ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category: **Regular Project**

Country/ies: **United Republic of Tanzania**

Title of Project/Programme: **Strategic Water Harvesting Technologies for Enhancing Resilience to Climate Change in Rural Communities in Semi-Arid Areas of Tanzania (SWAHAT)**

Type of Implementing Entity: **National Implementing Entity (NIE)**

Implementing Entity: **National Environment Management Council (NEMC)**

Executing Entity/: **Sokoine University of Agriculture**

Amount of Financing Requested **1,280,000 (in U.S Dollars Equivalent)**

Project Summary

The objective of proposed SWAHAT project is enhancing resilience and adaptation of semi arid rural communities to climate change-induced impacts of drought, floods and water scarcity.

This will be achieved through strategic water harvesting technologies that will contribute to improved crops, aquaculture and livestock productivity, reforestation as well as combating emerging crops and livestock pests and diseases.

The conceptual design of the water harvesting dam has been designed to ensure afforestation of the catchment before the dam thus prevention excessive siltation. The constructed or rehabilitated dams will supply water for all the proposed resilience and adaptation enhancing integrated innovations to be implemented on the semi-arid landscapes. In addition, synergism between aquaculture and agricultural activities will be done to enhance nutrient recycling and improve resource use efficiency. Nursery for fruits and forest trees as well as vegetable gardens will be established and supply seedlings for afforestation and horticulture. Pastureland and animal husbandry infrastructure will be established downstream of the dam for improved productivity and supply of manure for soil fertility improvement. The afforested landscape will integrate apiary units, provide fuel wood and restore habitats for biodiversity conservation. All these integrated approaches will contribute to livelihoods diversification to improve adaptation and resilience capacity to climate change of the semi-arid communities and the surrounding ecosystem.

The project will be accomplished through four integrated components for concrete adaptation strategies namely:

1. Installation and rehabilitation of community water harvesting facilities that will integrate agriculture, livestock, tree planting and aquaculture; (Cost 538,510 USD).

2. Develop and implement participatory afforestation program for locally adapted fruit and forest trees (Cost 155,020 USD).
3. Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture (Cost 172,920 USD).
4. Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity. (Cost 77,685 USD)

1. PROJECT BACKGROUND AND CONTEXT:

Problem

The proposed SWAHAT project intends to address the climate change-induced impacts due to drought, floods and water scarcity causing reduction in crops, aquaculture and livestock productivity and forest degradation in semi arid regions in Tanzania

Majority of semi arid rural communities live and derive their economy from a rural agrarian setting. Climate change has come with devastating effects on agriculture in the semi arid areas leading to drought, floods and water scarcity causing direct consequence on social, economic, gender and environment. As a result, food availability, natural resource utilisation and income generation by the vulnerable semi arid communities is severely affected. The government and donor community is obliged to set aside large sums of budget to support such communities for food as well as financing various socio economic needs such as food aid, education, health and water supply. This call for concrete climate change adaptation interventions that will enhance resilience of the vulnerable communities in the semi arid rural dwellers. The project will be implemented in drought and flood prone semi arid regions of central and western Tanzania[1] particularly Dodoma, Singida, and Tabora.

Among the key climate change related impacts affecting communities living in the in these semi-arid regions is water scarcity. Water scarcity is therefore the major driver of vulnerability to climate change. Lack of water resulting from drought, damaged landscapes and loss through floods leads into crop failure and famine, reduced livestock productivity, loss of land cover, drying of natural water bodies and other surface and ground water and limited access of water for domestic uses. As a result most of the semiarid rural community faces limited or lack of livelihoods diversification for adaptation to impacts of climate change.

In the semi arid areas, copping strategies for adaptation to water scarcity is done by few dedicated farmers who dig small pits (<3 m diameter; < 2m deep) and small ponds for tapping surface run-off water to be used for irrigating vegetables in small plots, livestock drinking and domestic use (cooking and washing). In addition, there exist borrow pits as left overs of excavation from road construction activities. These borrow pits have proved to be useful sources of water to the local communities. They support to a small scale, irrigation of crops, drinking points for livestock, save as spontaneous fish and other aquatic habitat and domestic water supply (Figure 2). However, these borrow pits as well as the dug pits and ponds are small often polluted and contaminated and not strategically designed to cater for multiple and integrated activities effective for enhancing adaptive and resilience capabilities of affected semi arid communities to climate change.

The proposed schematic water harvesting and integrated innovations design (Figure 1) is based on the existing utilization of left over roadside borrow pits, over 60 years old water harvesting dams, small water pits and local ponds that have proved to accommodate agriculture, livestock and domestic needs although very insufficiently due to inadequate capacity of the infrastructure as well as people's skills and knowledge on management and utilization of the scarce water resources.

[1] Yanda et al. (2015). Tanzania: Country Situation Assessment. Working paper. Research for Climate-Resilient Futures. Pathways to Resilience in Semi Arid Economies (PRISE) Project. 47pp.

Innovative climate change adaptation technologies for crop and livestock production, aquaculture, horticulture and afforestation that are tailored to the local conditions are highly dependent on long term and reliable water availability. The vulnerable rural communities of semi arid areas have the will to sustain their livelihood through engagement in one or more of these innovative technologies, but they are constrained by lack of reliable water supply due to dependency on rain-fed agriculture and impacts of climate change. The proposed schematic design (Figure 1) for water harvesting technologies that incorporate integrated interventions will enhance sustainable adaptation and resilience to climate change.

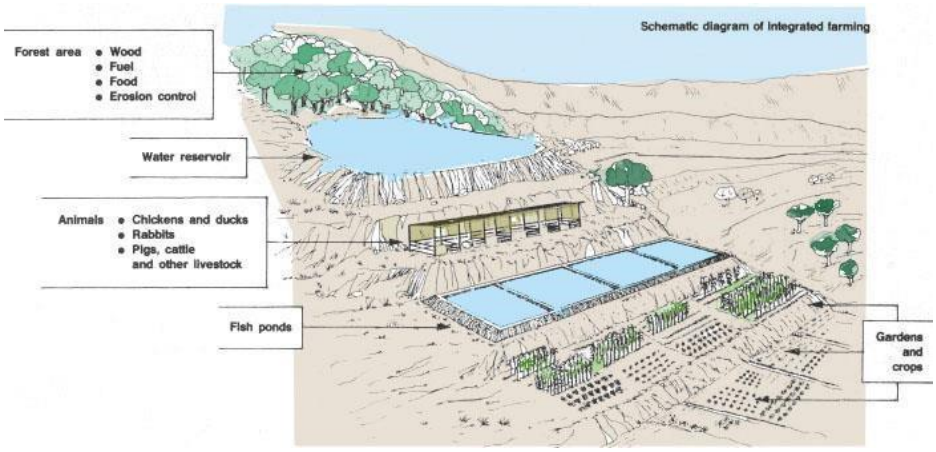

Figure 1 : Schematic representation of the project concept (Source FAO).

This project concept (Figure 1) has proved successful in Vietnam, China, India and a few countries in sub-Saharan Africa [234]. In addition, the project design is tailored to validate and upscale the success of the left over roadside dams/ borrow pits (Figure 2) in order to implement integrated innovative interventions for adaptation and resilience to climate change of the vulnerable rural communities of semi arid regions. The conceptual design of the water harvesting dams has been designed to ensure afforestation of the catchment before the dam thus prevention excessive siltation. The installed dams will supply water for all the proposed resilience and adaptation-integrated innovations to be implemented on the semi-arid landscapes. In addition, synergism between aquaculture and agricultural activities will enhance nutrient recycling and improve resource use efficiency. Nursery for fruits and forest trees as well as vegetable gardens will be established and supply seedlings for afforestation and horticulture. Pastureland and animal husbandry facilities will be established downstream of the dams and will, in addition to improve livestock productivity; supply manure for soil fertility improvement. The afforested landscape will integrate apiary units, provide fuel wood and restore habitats for biodiversity conservation. All these integrated approaches will contribute to livelihoods diversification to ensure adaptation and resilience to climate change. Main goal of the proposed SWAHAT project is focused on enhancing resilience of rural community to climate change-induced challenges of drought, floods and high temperatures in semi arid regions of Tanzania for improved agricultural, aquaculture and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases.

[2] Brummett, R.E., 1999. Integrated aquaculture in sub-Saharan Africa. Environment Development and Sustainability 1, 315–321.

[3] De Silva, S.S and Davy, F.B., 2010. Success Stories in Asian Aquaculture, Springer, Dordrecht

[4] Lu, J.B. and Li, X., 2006. Review of rice–fish–farm systems in China — the Globally Important Ingenious Agricultural Heritage Systems (GIAHS). Aquaculture 260, 106–113.

Figure 2:. Representative of model services provided by road construction borrow pits as remnant dams left from road construction along side roads in semi arid regions where this collected run-off water become available for multipurpose uses: for domestic use, livestock and irrigation water for vegetable crops can be freely obtained and consequently offers a means of adaptation and resilience to climate change. (Photo taken on roadside along Kondoa – Dodoma)

Climate Change Context in Tanzanian

Rainfall trends

Tanzania is not homogeneous from a climatic point of view. Some areas have bi-modal rains i.e. have two distinct rainfall seasons comprised of the long rains ("Masika") between March-May and short rains (Vuli) between October-December. This pattern of rainfall is typical of north-eastern, north-western (Lake Victoria basin) and the northern parts of the coastal belt. Elsewhere in the country, especially in the southern, central, western, and south-eastern parts rainfall is mainly unimodal, starting from midNovember and running until mid-April. However, late onset of rainfall and early cessation are becoming common in most parts of the country. Observational evidence suggets seasonal shifts in rainfall patterns, a decrease in the amount of rainfall and an increase in temperatures in most parts of the semi-arid regions[1].

Rising temperatures, longer dry spells, more intense heavy rainfall and intense flooding make Tanzania among the most vulnerable country to climate risks. The current population of 56 million is expected to increase to 130 million by 2050. In rural areas, there is high dependence on rain-fed agriculture and limited access to health care, education and electricity. Yields for critical crops, including maize, beans, sorghum and rice, are projected to decrease in coming decades, endangering livelihoods and food security. Livelihoods and food supply also depend on semi arid land resources, which are increasingly threatened by drought, unreliable rainfalls, flooding and soil erosion.

It has also been noted that in most parts of Tanzania, rainfall has been characterized by stronger interannual variability[567]. Even though there is a long history of droughts in Tanzania, studies show that the frequency of drought has increased over the past few decades, especially in the semi arid areas such as Dodoma, Shinyanga, Singida, Tabora and some parts of Arusha and Iringa. Annual rainfalls in central Tanzania specifically Dodoma region (Figure 3) which represents semi-arid regions indicate high intraseasonal and inter-annual variability of rainfall underlining the nature of uncertainty associated with rainfall patterns.

