara used catch per unit effort method (CPUE) as stipulated in Kantoussan et al., 2014. During this survey unit effort was defined as a fishing trip per boat per day and catch by number of fishes landed on the shore per boat per fishing trip. Catch weight was measured using a 20L bucket which was assumed to be equivalent to 20Kg. This bucket is the catch measurement tool the fishers use at lake Manyara. To get a wider picture of the catch size, the field team continued to count all fishes in many boats as they can that landed at the lake shore. This was done after finishing dealing with the selected two boats. Habitat assessment was done by measuring in situ selected proxies for habitat condition which were levels of turbidity, dissolved oxygen (DOC), chlorophyll-a (Chlo-A), salinity and average depth. Other parameters such as Nitrate and Orthophosphate as indicators of eutrophication were analyzed in the laboratory. During in situ measurement researchers sailed with fishers into the lake during normal fishing hours. We identified four species of fish in the lake i.e., Manyara Tilapia (*Oreschromis amphimelas*), Nile Tilapia (*Oreochromis niloticus*),

African catfish (*Clarias gariepinus*) and Sardines and the water was very turbid and eutrophied. Most of the fishes were of small size (SL: 3-13cm Manyara Tilapia and Nile Tilapia).

Limitations

All landing sites on the shore of lake Manyara were not visited due to fund limitation. However, we made all efforts to ensure that the collected data are representative as possible such that they allow effective estimation of the stock of Manyara Tilapia and assessment of its population structure.

Field team

The field survey involved the following people.

- Mr. Gordian Mataba (Nelson Mandela African Institution of Science and Technology).
- Dr. Grite Nelson (Nelson Mandela African Institution of Science and Technology).
- Mr. Joseph Kigoda (Fisheries officer – Monduli district).
- Mr. Haji Deus (Fisheries officer – Babati rural district).
- Mr. Wambura Patrick (Fisherman).
- Mr. Dula Mohamed (Fisherman).

Remaining work

To compile and analyze the data, writing manuscript and publishing results.

Below is a summary of some of the collected data

Table 1. Estimated landings per day

S/n	Fishing camp	Number of fishing boats	Number of fishers	Number of camp residents	Mean catch/ boat/ day	Number of 20Kg buckets that are equivalent to mean catch/boat/ day	Total number of 20Kg bucket /per camp/ day	Estimated total Kg of catch landed/ day
1	Kambi ya Fisi	30	60	200	500	2	60	1,200
2	Kisese	100	200	300	473	2	200	4,000
3	Mfuru wa ng'ombe	120	120	400	1,033	3	360	7,200
4	Kambi ya kayabo	22	88	300	12,000	4	88	1,760
5	Migunga mitatu	146	184	350	66	0.3	43.8	876
6	Ngogolo	146	178	840	567	2	292	5,840
7	Olasti	98	196	300	10,500	3.5	343	6,860
8	Paris	76	174	215	7,367	6	456	9,120
	Total							**36,856**