[5] Ladislaus B. Chang'a, L.B, Yanda, P.Z and Ngana, J., 2010. Indigenous knowledge in seasonal rainfall prediction in Tanzania: A case of the South-western Highland of Tanzania. Journal of Geography and Regional Planning Vol. 3(4), pp. 66-72.

[6] Kijazi, A.L. and Reason, C.J.C. (2009) Analysis of the 1998 to 2005 Drought over the Northeastern Highlands of Tanzania. Climate Research, 38, 209-223. http://dx.doi.org/10.1007/s00704-012-0746-3

[7] Zorita, E., and Tilya, F.F., 2002. Rainfall variability in Northern Tanzania in the March–May season (long rains) and its links to large-scale climate forcing. Clim Res 20:31–40

The climate in central Tanzania which is semi-arid, is characterized by low rainfall patterns, punctuated by storms, droughts and floods; and increasing and decreasing trends in precipitation. In many drought stricken parts of the semi arid regions of Tanzania, where poverty is common, livelihoods are largely anchored on farming, pastoralism and agro-pastoralism. Frequent dry spells have resulted in reduced crop yields and increased food shortages leading to food insecurity. Annual rainfall has decreased at an average rate of 3.3 percent per decade. Precipitation patterns have become more unpredictable, with an increase in the amount of precipitation falling in isolated events. A larger percentage of precipitation is anticipated to fall in heavy rainfall events. Projected changes in annual precipitation by the 2060s range from a decrease of 1 percent to an increase of 18 percent from the 1970-99 average[8].

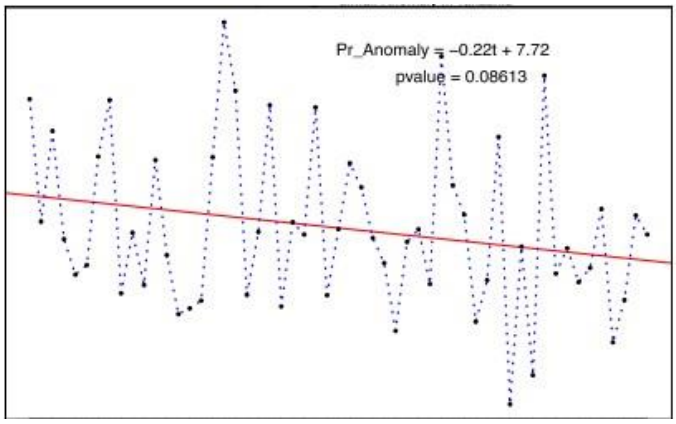

Figure 3:**Trend in mean percentage rainfall anomaly for the period 1961-2015 (Source[9])**

Temperature trends

There is a noticeable rise in temperature in Tanzania as noticed by[10] Temperatures have risen by about 1.0°C since 1960, an average of 0.23°C per decade and is expected to increase by 2.7°C annually by the 2060s, and by 4.5°C by the 2090s. The increase in temperature will be more during the cool months of June, July and August than during the warm months of December, January and February. The deference between the two periods was predicted to be about 10°C on average. The increase in annual temperature over the whole country is predicted to be between 2.5°C to 3°C in the warmest months of December and February and between 3°C to 3.9°C in the coolest months of June to August. A preliminary study of temperature from some stations in Tanzania representing different zones show predominantly increasing annual temperatures suggesting that temperature is bound to increase throughout the country (Figure 4). On average, the annual timescale indicate that mean temperature anomaly has increased by 0.69˚C, mean percentage of warm days has increased by 9.37%, and mean percentage of warm nights has increased by 12.05%. Mean percentage of cold days and nights have decreased by 7.64% and 10% respectively[11]

These changes are therefore expected to vary across the country but will mostly have negative impacts on agriculture and food security, livestock production and health, water resources, energy, human health, forest ecosystems and biodiversity. Climate change is predicted to cause net economic costs that are

[8] https://www.climatelinks.org/countries/tanzania

[9] Chang'a, L.B., Kijazi, A.L., Luhunga, P.M., Ng'ongolo, H.K. and Mtongori, H.I. (2017) Spatial and Temporal Analysis of Rainfall and Temperature Extreme Indices in Tanzania. Atmospheric and Climate Sciences, 7, 525-539. https://doi.org/10.4236/acs.2017.74038

[10] Agrawala, S., Moehner, A., Hemp, A., van Aalst, M., Hitz, S., Smith, J., Meena, H., Mwakifwamba, S.M. Hyera, T. and Mwaipopo, O.U., 2003.Development and climate change in Tanzania: focus on Mount Kilimanjaro. Working Party on Global and Structural Policies and Working Party on Development Co_operation and Environment. Environment Directorate and Development Co_ operation Directorate. OECD.

[11] Chang'a, L.B., Kijazi, A.L., Luhunga, P.M., Ng'ongolo, H.K. and Mtongori, H.I. (2017) Spatial and Temporal Analysis of Rainfall and Temperature Extreme Indices in Tanzania. Atmospheric and Climate Sciences, 7, 525-539. https://doi.org/10.4236/acs.2017.74038

equivalent to a loss of almost 2% of GDP (1 billion USD) each year by 2030 in Tanzania. The impact of climate change and climate variability in Tanzania is therefore increasingly threatening the livelihoods of especially the semi arid rural population with low income, food insecurity, inadequate health services, unstable energy supplies, and fragile natural ecosystems. As such the government has identified agriculture, water, energy, health and forestry as the most vulnerable sectors of the economy under climate change impacts[12].

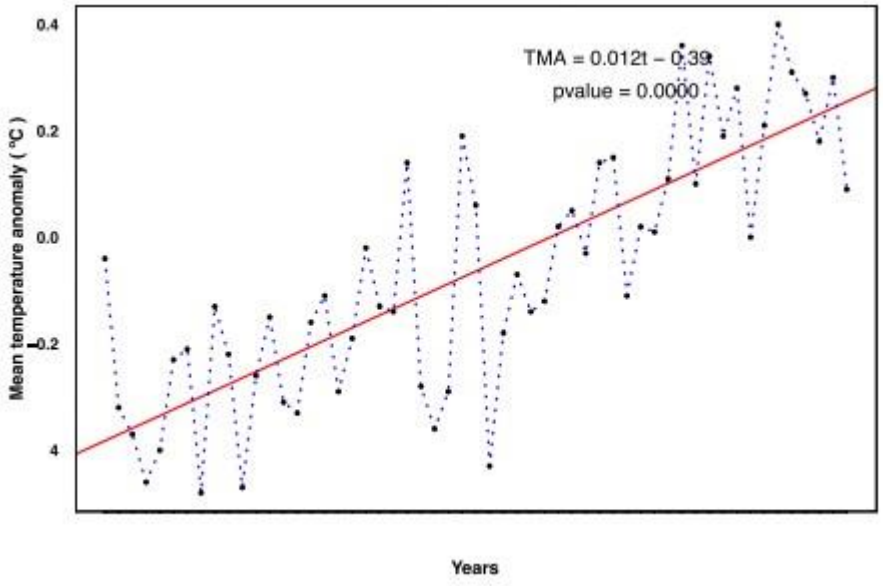

Figure 4: Trends of mean annual temperature anomaly from 1961 to 2015 (Source[11])

Trends and Projections on Impacts of Climate Change

Forests

According to NAFORMA[13], Tanzania's forest and woodlands cover was estimated amounting to 48.8 million hectares by 2015. However, these forests and woodlands are threatened by increasing deforestation and degradation. The causes of deforestation include clearing for agriculture and settlements, overgrazing, wild fires, and charcoal making. Moreover, since some forest areas are important water catchments supplying water to different regions, the loss of forest covers, as illustrated by deforestation of most of the semi arid forest tree cover have reduced water supply. These possible changes in vegetation due to climate variability will however be compounded with anthropogenic pressures on the biophysical systems, including increased land degradation. Conservation and restoration of degraded natural forests to increase species diversity will have to consider these other important functions, and how they might be affected by climate variability.

Agriculture and Livestock

The agriculture sector is the mainstay of Tanzania's economy, as well as having a key role in sustaining livelihoods. It is also a very climate-sensitive sector. Future climate change has the potential to exacerbate current production risks in agriculture, either from changes in temperature and rainfall trends, from enhanced variability, or from other effects. A number of previous studies have considered the potential effects of climate change on Tanzania, and because these consider different impacts and use different

[12] NAPA, 2007. Tanzania National Plant for Action. Vice President's Office; Division of Environment, Dar-es Salaam
[13] MNRT, 2015. National Forest Resources Monitoring and Assessment of Tanzania Mainland (NAFORMA). Ministry of Natural Resources and Tourism. Tanzania

projections and models, they provide a wide range of results[14]. The country has about 88.6 million hectares suitable for agricultural production, including 60 million hectares of rangeland suitable for livestock grazing and production majority of them located in arid and semi arid landscapes. Under increasing temperature scenarios, it is anticipated that decrease in amounts of rainfall, increased evapotranspiration and seasonal unpredictability are causing serious consequences on crop yields, shifts in agro-biodiversity, increased outbreaks of pest and diseases, reduced germplasm diversity as well as expansion of livestock keeping range into croplands as the area under range-land shrinks.

As mentioned before, agriculture in semi arid regions of Tanzania is predominantly rain-fed, hence the frequency and intensity of droughts and water scarcity are seriously affecting the sector's productivity. In these semi arid regions, high water-demanding crops like maize, vegetables, and rice are becoming more marginalized, and replaced by more drought tolerant but less preferred crops like sorghum and millet and if the trend continues, these farmlands are expected to get drier and will be converted to grazing areas. Where rainfall decreases by up to 15% and there is no adaptation, average maize yields could decrease by up to 16% by 2030 (a loss of around 1 million tonnes/year) and 25 - 35% by 2050 (2 to 2.7 million/tonnes per year). Since maize, pearl millet and sorghum are the main staple food crops in the semi arid regions whose productivity have been declining due to drought incidences and therefore triggered food insecurity, reduced incomes, and consequently increased poverty. Therefore the decrease rainfall, and hence less water available for irrigation, have caused far reaching implications on food security, employment, income and balance of trade in semi arid areas. While farm level adaptation would be likely to reduce these impacts, analysis shows climate change could have very large economic costs, potentially several US$ hundred millions/year. Pastoralists have resilience to the historical risk of climate variability in arid and semi-arid lands. However it is reported that climate change present new risks that will decrease resilience and system stability causing significantly high impacts on livestock keeping[14]. This will aggravate conflicts between pastoral and agricultural communities, which continue, destabilize peace and harmony among communities in various parts of the country.

Water resources and wetlands

Wetlands are an important resource in arid and semi-arid areas. Although not extensively available, they are in many cases the only water source and contribute in solving water scarcity problems in these areas. Decline in rainfall due to climate change has decreased water availability and as a result patches of wetlands have dried, as witnessed during the survey (Figure 2). This has declined the areas under wetlands with consequences on water supply and resident biodiversity. Wetlands are sources of water points for livestock and provide local ponds for fish and other aquatic habitats. Most of these have dried and or diminished as a result of climate change.

Rise in temperature, drought and floods contributes in reduction of water quantity and quality increasing water scarcity, leading to potential water use conflicts. Increasingly erratic rainfall regimes and higher mean temperatures in upper catchment areas will ultimately lead to less river water discharge and flow, while high evaporation losses downstream will mean less water available for domestic, irrigation and, hydro-power generation. The impact of climate change on domestic water supplies, both in terms of decreasing quantity and quality is overarching. For instance, the second Vulnerability Assessment Report[12] showed that most of the households in Tanzania use more than one source of water supply, and 62% depend on traditional water supply sources. The majority of the population has no access to potable water and relies on surface water supply, which is mostly lost by floods and drought frequently occurring in the semi arid regions.

Emerging pests and diseases

[14] Watkiss, P, T Downing, J Dyszynski, S Pye et al. 2011. "The economics of climate change in the United Republic of Tanzania", Report for Development Partners Group and the UK Department for International Development, January, available at http:// economics-of-cc-in-tanzania.org/, 34 pages.

Under climate change, pressures from pests, weeds, and diseases have been reported to increase, with detrimental effects on crops and livestock[15] . In the semi arid areas of Tanzania, climate change has lead to emergence of new crop and livestock pests and diseases. Example of such animal and plant disease vectors transmitting virus and parasites belongs to the arthropods. This has led o emergence of diseases such as maize lethal necrotic virus, cassava and sweet potato mosaic which affect the major crop types of semi arid regions in Tanzania. Fruit flies, for instance, cause extensive damage to fruit and vegetable production and, as the globe's temperatures continue to increase, are spreading to new areas. Of recent there has been frequent outbreaks of maize fall armyworms causing severe damage of maize crops. In the case of livestock, distribution of the main vector borne diseases spread by ticks, tsetse flies and mosquitoes have been observed in the semi arid regions[16].

Economic context

Climate change impacts have reduced agricultural productivity of semi-arid rural communities thus affecting economic and livelihoods diversification. Tanzania has a population of 55 million people with approximately 80% depending on agriculture as a source of livelihoods. Therefore, agriculture plays an important role in the economy of Tanzania; accounting for 60% of the export earnings and employing 84% of the rural population. Crucial components of the agricultural sector are food crops, at 55% of the total agricultural GDP, livestock at 30%, and traditional export crops at 8%[17]. Furthermore, over 80% of rural communities in semi-arid areas depend on rain fed agriculture for their survival. Agriculture drives livelihoods of rural communities in Tanzania; however, this agriculture is largely dependent on rainfall and therefore subject to high vulnerability to climate change impacts associated with droughts and floods. Drought leads to crop failure while excessive rainfall and run off leads to crop loss in most semi arid regions of Tanzania. In addition, climate change has been associated with new emerging insect pests and diseases that affects crop productivity[18] [19] . These emerging pests require immediate intervention technologies to serve small-scale farmers from crop loss leading to low food security.

The proposed dams will therefore supply water for domestic use, irrigation agriculture, and livestock production including aquaculture as well as reforestation of the degraded landscapes[20].They will include vegetable production, aquaculture, intensive livestock and poultry keeping, fruit trees and forest nursery production and apiculture for enhanced resilience to impacts of climate change.

Aquaculture in Tanzania has emerged as one of the component in livelihoods diversification for increasing resilience to impacts of climate change and in general as another means of generating income to households. Aquaculture is a source of high value protein, income generation, and employment. However, the per capita consumption of fish in Tanzania is estimated to be 7.6 kg per year, which is low, compared to global per capita consumption 20.1 kg per year (FAO 2018, MLF, 2019). Combined fish production

[15] Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, A., Lennard, C., Padgham, J., Urquhart, P., 2014. Africa. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros VR, Field CB, Dokken DJ and 13 others (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265.

[16] Olwochi, J., Reyers, B., Francois, B. and Barend, F., 2008. Climate change and the tick-borne disease, Theileriosis (East Coast fever) in sub-Saharan Africa. Journal of Arid Environments 72(2):108-120

[17] URT,2013; World Bank 2014 Reports

[18] Majule, A. E., Kauzeni, A. S and Mujwahuzi, M. (2013) Exploring opportunities for climate change adaptation in semi-arid areas of Tanzania: A case of Nzega District in Tabora region. Afr. J. of Env. Sci. and Tech. 7(8): 758-769. DOI: 10.5897/AJEST12.230.

[19] Fredrick Ojija , Siri Abihudi , Beatus Mwendwa , Cecilia M. Leweri , Kafula Chisanga (2017) The Impact of Climate Change on Agriculture and Health Sectors in Tanzania: A review International Journal of Environment, Agriculture and Biotechnology (IJEAB)2 (4):1758-1766. http://dx.doi.org/10.22161/ijeab/2.4.37.

[20] Ojija, F., Abihud, S., Mwendwa, B., Leweri, C., and Chisanga, K., 2017. The Impact of Climate Change on Agriculture and Health Sectors in Tanzania: A review. International Journal of Environment, Agriculture and Biotechnology (IJEAB). Vol- 2, Issue 4

from both capture fisheries and aquaculture production currently stands at about 400,000 MT way below the estimated annual demand of 700,000 MT. Climate change has drastically reduced fish habitat as a result of low water availability in rivers and some lakes, and drying of wetlands. Interventions to reverse this situation are important as fisheries play an important role in household nutrition and livelihoods.

The strategic interventions in this project have been designed to recycle water as much as possible. Recycled water from fish farming will bring synergism to agricultural activities through nutrient recycling that can be directly used in the nurseries and farms of fruits, forest trees and vegetable gardens to be established downstream of the dam. This strategy is expected to increase productivity and generate surplus for income generation of target communities. Intensive livestock and poultry production will benefit from pastureland and animal husbandry infrastructure that will be established downstream of the dam which in turn will supply manure for soil fertility improvement for horticulture and other land production systems. Afforestation integrated with apiculture interventions will be done on the degraded landscapes with the aim of increasing production of honey and wood products (e.g fuel wood and timber) for domestic use and income generation and very importantly restore habitats for biodiversity conservation and ecosystem resilience Afforestation and apiculture shall (among other potential benefits to be realized) restore the green infrastructure, capture and distribute water more spatially and temporally and provide efficient pollination services to the natural and agriculture systems for sustainable biodiversity and crop productivity. These are concrete adaptation activities that will bring income diversification and enhanced resilience to impacts of climate change and reflect on both local and national economy. **Social context**

Climate change is causing exacerbated poverty, food insecurity, emigration and loss of employment According to 2012 household budget surveys[21] basic needs poverty rate in Tanzania stands at 28.2% (not able to spend more than US$ 0.5 per day) and extreme poverty was 9.7% (food poverty). Although there has been recent growth that has helped Tanzanians poorest, the report emphasized that approximately 70% of Tanzanians continue to live with less than US$ 2 per day (Figure 6). To build on this growth and reach more people, the assessment recommends promoting faster economic growth and labour intensive sectors including agriculture where more than 80% of Tanzanians continue to be employed. The assessment underscores the need for specific measures to develop the rural economy and agriculture, and to diversify livelihoods. The Semi arid habitat occupies 18% of the total land surface area in Sub-saharan Africa, and covers 80% of the land surface in Tanzania[22]. Regions which lie in semi-arid areas among other places in Tanzania include Singida, Shinyanga, Dodoma, Tabora and some parts of Arusha and Iringa. The people living in these regiona are characterized by high levels of poverty[23] food insecurity, malnutrition and pastoral lifestyle.

It is evident that the impacts of climate change have manifested themselves everywhere. However, semiarid areas are the hardest hit by the effects of climate change due to their biophysical nature Over the past decade, several incidences of extreme climate events have occurred in various areas of semi-arid Tanzania, causing substantial and severe socioeconomic impacts including loss of human lives and destruction of properties (Table 1), crops, livestock[1] thus exacerbating poverty and food insecurity to people of the semiarid regions. Water scarcity is another critical climate change related impact to semi arid residents affecting pastoral systems and quantity and quality domestic water supply thus contributing to migration of people in search of grazing lands, water points and new settlements (Figure 5).

[21] URT, 2013. Household budget survey for Tanzania mainland - Key findings. National Bureau of Statistics Ministry of Finance, Dar es Salaam.

[22] Quinn, C. H. and Ockwell, D. (2010). The Link between Ecological and Social Paradigms and the Sustainability of Environmental Management: a case study of semi-arid Tanzania. In: Handbook for Environmental Management. (Edited by J. C. Lovett & D. Ockwell), Edward Elgar Publishing Ltd, Cambridge. pp.282-308.

[23] Economic and Social Research Foundation (2018) Tanzania Human Development Report 2017. Social Policy in the context of economic transformation. 138pp.

Figure 5 Large herds of livestock walking long distance to reach drinking points which have limited quantity of water and are at the same time used for cooking, washing and small scale irrigation

The lifestyle and economic strategy of people living in semi arid regions is traditionally characterized by their need to ensure adequate water supply and protection against food shortages. Moving with livestock in search of water and pasture resources is one of the main livelihood adaptation and resilience strategies[24]. The fact that some of these areas are regarded as not suitable for cultivation and that rainfall patterns are unpredictable and are subject to great fluctuations means people are not attracted to live in them and therefore migration are quite common. However a significant number of people continue to live in these areas due to their inability to afford migration and hence continue to suffer extreme vulnerability. Due to the prevailing climate change conditions, the semi- arid regions of Tanzania will continue experiencing unreliable rainfall and water shortages. Through consultations and previous studies, it was proposed that rainwater harvesting and the promotion of water-efficient irrigation agriculture might be the most logical policy for the semi-arid areas of Tanzania[1]. There is, however, no easy answer to the question of whether the focus of development in such areas should be based on irrigated agriculture alone. Implementing strategies to improve the productivity of the livestock sector through institutional and community capacity building can further enhance resilience in semi-arid areas[25]. Stakeholder engagement platforms as a basis for learning and integration of resilience strategies into sectorial plans and programmes are recommended[1]
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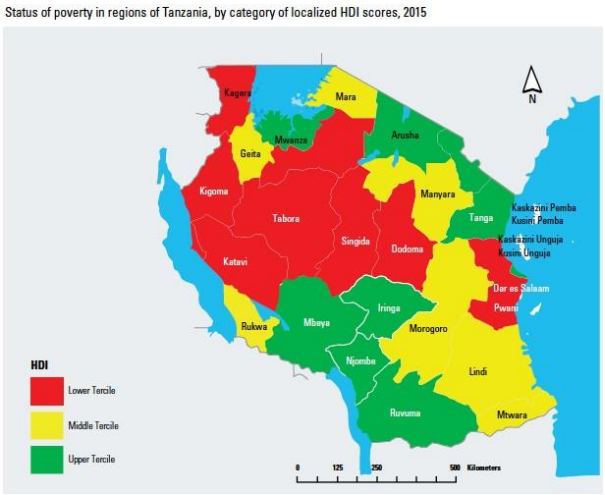

[24] Nori, M., Taylor, M., & Sensi, A. (2008) 'Browsing on Fences: Pastoral Land Rights, Livelihoods and Adaptation to Climate Change'. Rome: International Land Coalition.