Table 2. The measured habitat condition parameters

S/n	Camp	Depth (cm)	Chlorophyll-A (µg/l)	Phycocyanin (µg/l)	Turbidity (FAU)	pH	TDS (mg/l)	Conductivity (µs/cm)	Salinity (PSU)	NO3 (mg/l)	NH4 (mg/l)	PO4 (mg/l)	Eastings	Northings	Zone
1	Kambi ya Fisi-1	79	378.5	10.39	75	8.08	2020	4050	2.13	76.5	0.09	3.87	805273	9581833	36M
2	Kambi ya Fisi-2	216	330.5	9.472	37	9.72	2059	4127	2.18	24.4	0.02	1.5	804837	9581746	36M
3	Kambi ya Fisi-3	376	327.5	9.541	64	9.93	2101	4216	2.22	7.6	0.16	5.61	804521	9581679	36M
4	Kisese-1	243	343.6	10.69	57	8.85	1910	3829	2.01	54.6	0.03	4.62	805210	9577386	36M
5	Kisese-2	304	339.9	9.656	47	9.41	2037	4078	2.16	10.7	0.04	5.53	805634	9577451	36M
6	Kisese-3	313	334.6	9.858	50	9.62	2031	4065	2.15	30.8	0.03	5.25	805913	9527512	36M
7	Mfuru wang'ombe-1	152	320.9	9.025	50	8.16	2116	4220	2.25	51.2	0.1	3.72	811549	9582613	36M
8	Mfuru wang'ombe-2	394	294.8	9.207	72	8.1	2099	4164	2.22	29.5	0.13	3.75	810274	9582707	36M
9	Mfuru wang'ombe-3	462	296	8.638	36	9.84	2216	4426	2.36	13.8	0.02	6.06	810271	9582901	36M
10	Migunga mitatu-1	90	352.6	8.989	89	9.86	2185	4358	2.32	12.9	0.1	5.55	821545	9619601	36M
11	Migunga mitatu-2	324	344	8.923	82	9.92	2204	2403	2.35	9.8	0.08	4.96	821214	9619313	36M
12	Migunga mitatu-3	336	348.1	9.114	64	9.98	2184	4372	2.32	8.2	0.02	6.24	820985	9619180	36M
13	Ngogolo-1	67	565.4	9.557	80	9.88	2291	4586	2.44	10.5	0.12	5.91	822960	9614488	36M
14	Ngogolo-2	243	329.8	8.236	88	9.93	2204	4411	2.34	7.6	0.14	4.68	821607	9614365	36M
15	Ngogolo-3	304	314.5	8.268	89	9.91	2174	4360	2.31	12.7	0.09	4.86	820848	9613590	36M
16	Olasiti-1	109	325.1	9.964	150	9.97	2204	4412	2.34	20.4	0.29	4.41	821815	9593178	36M
17	Olasiti-2	196	461.4	10.52	118	9.99	2284	4566	2.43	17.8	0.41	5.43	821210	9593471	36M
18	Olasiti-3	262	309	9.225	114	9.96	2182	4365	2.31	9.5	0.28	5.25	821020	9593560	36M
19	Paris-1	111	348.2	9.931	72	9.73	1994	3984	2.11	15.8	0.04	6.36	807314	9575753	36M
20	Paris-2	187	336.6	9.642	71	9.73	1946	3906	2.05	10.7	0.02	5.4	807566	9575758	36M
21	Paris-3	212	344.9	10.32	103	8.77	1908	3808	2.01	26.3	0.03	4.98	808878	9574904	36M

Some photographic records


Few (57) large Nile Tilapias were caught at Kisese landing site (SL: between 20-26cm). The rest 1840 were between SL=6-19cm.


Left: Few (2) large Manyara Tilapia were caught at Ngogolo landing site (SL: between 21-23cm). Right: Size of Manyara Tilapia commonly caught at all landing sites (SL: between 3-12cm). 2252 fishes.


Catfishes of different sizes were also caught by hood and line and by long line.


Left: Sardines. Right: A woman carrying fishes in a 20Kg bucket at Kambi ya fisi landing site.

Left: Fishing boats on the lake shore at Mfuru wang'ombe. Right: Fishing boats at Kisese landing site.


Longline fishing gear.

Gill net gear with and without fishes.

Beach seine nets.

Left: Beach seining at Olasiti landing site. Right: Beach seining at Kambi ya Kayabo Mfuru wa ng'ombe.

Product of beach seine (sun dried small fishes-a.k.a Kayabo) at Kambi kayabo Mfuru wang'ombe.

Busket traps Paris camp.


Left: Measuring fish length at Kisese. Right: Measuring fish length at Mfuru wa ng'ombe.


Left: Measuring fish length at Paris camp. Right: Women processing fishes for sale at Mfuru wa ng'ombe landing site.