[25] Rowlinson, P., Steele, M. & Nefzaoui, A. (2008) 'Livestock and Global Climate Change. Proceedings of the Livestock and Global Climate Change Conference, Hammamet, 17-20 May

Figure 6 : Status of poverty in Tanzania by regions (*Source*[26])

Fetching drinking water is a time-consuming chore, especially for women and girls, who are the ones most often responsible for fetching water [23]. Women and girls, particularly in rural areas, are affected by the long distance walks (Figure 7) to find clean water sources often not available due to extreme levels of contamination, an exercise that reduces their time they could spend for educational or income-generating activities. Overall percentage of households that can access improved water sources is still low, ranging in most districts (Annex 3:).

Table 1. Extreme climate change calendar of events and their impact in Tanzania

Event	Affected areas	Year	Impacts	Reference
Drought	Semi-arid regions of Tanzania, i.e. Dodoma, Arusha, some parts of Iringa, Kilimanjaro, Manyara, Shinyanga and Singida	2003/2005/2009	Death of animals, effects on agriculture, energy and business	Shayo (2013)
Floods	Morogoro (Kilosa) and Dodoma (Mpwapwa and Kongwa)	2009/2010	Devastation to humans, property and infrastructure	
Floods	Dar es Salaam	2011	Loss of lives (23 people left dead), loss of property and destruction of various infrastructure	Shingirirai (2013)
Floods	Dar es salaam	2012	Loss of lives (40 people left dead), loss of property and destruction of various infrastructure	Shayo (2013)

(Source[1])

Gender context

Climate change is causing water scarcity, shortage of fuel energy, crop failure, drudgery and household labour disparity**.** Scarcity of clean and safe water for domestic use in these semi arid areas is a serious climate change induced impact. As a result, women and children are burdened with responsibilities of walking long distances in search of water from unreliable water sources. Consequently, women lose time and energy, which could have been invested in other more productive activities. In addition, young boys and girls are forced into child labour, which is against national and international laws and agreements. They spend less time for schooling so that they can help families fetch water from these distant sources affecting their performance in school and in extreme cases being forced to drop completely from their education career (Figure 7). Therefore, in order to reverse this situation there is a great need to enhance water availability for domestic use. The project through water harvesting will reduce walking distance in search for water and thus increase access of water for domestic use

[26] Economic and Social Research Foundation (2018) Tanzania Human Development Report.

Figure 7: Women and Children awaiting to take turns to fetch water for domestic use at one of the water pits in a village visited during consultation in Manyoni District

Climate change has resulted in reduced availability of forest resources important for day to day demands at the household level, particularly fuel wood. Searching for and collection of firewood is a burden allocated to women in many communities in Tanzania. Beside these climate change impacts to daily livelihoods of women they are required to participate in other household economic and social activities such farming, livestock rearing and caring for family members. This is a very common hardship facing women in semi arid regions subjecting them to adverse poverty. The proposed project offers an opportunity for relieving women and children from drudgery related to long distance walking in search for water and firewood. The afforestation and woodlots establishment will increase availability of firewood saving more time for women to be used in other income generating activities. The time saved in search of fuel wood will in turn allow women to be involved into more profitable activities such as gardening, fish farming, livestock and poultry and apiculture that can translate into economic empowerment of women and the society in general.

In semi arid areas, climate change effects in form of drought and emerging climate change related pests and diseases affects agriculture which is the primary economic activity resulting into frequent crop failures. This has major impacts on women who make 50% to 80% of rural agricultural labour in sub Sahara Africa[27][28]. As a result women suffers most from the consequences caused by agriculture failure, food insecurity and poverty which translates into loss of assets as families resorts to sale of their little properties in order to purchase food for the family. Through this proposed project, water harvesting will support irrigation of crops thus reducing crop failure due to droughts and floods. Integrating pest management into the improved farming systems will further reduce crop losses in the fields and stores and in the end improving food security.

Environmental context:

Climate change is causing severe land degradation, deforestation and loss of biodiversity leading to poor delivery of ecosystem services. Although Tanzania is endowed with a significant array of diverse natural resources including land, rivers, lakes, ocean, wetlands, flora and fauna most of these natural resource have been destroyed and disappeared in the semi-arid areas due to unsustainable utilization and impacts of

[27] FAO, 2011. The role of women in agriculture. ESA Working Paper No. 11-027

[28] Ismail, B.B., Rajeani, M.Z., Hussayn, U.I., Akoge, N.S., 2015. The Role of Women in Household DecisionMaking and their contribution to Agriculture and Rural Development in Nigeria. IOSR Journal Of Humanities And
Social Science (IOSR-JHSS) Volume 20, Issue 5, Ver. 1 (May. 2015), PP 30-39

climate change. Semi-arid communities are therefore deprived of these important natural resources, which would have provided resilient and sufficient ecosystem products and services necessary adaptation to climate change. For semi-arid rural communities, unsustainable use of natural resources and environmental degradation inhibits future economic growth, exacerbates multidimensional poverty over time, and undermines the achievement of key development goals such as poverty reduction and food security. Drought, floods, temperature rise due to climate change have been the key drivers of unsustainable utilization of natural resources by the people in the semi arid community for survival.

Global agriculture uses 70% of fresh water resources, making it the world's largest consumer[29]. The livestock sector is also a major use of natural resources such as land, and water, currently using about 35% of total cropland and about 20% fresh water for feed production[30]. Climate change has reduced amount of rainfall in these semi arid areas threatened by desertification. Worse still is the fact that this little amount of rainfall water is lost through surface runoff and evaporations.

The proposed project will support selected climate change vulnerable communities in villages of Dodoma, Singida and Tabora regions. These regions are characterized by semi-arid agro-ecological characteristics with erratic unimodal rainfall patterns[31]. These regions experience long and dry periods of 6 -8 months resulting into serious water scarcity for agriculture, livestock and domestic uses (drinking, cooking and washing). The scarcely available waters are seriously contaminated that they are muddy, mixed with cow dung and inhabited frogs causing alarming health risks and costs to humans especially children and the elderly who are normally less immune.

The average rainfalls in these regions are 581 mm (Figure 8 & Figure 9). This is a very small amount of rainfall and under climate change, impacts become adverse causing higher levels of vulnerability due to endemic crop failure, declined livestock production and escalated poverty calling for urgent intervention to address the challenges.

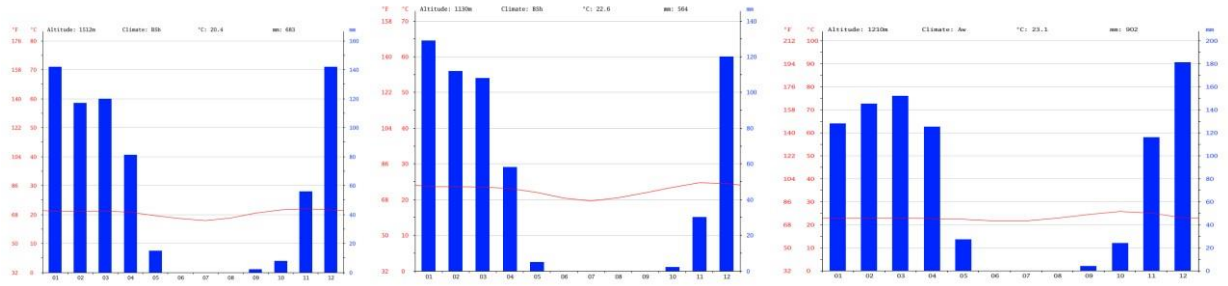

Figure 8: **From left to right; Annual rainfall distribution for Singida, Dodoma and Tabora Monthly weather data on rainfall and temperature (Source[1]).**

[29] Thornton, P.K., Van de Steeg, J., Notenbaert, A., Herrrero, M., 2009. The impacts of climate change on livestock and livestock systems in developing countries: A review of what we know and what we need to know. Agric. Syst. 101, 113–127.

[30] Opio, C., Gerber, P., Steinfeld, H., 2011. Livestock and the environment: addressing the consequences of 2141 livestock sector growth. Advances in Animal Biosciences 2, 601-607.

[31] Hamisi Juma (2013). Study of rainfall trends and variability over Tanzania. A research project submitted in partial fulfilment of the requirements for the postgraduate diploma in meteorology. University of Nairobi. 55pp

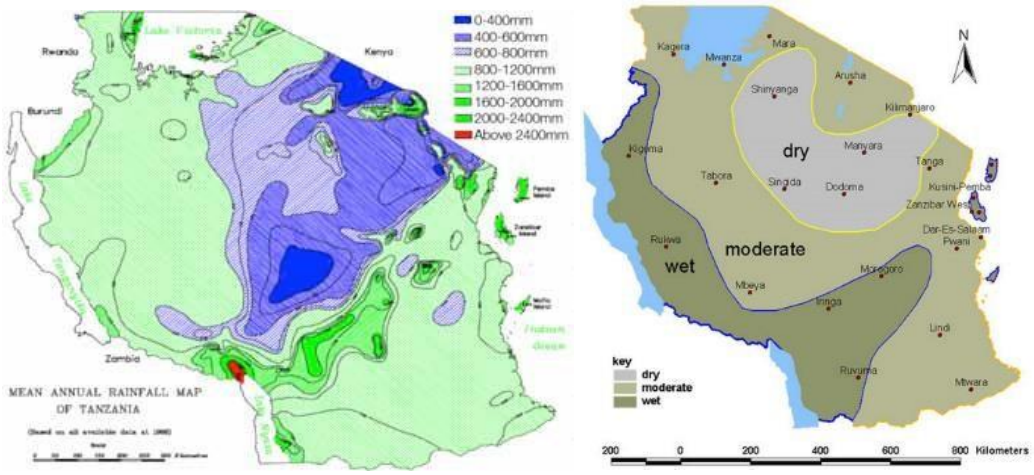

Figure 9: **Mean Annual Rainfall Data for Tanzania. The blue areas shown to receive less rainfall (400mm to 600mm) represent the arid and semi-arid areas of the country (Source[1]).**

The semi-arid landscapes of Tanzania are often surrounded or intertwined with Miombo woodland vegetation, which has been threatened, by land degradation and deforestation as a result of population growth coupled by environmental stress[3233]. Farming communities in the semi arid regions of Tanzania have contributed to large scale deforestation through agriculture (shifting cultivation), charcoal/firewood harvesting, human settlements pastoralism[133] These human induced effects on semi-arid ecosystems are exacerbated by impacts of climate change resulting into devastating loss of soil cover due to water runoff, floods and drought in farm lands[34]. Erratic rainfall results into unpredictable planting dates, poor crop establishment and performance, crop failure and hence low yields. Previous studies have demonstrated that climate change could lead to major crop failures of up to over 40%[35]. Water resource anomalies in Tanzania especially in the semi-arid regions are becoming as natural disaster[36] as it has been in many parts of the globe with similar biophysical challenges.

According to the Tanzania Meteorological Agency (TMA), since 2010 most of the country has experienced severe floods than any other in the last 50 years. Torrential rains formed strong floods leading to loss of water that would have been productive for agriculture, livestock and domestic use for improved livelihoods of the village or rural communities. In this project it is envisaged that, development of sustainable water harvesting technology will serve as adaptation and resilience vehicle for poor rural communities in Tanzania. With this respect, the project is aiming at implementing strategic water harvesting technologies for enhanced adaptation and resilience to climate change.

Urgent conservation and restoration measures are inevitable for restoration of resilience of the rural semiarid communities from the impacts of climate change. Different types of vegetation occupy the semi-arid areas of Tanzania, including grasslands, dense thickets, Miombo woodlands, baobab, acacia and seasonally inundated grasslands[37]. Anthropogenic activities have extensively modified these types of

[32] Gumbo, D.J., Dumas-Johansen, M., Muir, G., Boerstler, F., Xia, Z. 2018. Sustainable management of Miombo woodlands – Food security, nutrition and wood energy. Rome, Food and Agriculture Organization of the United Nations.

[33] Lusambo, L.P., Monela, GC., and Katani, J., 2007. Socio-Economic Analysis Of Land Use Factors Causing Degradation And Deforestation Of Miombo Woodlands In Kilosa District, Tanzania. Tanzania Journal of Forestry and Nature Conservation Vol. 76 : pp. 28-39

[34] OECD. (2016), Mitigating Droughts and Floods in Agriculture: Policy Lessons and Approaches, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264246744-en

[35] Tigchelaar, M., Battisti, D.S., Naylor R.L. and Depak, K..R. (2018). Future warming increases probability of global synchronized maize production shocks. PNAS 115(26) 6644-6649.

[36] Mikova and Makupa EE (2015) Current status of hydrological forecast service in Tanzania V International Scientific and Practical Conference on Modern problems of reservoirs and catchments, At Russia, Perm, Volume: 1

[37] Kisanga, D. (2002) 'Soil and Water Conservation in Tanzania – A Review', in Blench, R. and Slaymaker, T.

vegetation, with deforestation and land degradation in these areas on the increase[3839]. Deforestation could make Tanzania lose 3.5bn USD by 2033 which is at a rate of 370,000 ha per year[40], a country with a forest cover of roughly 48 millions hectares[41] . On the other hand, the cost of land degradation between 2001 and 2009 was estimated to be 2.3bn USD[42]. The cost brought about by climate change through floods and drought is very high[12]

Based on the above facts, it is obvious that climate change will accelerate the dependence of vulnerable rural community to forest resources for their livelihoods support leading to further forest and land degradation. Alternative integrated interventions are needed to address these challenges without which these community will be subjected to more risks and vulnerability to climate change. So far, forest ecosystems are known to be a good repository of biodiversity and also contribute significantly to livelihoods of semi-arid people but are taken for granted. The knowledge of impacts and response of forest ecosystems[43] to climate change resilience and adaptation measures emphasizes on strategies of reestablishment of vegetation cover through afforestation and reforestation by planting of fruits and multipurpose forest trees. Extensive pastoralism is also responsible for deforestation and land degradation. Under the proposed SWAHAT project, improved animal husbandry practices will be integrated in the land-use plans for better adaptation to and resilience to impacts of climate change. Proper balances for cultural values and carrying capacity need to be addressed through training and increasing awareness to the community for purpose of sustaining the benefit accrued from reduced forest cover and land degradation.

Climate change imposes negative impacts due to rise in temperature, CO_2 concentration and precipitation variation and combination of these factors[43] [45444546474849] High temperature and drought affects most of the

(eds) Rethinking Natural Resource Degradation in Sub-Saharan Africa: Policies to Support Sustainable Soil Fertility

[38] OECD. (2016), Mitigating Droughts and Floods in Agriculture: Policy Lessons and Approaches, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264246744-en

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[40] FAO, 2015. Global Forest Resources Assessment (FRA 2015). Country Report: United Republic of Tanzania. Rome, Italy.

[41] MNRT., (2015). National Forest Resources Monitoring and Assessment (NAFORMA) main results. Tanzania Forest Services, Ministry of Natural Resources and Tourism, Dar es Salaam, Tanzania. 106 pp

[42] Kirui, OK, and A Mirzabaev. 2014. Economics of land degradation in Eastern Africa No. 128. ZEF Working Paper Series 2014. Conference paper Tropentag 2014, Prague, Czeck Republic. doi:10.13140/2.1.1442.2400 [43] Enfors, E. I. and Gordon, L.J. (2007) Analyzing resilience in dry land agro-ecosystems: A case study of the Makanya catchment in Tanzania over the past 50 years. Land Degr. and Devel. 18: 680-696.

[43] Aydinalp, C., Cresser, M.S., 2008. The effects of climate change on agriculture. Agric. Environ. Sci. 5, 672–676 [45] Henry, B., Charmley, E., Eckard, R., Gaughan, J.B., Hegarty, R., 2012. Livestock production in a changing climate: adaptation and mitigation research in Australia. Crop Pasture Sci. 63, 191–202

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[47] IFAD (International Fund for Agricultural Development), 2010. Livestock and climate change. http://www.ifad.org/lrkm/events/cops/papers/climate.pdf

[48] Koffi K., Ahoussi E., A. M. Kouassi, O. Kouassi, Kpangui L. C. and and Biemi J. (2013). Integration of hydroclimatic data and land use in neural networks for modeling river flows: Case of Lobo river in the southwest of Cote d'ivoire Yao Blaise. African Journal of Environmental Science and Technology. Vol. 7(8), pp. 783-788, August [49] DOI: 10.5897/AJEST2013.1453

critical factors for livestock production such as water availability, pasture quality and quantity, animal productivity, reproduction and health[50].

Management, Soil and Water Conservation Among Resource-Poor Farmers in Semi-Arid Areas. Tamale: University of Development Studies.

Developmental context

Climate change impacts have negative effects on National development efforts. Tanzania with a population of 55 million people at a growth rate of 2.9%[51] is endowed with a significant variety of natural resources including land, rivers, lakes, ocean, forests, woodlands, wild animals, and wetlands. The richness in natural resources constitutes a major asset and opportunity, which is fundamental for growth and economic development, including poverty reduction. Most of the citizens depend on natural resources for income and livelihood. Despite the rich endowment of natural resources, the country's failure to realize the full potential value of natural resources and environment for development has contributed to Tanzania standing as one of the world's poorest countries. Agriculture plays an important role in the economy of Tanzania; it accounts for 60% of the export earnings and employs 84% of the rural population. Crucial components of the agricultural sector are food crops, at 55% of the total agricultural GDP, livestock at 30%, and traditional export crops at 8%[52].

Tanzania is not exempted from the consequences of climate change. However, the magnitude, rates and negative impact on people's livelihood and environment vary across agro-ecological zones. It is estimated that between 45% and 75% of the total land of Tanzania has been degraded as a result of unsustainable use coupled with the adverse effects of climate change. The consequences of climate change and unsustainable land use include land degradation, reduced productivity, food insecurity, and destruction of important ecosystems and loss of income, biodiversity, and livelihoods. These consequences have resulted into increased vulnerability of people and the ecosystem at large. They bear a toll on national development goals because the effects of climate change seriously impede household productivity and its eventual contribution to local and national development. The best solution suggested include effective investment in instilling knowledge to the community and water harvesting innovations that will enhance the resilience ecosystem as well as supply water for domestic use, irrigation agriculture, livestock production including aquaculture as well as reforestation of the degraded landscapes[53.] In this proposed project, water-harvesting technologies will significantly lead into increased water availability for the livestock, crops, pasture, trees productivity, as well as for domestic use.

The proposed interventions are in-line with National development priorities and strategies, including, National Development Plans, Poverty Reduction Strategies, National Climate Change Strategy, National Adaptation Programme of Action, and other relevant instruments reflecting the national priorities on climate change adaptation.

Focus of the proposal

The proposed SWAHAT project intends to address the climate change-induced challenges of drought, floods and water scarcity in semi arid regions in Tanzania. which results into serious water shortages. Management of the water sector in the semi-arid regions has become increasingly difficult as the quantity and quality of water in rivers is reduced by siltation, erosion, pollution, rapid evaporation, drought and poor governance of the scarce resources. In the event of heavy and erratic rainfalls most of river water is

[50] Melissa M. Rojas-Downing, A. Pouyan Nejadhashemi, Timothy Harrigan, Sean A. Woznicki (2017). Climate change and livestock: Impacts, adaptation, and mitigation Climate Risk Management 16 145–163

[51] Tanzania National Bureau of Statistics (2012)

[52] URT,2013; World Bank 2014 Reports

[53] Ojija, F., Abihud, S., Mwendwa, B., Leweri, C., and Chisanga, K., 2017. The Impact of Climate Change on Agriculture and Health Sectors in Tanzania: A review. International Journal of Environment, Agriculture and Biotechnology (IJEAB). Vol- 2, Issue 4

lost downstream if no harvesting strategies are put in place. Climate change has been associated with new emerging races and ecotypes of insects and disease pests. As of recent fall armyworms, spider mites, races of virus like maize lethal necrosis, and animal diseases are said to come with elements of climate change. Ultimately, the emergence of these climate change related pests and diseases, as well as water scarcity has led into reduction in crops and livestock productivity, forest and ecosystem degradation, deprivation of safe and enough water for domestic uses, increased water related health problems and escalated poverty and vulnerability of the communities living in semi-arid areas to climate change. The above mentioned problems are exacerbated by the following underlying drivers of vulnerability: i) strong dependence on rain-fed, unimproved agriculture; ii) lack of diversified crop varieties; iii) high poverty levels accelerated by lack of diversified income sources; iv) deforestation and degraded land resources; and v) lack of appropriate knowledge and information on adaptation and resilience to impacts of climate change.

Therefore, the main goal of the proposed project is focused on using water harvesting technologies as an entry strategy for enhancing adaptation and resilience of rural communities to climate change-induced challenges. The project will install and rehabilitate dams, which will take into account a series of strategies/techniques for improved water use efficiency (e.g. construction/installing of improved irrigations systems, water use rights and governance aspects, etc). The water harvested will lead to reduced drudgery and time spent by particularly women and children to search and fetch water for domestic use. These dams will provide water for crops, livestock and fish production, as well as for forest and fruit tree nursery establishment and eventual planting and tending. The outcome of these interventions will translate into critical adaptation and resilience to climate change. The interventions of this project will benefit more the most vulnerable people in semi arid areas who are women, children, elderly and the youths. The restored ecosystem vigor through afforestation and sustainable land management interventions achieved through improved farming techniques will strengthen the natural resilience that will provide better support to the economy and biodiversity.