Left: Project leader and one of the field assistants at Kisese. Right: Project leader and some of the field assistants at Mfuru wa ng'ombe camp.

Left: Appearance of Mfuru wa ng'ombe fishing camp. Right: Appearance of Olasiti fishing camp.

Project leader analyzing water for Nitrate, Ammonium and Orthophosphate at The Nelson Mandela African Institution of Science and Technology (NM-AIST) water laboratory.

Below pictures show different birds that were found at the shore of lake Manyara

3. DISSEMINATION OF CONSERVATION AWARENESS

The importance of conservation education is that it raises understanding of individuals on the importance of natural resources and their conservation. It instills in local communities the sense of ownership and responsibility towards existing natural resources, hence make local people value natural resources and stimulate their conservation. During execution of this project, we also created conservation awareness to communities surrounding lake Manyara from November 15 to 15 December 2022. We visited nine (9) villages (Minjingu, Magara, Mdori, Vilima vitatu, Ngolei, Oltukai, Loswila, Migombani, and Eslalei) that are adjacent to lake Manyara and met with focus groups through organized indoor meetings, and the general public through outdoor public meetings. We started by meeting with village leaders, representatives of fishers, farmers, pastoralists, and schoolteachers in indoor meetings. We thought that educating first the leaders will have far reaching impact as these will be the ambassadors and frontline environmental supporters in their communities. We then met with all villagers in the public meetings. This was important to make sure that the knowledge provided may be transferred to other villagers who fails to attend the village meeting. We discussed several issues including conservation of Manyara Tilapia through sustainable fishing. We also stressed on good farming practices as the only way to reduce deterioration of ecological habitat of Manyara Tilapia in lake Manyara. Two meetings were held in each village on separate days. More than 200 local people were able to participate in this conservation education campaign. The focus of this education program was to raise Manyara Tilapia conservation awareness in communities.

The program was very interactive, pretesting of conservation awareness among villagers revealed that villagers seemed to have some level of knowledge on environmental conservation particularly on illegal fishing (such as beach seining, use of banned small mesh nets and fish poaching which is fishing during closed seasons and fishing without licenses) and on bad farming/cultivation practices (e.g., overgrazing, shifting cultivation, and cultivating on sloping lands). The big challenge is failure to adhere to existing environmental regulations with many villagers still practicing forbidden activities in the lake and in nearby surroundings to meet their daily needs. Also, many of the villagers are still not well familiar with the importance of species conservation and sustainable utilization of natural resources. They even didn't know what species endemism and endangered conservation status mean. Hence, they were unaware that Manyara Tilapia is endemic and endangered. These two challenges pose big threat on sustainability of fish stocks in lake Manyara

and continued existence of Manyara Tilapia. Overall, conservation education was well given to villagers particularly on the advantages of conserving fish stocks in lake Manyara at family and national level, and on the effects of environmental degradation on fish stocks in lake Manyara.

Topics offered during the program were

- Importance of natural resources and the need for their conservation.
- History of lake Manyara and its fish resources.
- Introduction to Manyara Tilapia and its endangered status.
- Threats to conservation and existence of Manyara Tilapia and other fish stock in lake Manyara.
- Effects of clearing of vegetation cover and overgrazing on soil conservation.
- Sustainable fishing and implications of unsustainable fishing practices.
- Fisheries management strategies.
- Ways to prevent soil erosion.

Facilitators were

Mr. Gordian Mataba (NM-AIST).
Ms. Happy Masaki (Forest officer - Monduli district). Mr. Joseph Kigoda (Fisheries officer – Monduli district). Mr. Haji Deus (Fisheries officer – Babati rural district). Mr. Alfan Rashid (Livestock officer- Babati rural district).

Other identified challenges

Fish stocks in lake Manyara is nearly under open access. No established beach management units (BMUs) for co-management of this resource. BMUs ensure villagers directly participate in the management of fish resources and in accrual of the benefit thereof. District offices administer fisheries at lake Manyara however, they lack adequate fund and field equipment such as patrol vehicles and fuel for regular law enforcement. With this remark BMUs are therefore important for law enforcement when the government is not around.