2. PROJECT OBJECTIVES

The project have been designed to have four objectives which when accomplished they will translate into improvement of adaptation and resilience capacity of the vulnerable communities of semi- arid areas of central-western Tanzania. Below the objectives are outlined alongside the AF outcomes they respectively align with.

1. Installation and rehabilitation of community water harvesting dams and facilities that will integrate agriculture, livestock, tree planting and aquaculture:
   This objective is in line with:
   Adaptation Fund Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors
   Adaptation Fund Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress
2. Develop and implement participatory afforestation program for locally adapted fruit and forest trees
   This objective is in line with:
   Adaptation Fund Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level
   Adaptation Fund Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced and
3. Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture
   This objective is in line with:
   Adaptation Fund Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level
   Adaptation Fund Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas

4. Formulate and implement interventions for integrated management of climate change related emerging pests and diseases that affect crops and livestock productivity.
   This objective is in line with:
   Adaptation Fund Outcome 3. Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

3. PROJECT COMPONENTS AND FINANCING

The SWAHAT project's strategy will be to implement concrete water harvesting technologies and integrated interventions to increase the resilience of communities from three selected semi arid regions of Tanzania including a total of 6 selected target villages. This will be achieved through implementation of the following strategic components: i) Installation and rehabilitation of community water harvesting facilities that will integrate agriculture, livestock, tree planting and aquaculture; ii) Development and implementation of participatory afforestation program for locally adapted fruit and forest trees entailing nursery establishment, tree planting, management and sustainable harvesting and utilization; iii) Development of integrated climate resilient livelihoods diversification through improved technologies in agriculture, and iv) Formulation and implementation of interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity. Successful implementation of these project components will enhance community resilience to impacts of climate change and reduce crop and livestock vulnerability to ensure agricultural growth and poverty reduction. This will be achieved within four years by implementing four integrated project components for financing as shown in Table 2.

Table 2: Project components and Finance

Project Components	Indicators	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Installation and rehabilitation of community water harvesting dams and facilities	Functional dams and deep-wells with harvested water	**Output 1.1:** Six (6) waterharvesting dams constructed and rehabilitated for increased water availability	Improved and sustained water availability to the semi arid communities for improved livelihoods and resilience to the effects of climate change Community enabled to sustainably manage and use water resources and their infrastructure	341,840
		Output 1.Installation of bore holes for domestic water use		66,560
Develop and implement participatory afforestation program for locally adapted fruit and forest trees	Number of nurseries established and running Number of trees planted and surviving in the field	**Output 2.1:** Six community fruits and forest trees nurseries established.	Restoration of ecosystem services and improved livelihoods of target community Strengthened capacity of semi arid communities on integration of conservation and income generation	74,000
		Output 2.2: capacity buildig in tree planting and management of 100,000 locally adapted fruits and forest trees per project site-farms and catchments		18,920
		Output 2.3: Enhanced capacity of community members on establishment and management of fruits and forest tree species for conservation and income generation		62,100

Project Components	Indicators	Expected Concrete Outputs	Expected Outcomes	Amount (US$)

Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture	Number of aquaculture ponds established Number of vegetable farms established Water,pasture and fodder availability	**Output 3.1:** Twelve aquaculture model farms established.	Enhanced capacity of people with knowledge on integrated and diversified technologies for fish, crops and livestock production. Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use	82,520
		Output 3.2: Six vegetable model farms established		93,760
		Output 3.3: Establish water drinking points, pasture and fodder for livestock production		54,000
Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity	Reduced prevalence of tickborn diseases	**Output 4.1:** Six dip tanks for control of tickborne diseases constructed	Reduced losses from climate change associated emerging insect pest/vector and diseases, hence leading to improved crop and livestock productivity. Increased semiarid community adaptation and resilience capacity Strengthened awareness and capacity of people on adoption and application of IPM technologies in crop production	69,000
	Increased capacity to control emerging plant pests and diseases	**Output 4.2:** Model plant health clinics and surveillance systems established		28,200
		6. Project Execution costs		193,876
		7. Total Project Cost		1,084,746.00
		8. Project Execution Cost (9.5%)		103,050.60
		9. Implementing Entity Project Cycle Management Fee (8.5%)		92,203.40
		Amount of Financing Requested		**1,280,000**

Projected Calendar:
Table 3: Milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	March 2020
Project/Programme Closing	March 2024
Terminal Evaluation	June 2024

PART II: PROJECT JUSTIFICATION

A. PROJECT COMPONENTS,

Climate change is widely regarded as a global problem posing challenges to survival of mankind and sustainable development. Climate change poses serious risks that impede government's efforts to tackle poverty and indeed, threatens to undo decades of development efforts, which are being implemented. It is widely accepted that the impacts of climate change are, and will continue to be more pronounced in poor countries. As has been explained in the background section, Tanzania is a poor country with poverty more severe in rural settings and especially so in semi-arid areas where the environmental is naturally unsupportive of development and basic livelihood activities. The biggest underlying challenge facing semi-arid communities of Tanzania is water scarcity preventing quantity and quality water supply for household use as well as for crop and livestock production. Semi-arid community feels effects of climate change more severe where costs of lack of adaptation measures can be very high to both local and international community. Adaptation interventions that build the capacity of semi-arid communities to deal with the challenges of water scarcity and the associated climate challenges of floods and environmental degradation are critically demanded. Communities are surviving under very harsh conditions where very small waters are available and worse still highly contaminated and shared between humans and animals. In addition, existing water harvesting dams were constructed during colonial times (> 60 years ago). These dams have been heavily silted thus reducing their water storage vulumes, broken embankments and spillways (Figure 10). This project is designed to enhance water-harvesting capacity of the semi-arid communities. The water harvested from the proposed dams will be used to support integrated innovations for horticulture and livestock production as well as afforestation. The water harvesting is designed to help supply clean and safe water for domestic water and shorten the long distances walked by especially women and children to fetch water. Community and institutional capacity building is coined into each intervention to enable sustainable implementation and out-scaling of the introduced interventions. To achieve the aims of this project the following four components have been proposed by SWAHAT:

PROJECT COMPONENT 1: Installation and rehabilitation of community water harvesting dams and facilities:

Water availability is the key entry point in building livelihoods resilience in rural communities living in climate change prone semi-arid areas who solely depend on rain-fed agriculture. Water harvesting technology proposed in this component is the fundamental intervention where other project components will be anchored-on to build resilience of vulnerable rural communities to climate change impacts. The resultant outcomes from this project component will lead into improved livelihoods and resilience of the rural communities and improve their adaptation capacity to climate change, improved food and nutrition security, and ecosystem services. In addition, the constructed dams will increase availability and access of water to resident rural community members as well as reduce drudgery for family members especially women and children from long distance walk in search for water. Additional deep-wells will be installed in the project village sites in order to enhance availability of water for domestic use. This will save time women and children to venture into income generating activities and education respectively.

To ensure sustained management and maintenance of the harvested water and its associated integrated systems, each component has a capacity building activity to enable the community to acquire the necessary knowledge and skills to be used during and after the project. Local government authorities with expertise in different fields of the intervention systems (agriculture, horticulture, forestry, beekeeping, irrigation and aquaculture) will be engaged in the project in order to take lead and contribute to integrate innovations into local government development strategies. For further sustainability of the dams and the systems, a "water users right committee" will be formed in each village in order to foresee the management of the systems associated with strategic water harvesting. A certain small, affordable and consented tariff will be set to be paid to the water committee account in order to serve for maintenance of the systems even after the project lifespan. In addition, the local district authorities under the District Executive Director (DED) will be the overall authority and has the capacity to inject finances for maintenance costs of the dams after project closure.

This component 1 is in line with two AF (adaptation fund) outcomes:
Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors
Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress
This component will generate two concrete outputs:

Output 1.1: Six (6) water-harvesting dams constructed and rehabilitated and boreholes established for increased water availability.

Figure 10: **Broken embankment and spillway of dams as observed during field survey and stakeholders' consultation exercise in June 2019 by project team. These water-harvesting dams have become shallow due to siltation and can barely store rainwater during dry seaseon for 2 months only.**

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Drought, runoff due to flooding, with no effective water harvesting interventions, water scarcity for agriculture, livestock and domestic use.

Brief Activities	Survey, and Enforcement of dam spillways, erecting embankments, excavation of silted dam areas, Installation of irrigation water gates and canals, installation of bore hole for safe/clean domestic water
Adaptation Benefit	All people (129,000) living in and around the project villages will benefit from increased water availability for enhanced resilience and productivity of agro-ecosystems goods and services The water will be used for livelihood improvement through agriculture and horticulture (crop production), improved livestock husbandry, aquaculture, and improved forest ecosystem services
Budget	**408,400**

Water harvesting through dams will involve technological adaptation strategy that will improve the efficiency and effectiveness of utilising water resources. In absence of the proposed dams, non-harvested water will continue to be lost rapidly through runoff, floods and evaporation. The dams will solve the problem of water scarcity and retain water in the local areas for various livelihood activities in particular agriculture and horticulture (crop production), improved livestock husbandry, aquaculture, and improved forest ecosystem services. To ensure availability and access of clean and safe water for domestic use in the selected and most climate change affected areas, deep bore holes will be installed in these areas. The following activities will be implemented in this output:

Activity 1.1.1: Land Survey, dam site mapping and land clearing of dam sites:

Selection of the dam sites has been done in participatory consultative process (Annex 1) involving district land use, agriculture, forestry, livestock, aquaculture and irrigation experts, CBO/ NGOs and members of the local community during consultation work. In addition, survey on social and economic wellbeing status, potential weather and meteorological data, catchment point, vegetation, soil types, crops grown, livestock population and types will be conducted.

Activity 1.1.2: Excavation of dams to increase depth for more water storage capacity, re-installation of dykes and construction of spillway in each of the strategically selected water harvesting dams in vulnerable villages activities will be carried out in 3 semi arid regions of Tabora, Singida and Dodoma (6 dams.
Topographic surveys and designs of the catchment and the dam sites have been clearly established (Annex Figure 13: Topographic outlines of the Ibugule dam for proper design of enforcement of embenkement and water storage capacity of the dam, Annex Figure 14 Design of the embankment and water storage capacity of the Ibugule dam). Designs for dams restoration and re-enforcement of spillway and repair of brocken embankements have been established to allow for correct implementation of the project (Annex Figure 14 Design of the embankment and water storage capacity of the Ibugule dam). By this procedure, catchment-wide and further surveys have been minimized.

Activity 1.1.3: Installation of water drinking troughs for livestock and water supply system for tree nursery, poultry.

Output 1.2 Improved Management and conservation of the dams' catchment areas

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Land degradation leading to soil runoff, siltation and damage of constructed dams. Low institutional and community capacity on sustainable management, governance and use of water and other natural resources
Brief Activities	Planting trees for catchment protection and training of community and relevant stakeholders on catchment and water management, governance and utilisation
Adaptation Benefit	All people in the project villages will benefit from sustainable water availability and better adaptation to climate change The target community will build their capacity in terms of skills and knowledge on sustainable management, governance and utilization of water resources. They will be able to protect and sustain catchment health, water harvesting infrastructure, implement water use governance and bylaws, conflict resolutions and be in a position to take over interventions after project life time
Budget (USD)	**66,530**

Major activities for this out put include:

Activity 1.2.1: Planting of forest trees in the catchment areas to protect water-harvesting dams
Activity 1.2.2: Establish water user groups for governance mechanism for equitable water sharing and forest resources
Activity 1.2.3: Conduct training on water hygiene, sanitation, governance, maintenance and management of dam infrastructure and sustainable use of water resources

Project Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees

This component will support climate change vulnerable farmers to manage their resources in ways, which protect ecosystems and increase resilience to climate change. Widespread degradation of forest and agroecosystems in arid and semi- arid areas has reduced capacities for resilience and adaptation to climate change. A range of technical prototypes will be devised to address appropriate selection of adopted fruit and multipurpose forest and agroforestry species, nursery establishment and management, tree planting and care, sustainable harvesting and use of restored tree resources so as to sustain a green environment in these areas. They will include integrated apiculture, non-destructive harvesting of wood-based products e.g. for fuel wood and construction materials, processing of non-wood products and introduction of energy saving stoves. Encouraging ecosystem-based interventions (integrated activities) will help to improve the resilience, adaptation capacities of the beneficiaries and for the wellbeing of the natural habitat. Consequently, this component will contribute towards Improved ecosystem resilience and delivery of ecosystem goods and services; Increased sources of employment opportunities resulting from fruits and forestry venture and reduced land and forest degradation in the semi-arid landscapes.

This project component is in line with the following adaptation fund outcomes:

Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level
Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced and This component will generate four outputs:

Output 2.1: Six community fruits and forest trees nurseries established.

Location	Nzega, Igunga, Manyoni, and Bahi

Issues	Climate change is contributing to land degradation and leading to deforestation of village forest reserves aggravated by drought and anthropogenic activities. Community lack seedlings supply, cannot afford expensive seedlings available from distant suppliers, start-up support for nursery establishment, the required nursery running skills and knowledge and how to handle and transport seedlings for transplantation
Brief Activities	Establishment of nurseries for forest and fruit trees species using mango, cashew, grapes, guava, oil palm, dates, avocado and citrus, and adapted forest species such as include Senna, *Azadirachta*, *Acacia*, *Cassia*, *Trichilia*, *Leucaena* and Moringa trees.
Adaptation Benefit	12,000 Community members (especially women and youths) with increased knowledge on tree nursery management for increased alternative sources of income generation and reduction of land and forest degradation in the community landscape threated by climate change.
Budget (USD)	**74,000**

Major activities for this output include:

Activity 2.1.1: Selection and collection of of the best adapted tree species for semi arid areas

This will be made based on further consultation with local communities and feasibility assessments. This activity will emphasize nursery interventions that will produce quality seedlings to be used for afforestation of the semi-arid landscapes as a way of counteracting deforestation, protecting the environment and meeting the ecosystem goods and services needs of the rural and adjacent township communities.

Activity 2.1.2: Optimization of propagation methods for each of the selected species under standard nursery establishment and management.

Activity 2.1.3: Farmers Groups training on nursery techniques, establishment and management

Training will focus on seed and vegetative propagation methods and distribution of germplasm material. Although technologies on establishment, propagation and management of fruits and forest tree species exists, yet the challenge has been the lack of knowledge and access to these practices by the vulnerable rural community. This output will focus on introducing and training vulnerable communities on these knowledge and technologies through establishment of farmer field schools and exchange visits in collaboration with other farmers, researchers and local institutions (local government and NGO) on establishment, propagation and management of fruits and forest tree species.

Output 2.2: At least 100,000 locally adapted fruits and forest trees per project site planted in local communities' farms and catchments

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Climate change is contributing to land degradation and leading to deforestation of village forest reserves aggravated by drought and anthropogenic activities. Communities have the will to plant trees but lack seedlings, initial planting support and have no knowledge and skills on tree planting and management. Lack of tree cover in these areas weaken ecosystem resilience, declines biodiversity and fail to supply important ecosystem goods and services vital for livelihoods
Brief Activities	Planting and proper management of locally adapted fruits and forestry trees for afforestation and reforestation of degraded catchments and farmlands in semi-arid areas; Management, monitoring and evaluation of performance of planted trees
Adaptation Benefit	Greening of the semi-arid landscapes, habitat restoration for biodiversity

	conservation, improved ecosystem resilience for supply of goods and services. Women and children will be relieved from the drudgery of walking long distance in search for fuel wood, income and nutrition security will be improved. Therefore, the community and environmental resilience to climate change will be enhanced.
Budget (USD)	**18,920**

Major activities for this output include:

Activity 2.2.1: Planting of forest trees and fruits in the catchments and degraded land for conservation of biodiversity and water resources, on farmlands and village forests for wind breaks, erosion and flood control, agroforestry with its associated benefits, woodlots, fruits, apiculture, and construction materials; and along the dams for protection of embankments and the general infrastructure. **Activity 2.2.2:** Management, monitoring and evaluation of performance of planted trees

Output 2.3: Enhanced capacity of community members on establishment and management of fruits and forest tree species for conservation and income generation

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Limited capacity for afforestation and reforestation of degraded farms and forest landscaped. Lack of species-specific requirements and skills needed for planting and management in the field. Lack of capacity to generate income from tree products in a way that is not destructive i.e. combining conservation and economic gains goals for sustainable adaptation to climate change
Brief Activities	Instilling hands-on practical skills to farmers and extension officers on tending operations (planting, protection, pruning and thinning) and requirements for each species.
Adaptation Benefit	Farmers and extension officers with increased knowledge on tree care and management. Improved performance and survival of trees in the field, hence more potential for social and environmental benefits of vegetation of semi-arid landscapes. Improved livelihoods and local economy of semi-arid communities through conservation and income generation interventions
Budget (USD)	**62,100**

Major activities for this output include:

Activity 2.3.1: Capacity building to communities on appropriate skills and knowledge on tree planting and management

Activity 2.3.2: Dissemination for wider capacity building and knowledge dissemination through media like radio, TV and newspapers;

Activity 2.3.3: Mainstreaming training and training in various platforms.

Establishment of farmer schools where knowledge and skills for improved natural resource management can be obtained. Apart from farmers' schools, also schools will be involved through Environmental Clubs with the purpose of inculcating environmental awareness to people since their childhood on adaptation to climate change and resilience.

Activity 2.3.4: Training local communities especially women and youths in the target semi-arid areas focusing on income generation through commercialization of nursery seedlings and fruit and forest products. It will involve sustainable harvesting and processing technologies for products such as charcoal briquettes, honey and candles, fruits and poles. The key issue under this activity is to allow community to improve livelihood from use of tree resources using non-destructive harvesting and utilization techniques.

Analysis has indicated that tree farming, if appropriately commercialized; has significant returns since the inputs and labour requirements are low but the returns are higher.

Project Component 3: Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture

About 75% of the country's population lives in the rural areas and depend on agriculture for their livelihoods. Poor agricultural practices often driven by lack of knowledge and poverty has resulted in low yields, land degradation and escalated poverty. Such challenges are even severe in arid and semi-arid areas under the face of climate change. Actions are needed that will minimize the problems facing agricultural productivity. Technologies for improved and sustainable agriculture are available. These technologies need to be tailored to suit local characteristics and then given to local communities for practicing. These farmers need support of appropriate technologies as well as initial set up of such interventions. In this component appropriate integrated agriculture technologies (IAT) for climate resilience livelihoods diversification will be introduced and promoted to the vulnerable rural communities. These IAT will emphasize on utilization of harvested water through linkages and synergies among various agricultural activities like livestock production, fish farming and crops (especially horticulture). Rain-fed agriculture and lack of irrigation means leads to poor yields and crop failure. There are inadequate livestock water points and pasturelands forcing them to walk long distances in search for water and pasture. Community and their institutions have low capacity on improved and integrated farming, livestock production and aquaculture techniques

The major outcomes from this component will include: Improved and sustainable farming systems that are in line with conservation of semi-arid landscapes, Improved crop, livestock and fish yields that will translate into improved nutrition and food security and hence more adaptation capacity by a healthy society. Improved household livelihoods and income generation of local communities from sale of fish, crop, and livestock products, and reduced rural to urban migration in search for better life.

This project component is in line with adaptation fund outcomes

Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level
Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas

This component will generate four outputs

Output 3.1: Twelve aquaculture model farms established.

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Over-dependence on crop farming for earning livelihoods and lack of diversification has increased demand pressure on land; intensifying shifting cultivations and making community more vulnerable to climate change impacts. Aquaculture is an emerging and promising livelihood option in Tanzania but is yet to be capitalized due to among other things, include lack of awareness and the required skills and knowledge.
Brief Activities	Integration of tailored aquaculture, horticulture and livestock husbandry proven technologies and methods; taping from research and project experience from agricultural institutions and best practices. Capacity building so as to equip responsible institutions and communities with the technologies and methods for Establishment, stocking and management of fish farms in villages;

Adaptation Benefit	Farmers in the project areas will benefit through improved household livelihoods and nutrition by adoption of fish farming practices as divesrsified sources of incomes, and nutrition
Budget (USD)	**82,520**

To accomplish this output, the following activities will be undertaken:

Activity 3.1.1: Excavations and establishment of model fish ponds down stream of the water harvesting dams;
Activity 3.1.2: Stocking of fingerlings and management of fish ponds
Activity 3.1.3: Construction of water and nutrient recycling systems from fish to vegetables
Activity 3.1.4: Training of farmers in the target communities on fish farming practices, management of ponds and sustainable harvesting of fish;
Activity 3.1.5: Development of manuals and fliers on aquaculture and value addition and marketing;

Output 3.2: Six vegetable model farms established

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Experiencing crop failures due to limited rainfalls and lack of irrigation schemes; lack of institutional and community capacity in horticulture skills, and how could be integrated with other activities such as aquaculture and livestock husbandry.
Brief Activities	Establishment, production and management of horticultural crops in the project sites using irrigation, institutional and community capacity building on irrigation and horticulture aspects.
Adaptation Benefit	Village communities in the project areas will have access to vegetables/horticultural crops for household consumption (improved nutrition) and income generation throughout the year.
Budget (USD)	**93, 760**

In order to achieve this output, major activities will include:

Activity 3.2.1: Eestablishment and management of horticultural crops down-stream of the water dams;
Activity 3.2.2: Design and establish irrigation systems for horticulture crops (overhead, furrow or drip irrigation);
Activity 3.2.3: Training of farmers on horticultural value chain of different adapted commercially marketable crops;
Activity 3.2.4: Training on postharvest handling and packaging of horticultural crops for local and distant domestic markets; and
Activity 3.2.5: Develop vegetable gardens for enhanced production efficiency of horticultural crops in the project areas.