Recommendations

Education on environmental conservation and sustainable utilization of natural resources (including fish stocks in lake Manyara) needs to be conducted regularly to the villages neighboring lake Manyara. Direct or indirect benefits of lake resources need to be clear to the local communities as this may help to reduce the rate of environmental degradation and overfishing and motivate them to conserve the lake and Manyara Tilapia. Projects conducted for conservation of lake Manyara and its resources should somehow benefits local people's livelihood as this will increase their collaboration and support towards conservation of lake resources.

Below are some pictures that were took during the program

Project leader before villagers during a public meeting at Mdori village.


Meeting with village leaders and representatives of selected social groups.

4. ALTERNATIVE INCOME GENERATING ACTIVITIES

We also initiated small projects as alternative income generating activities (IGAs). These included poultry farming and tree planting activities.

Tree planting

To conserve soil erosion and reduce sedimentation in the lake, we lunched a tree planting small project from 3rd January to 16th February 2022 in four villages (Oltukai, Loswila, Migombani, Eslalei) located in Mtowambu area in Monduli district. The project also aimed at improving water quality in rivers and streams during wet months. Apart from the conservation education provided, during tree planting phase villagers received further practical training on tree planting and preparation of tree nurseries. We visited several river channels, streams, and farms for field training. The tree planting exercise focused on riverbanks and farm edges. For demonstration purpose we planted 150 fruit and nonfruit trees in a farm area of seven hectares (ha). Fruit trees were planted on farm edges and non-fruit trees along riverbanks. This exercise was well received by villagers who most of them were farmers and was facilitated by the forester Ms. Happy Masaki. Villagers were also trained on tree nursery production and on how to monitor their growth. Tree nurseries of about 2,000 trees to be planted in degraded areas adjacent to lake were prepared and some may be sold for income generation. A total of 100 people were trained on tree planting and tree nursery production. For nursery preparation the 100 people were divided into ten (10) groups which were selected during public meetings and received training and, some tree seeds, polyethene bags and watering cans were left to them for future use as startup materials. We also agreed that the day-to-day monitoring and technical assistance will be done by the forester

Ms. Happy Masaki from Monduli district. The table below shows a list of planted trees.

Table 3. List of planted trees

Common name	**Vernacular name**	**Scientific name**	**Fruit tree or not**
Mango	Muembe	*Mangifera indica*	Fruit
Lemon	Mlimao	*Citrus limon*	Fruit
Purple	Mzambarao	*Syzygium cumini*	Fruit
Mitzeeri	Mmaria	*Bridelia micrantha*	
Pink cedar	Mbunduki	*Acrocarpus fraxinifolius*	
Cape fig	Mkuyu	*Ficus sur*	Fruit
African fern	Mpaini	*Afrocarpus gracilior*	
Cordia	Msumari	*Cordia africana*	
Siemese cassia	Mjohoro	*Senna siamea*	
African baobab	Mbuyu	*Adansonia digitata*	
Drumstick	Mlonge	*Moringa oleifera*	Fruit
African cherry	Mtipisi	*Prunus africana*	Fruit
Sugar apple	Mtopetope	*Annona squamosa*	Fruit
Soursop	Mstafeli	*Annona muricata*	Fruit
Jackfruit	Mfenesi	*Artocarpus heterophyllus*	Fruit
Jacaranda	Mjakaranda	*Jacaranda mimosifolia*	
Quinine	Msesewe	*Rauvolfia caffra*	
Sweet orange	Mchungwa	*Citrus sinensis*	Fruit
Royal poinciana	Mkakaya	*Delonix regia*	
Avocado	Mparachichi	*Persea americana*	Fruit
Large leaved Albizia	Mduruasi	*Albizia versicolor*	

Below are some pictures during tree planting exercises and nursery production

Farmers selecting and taking trees for planting exercise during field training.

Villagers learning how to plant trees.




Some planted trees adjacent to stream banks.

Example of bare stream banks.

Pictures showing how tree protects riverbanks.

Tree nurseries.

Poultry farming

To reduce overdependence of villagers on fishing as their main livelihood activity, and to ensure that local community benefit from conservation projects, on 1st March 2022 we introduced a small project on indigenous poultry farming to boost income of villagers. This project was not to substitute fishing but rather to serve as an alternative income generating activity to curb overfishing in the lake. We started by providing entrepreneurship and poultry farming training to villagers from five (5) villages in Babati rural district (i.e., Minjingu, Magara, Mdori, Vilima vitatu, Ngolei). Mr. Alfan Rashid the livestock officer from Babati rural district facilitated this training. Subject to the amount of available fund the project intended to build five (5) chicken houses in three villages (Mdori-two houses, Ngolei-two houses, and Minjingu-one house) which would act as pilot projects or field classes. Through these projects other villagers not included in the projects would learn and start their own chicken farming. As startup inputs we have constructed three strong (of brick) chicken houses on two villages (Mdori-two houses and Ngolei-one house), provided 10 local hen and two cocks for each house. We also provided poultry vaccines and medicines. The aim is that the chickens would increase in a multiplicative way when they reproduce. Each local hen can produce a minimum of six chicks after every four months. Local chicken and their products fetch high price in Tanzania. Thus, villagers can sell them, their eggs, e.t.c and improve their income. Each chicken house was under a group of ten villagers which were selected during public meeting. We build strong houses that would protect chickens from rain and carnivorous animals that

would dig holes through walls and reach chickens.

We decided to use local varieties instead of layers/broilers because local breeds are resistant to diseases and can easily tolerate environmental stresses. They can feed themselves by collecting food when roaming outdoor. Thus, there is no feeding cost especially when they are in small number. This strategy is relevant and affordable to villagers even after project phasing out. Broilers are very prone to diseases and environmental stress. Chicks especially are very prone to low temperature, may end up dying if left unprotected. However, the cost of managing temperature for the chicks is very high such that villagers will not afford. Also, handling and feeding costs for layers/broilers are higher than what the project and villagers could afford.

Topics offered during the training were

- Importance of poultry farming for family income
- Poultry varieties
- Poultry houses
- Poultry diseases
- Poultry vaccination
- Poultry feeds and feeding
- Treatment of poultry disease
- Poultry products (eggs, feathers, chicks, chicken, meat, manure)
- Market for poultry and its products.

Challenges

Actual costs for construction of chicken houses are higher than what was budgeted.

Remaining work

Constriction of other chicken houses in other villages and provision of chickens and other startup inputs.

Here below are some pictures showing different events during implementation of the poultry farming project.

Training on poultry farming provided by Mr. Alfan Rashid the Livestock officer from Babati Rural district. This training was held in the building of the Vilima vitatu village government.

Construction materials, and construction phases of a chicken house at Mdori village in Kigongoni hamlet.

Construction materials, and construction phases of a chicken house at Ngolei village.

Construction materials, and construction phases of a chicken house at Mdori village in Malewa hamlet. Those are chickens which were installed in each of the houses.

Acknowledgements

I would like to convey my sincere gratitude to Mr. Seleman Mkola (VEO-Mdori), Greta Gombe (VEO-Migombani), WEOs-ward executives (Nkaiti and Mtowambu), other village leaders and all other stakeholders for their support and participation in the implementation of this project. In a special way I thank Ms. Happy Masaki (forest officer), Haji Deus and Joseph Kigoda (the fisheries officers) and Alfan Rashid (livestock officer) for facilitating trainings during execution of the project. Due to time limitation, I cannot mention everyone however, I recognize and appreciate the support rendered to us by all other stakeholders during project execution.