Figure 14: Horticultural activities undertaken by few farmers but limited with sufficient irrigation water

Output 3.3: Establish water drinking points, pasture and fodder for livestock production

Figure 15: Limited water supply and infrastructure for livestock observed during the consultation exercise in the proposed project semi-arid areas

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Reduced productivity of livestock and poultry due to prevalence of pests and diseases, limited availability of water, pasture and feeds. Low institutional and community capacity on skills and knowledge for improved management of livestock under harsh semiarid and climate change conditions.
Brief Activities	Establish poultry and livestock demonstration units, and Construction of livestock water drinking points to serve for community livestock herds; Capacity building of local communities through training
Adaptation Benefit	At least 40% Increased resilience of livestock as a result of increased access to fodder, water and improved diseases and pests' control to village community livestock herds. At least 30% increased household nutrition and income from adoption the developed model for improved crops –poultry, fish and livestock complementarity for climate change adaptation and resilience. Enhanced institutional capacity, and farmers equipped with improved capacity in livestock husbandry for increased adaptation and resilience to climate change
Budget USD)	**54,000**

This will involve integration of livestock and poultry as part of components utilizing harvested water for diversification of community livelihoods. Pasture plots will be established along the dams for fodder to feed livestock.

Major activities in this output will include:
Activity 3.3.1: Training on modern livestock management for climate change adapatation

Activity 3.3.2: Construction of water drinking points and water delivery trenches for community livestock along the dams to reduce siltation and contamination of water; **Activity 3.3.3:** Establish model pasture paddocks for rotational grazing;

Figure 16: Livestock drinking point with turbid water due to poor construction and management of the dam embankment as observed in Manyoni District during consultation.

Project Component 4: Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity

Climate change has been associated with new emerging races and ecotypes of insects and disease pests. As of recent fall armyworm, spider mites, races of virus like maize lethal necrosis and animal diseases are associated with elements of climate change. This component aims to implement optimal strategies for integrated pest and diseases management in order to reduce risks of crop and livestock loss. In order to enhance resilience of farmers, the project will establish concrete pest management structures to combat diseases causing vectors and insect pests both in crops and livestock, design reliable management options and mechanism to avoid the spread of pests and diseases. The project will build crop pest traps in target village farms for collection and monitoring of major threat pests in each crop season. For animal disease vectors; dip tanks will be constructed in each target project villages for control of vectors of tick-borne diseases. These concrete structures will be coupled with other IPM strategies in control emerging pests and diseases in crop and livestock. For crop pests and diseases some of the IPM technologies will include among others testing economically feasible pest management options involving the use of pest and disease resistant crop varieties, use of natural products, cultural control strategies, push-pull technologies and minimum use of synthetic pesticides. Farmers training and training of trainers on IPM packages will be conducted for management of emerging pests and diseases affecting crops productivity as a result of climate change. On the other hand, management livestock and poultry diseases will focus on arthropodborne diseases such as African swine fever, rift valley fever, east coast fever, Newcastle disease, fowl pox, and CCPP (Contagious Caprine Pleural Pneumonia) and CBPP (Contagious Bovine Pleural Pneumonia) affecting goats and cattle respectively. These will be managed through establishment of vaccination programs, dipping and training farmers in the target community on biosecurity measures. The outcome from implementation of this project component will lead into reduced losses from climate change associated emerging insect pest/vector and diseases, hence leading to improved crop and livestock productivity consequently increased farmers' resilience to climate change impacts.

This project component is in line with adaptation fund outcomes

Outcome 3. Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

This component will generate four outputs

Output 4.1: Six dip tanks for control of tickborne diseases constructed

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Low capacity in terms of skills and infrastructure of livestock keepers to control
	tick-borne diseases that reduce livestock productivity
Brief Activities	Site selection for building dip tanks and excavation of pits, formation of village committees for dip tank management. Sustainable management of dip tanks, and Registration of livestock keepers and training of dip attendants
Adaptation Benefit	300,000 cattle, 500 Sheep and goats will be served from diseases transmitted by vectors due to dipping.
Budget (USD)	**69,000**

Water harvested from the dams will be used to fill up dip tanks for animals.

Activity 4.1.1: Site selection, excavation of pits and building dip tanks

Activity 4.1.2: Formation of village committee for dip tank management, include formulation of strategies that will lead into sustainability of dip tanks.

Activity 4.1.3: Registration of livestock keepers and training of dip attendants

Output 4.2: Plant health clinics and surveillance systems established

Location	Nzega, Igunga, Manyoni, and Bahi
Issues	Crop losses contributed by climate change related emerging pests and disease, low institutional and community capacity to deal with climate change related emerging pests and diseases
Brief Activities	Traps will be installed in crop fields for catching insect pests and vectors for early warning. traps will help to collect new and common insect species. Participatory surveillance and scouting for identification of major insect pests and vectors that occur in the project areas . Training of extension officers and community members on detection, identification and management of emerging pests and diseases. Develop manuals for Appropriate diagnostics of pests and diseases and corresponding IPM approaches.
Adaptation Benefit	Early warning systems for control of climate change related pests and diseases established. At least 40% increased in productivity of crops as a result of implementation of timely control of emerging pests and diseases in the fields. Improved capacity of farmers to diagnosis of pests and diseases.
Budget (USD)	**28,200**

Physical insect collection traps will be installed in crop fields for catching insect pests and vectors thus helping to give early warning of emerging pests of threat to crop production. These traps will help to collect new and common insect species of that directly devastate crops line fall army worms, maize stalk bores, aphids, white flies, and moths. Once timely collected quantified and identified by the help of extension entomologist or plant protection extension agents will provide to farmers early intervention strategies to minimize crop loss or transmission of diseases such as viral diseases.

Activity 4.2.1: Participatory surveillance and scouting for identification of major insect pests and vectors that occur in the project areas affecting crop and livestock production;

Activity 4.2.2: To establish insect traps based on abundant species in the location.

Guidelines for each insect pest/vector and disease will be produced and distributed to target farmers to help on intervention towards control of the pest.

Activity 4.2.3: Desisgn diagnostic tools for pest and disease and implementation of management options /IPM technologies

B. ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS

The baseline information given in the project background above and baseline survey carried out in the project sites clearly shows that there are climate change related economic, social and environmental impacts associated with rainfall scarcity and irregularity, land degradation, floods, biodiversity loss, and increased pests and diseases of crops and livestock in the semi arid areas of Tanzania (Annex 1). This background information provided in PART 1 above, include the consultative fieldwork that was undertaken provides baseline evidence of vulnerability of the semi arid regions to climate change. One of the baseline surveys was done to generate evidence of climate change levels of vulnerability to the target semi arid rural cummunitie (Annex 1). This survey involved a set of questions that identify processes for options in resilience, adaptation and enhancing livelihoods. The participatory baseline studies in each of the study village were to establish the status of environmental, economic and social aspects related to each of the project components. The current impacts and and proposed outcomes will be measured against during monitoring and evaluation of the progress of the SWAHAT project. Beneficiary villages for the project have therefore been selected based on: i) vulnerability of communities to the impacts of climate change; ii) adaptive capacity of communities; and iii) dependence of the communities on agriculture and ecosystem services. Selection of individual participants in the project was random but stratified to include different vulnerable social groups within the village. From the baseline study, different social groups were identified and ranked according to the climate change vulnerability levels.

The project will have both economic and social benefits. Women and men will be involved and participate fully and equitably while receiving significant social and economic benefits. People with disability, living with HIV/AIDS, youth and the elderly people, and all other disadvantaged social groups will be specially integrated into the project so as they receive fair and equitable benefits. The Government of the United Republic of Tanzania strategy is to achieve engagement of 50% participation of women in different positions e.g. decision making and employment positions. SWAHAT implementation will be inline with the National Strategy for Gender Development where involvement of women in project implementation will be at least 50%. Women will be sensitized, trained and facilitated to participate in all integrated interventions of the project. Training empowers women with skills, which enhance their performance in planning, management, entrepreneurship, and business administration including undertaking various developmental interventions. The local economy of the semi-arid region will gain a boost through improved income generation sale of crop and animal produce as well as savings due to more time made available to entrepreneurship and business ventures. Improved local economy will increase the capacity of the community to meet basic needs such as education, medical care and food.

Environmental benefits will be realised through restored vegetation cover due to planting of fruit and forest trees. At least 100,000 trees will be planted during the project implementation while the local government and communities will be capacitated to continue production of seedlings and planting after the project. This will lead to habitat restoration that will harbour more flora and fauna organisms, improved ecosystem resilience, goods and services and reduced land degradation caused by surface run off and floods. Consequently the natural resilience of the environment to climate change effects will be increased while also reducing biodiversity loss.

It therefore, expected that strategic water harvesting and the associated integrated interventions will provide social, economic and environmental benefits to the vulnerable communities in these areas. The successful implantation of the four project components will contribute to increased crop, livestock and fish

productivity that lead to improved households' nutrition, income generation, and eventually raising the local economy. Nursery production of fruit tree seedlings will lead to increased production, consumption and sale of fruits with positive effects to people's health and income status. This project will increase water availability as a result of water harvested from dams and bore holes deep wells thus reduce drudgery and time spent by women and children looking for water to serve for domestic use. The outcome of these impacts has multiple-functions, the saved labour time and energy which is mostly of women will be redirected to other production activities for generating income, include investing much time on education for children. Afforestation and reforestation in combination with fruit trees, locally adapted forest tree will provide high environmental benefits including restoration of land cover, ecosystem services and enhanced biodiversity. This will increase availability of vital ecosystems services such as improved soil water retention capacity, soil moisture recharge, availability of pollinators as well as improved microclimate. Table 3 summarizes the tangible social, economic and environmental benefits of the four major project components.

Table 4: Contribution of the project components to social, economic and environmental benefits

Project component	**Social benefits**	**Economic benefits**	**Environmental benefits**
	Short to long term	**Short to long term**	**Short to long term**
Component 1: Installation and rehabilitation of community water harvesting facilities that will integrate agriculture, livestock, tree planting and aquaculture	• Improved livelihoods and resilience of the rural communities to climate change, improved food and nutrition security • Reduce drudgery for women and children from long distance walk in search of water • increased knowledge and skills on water resource management	• Reduced time and fatigue to livestock and human in search for drinking water due to long distance walk. • Increased productive time of women relieved from drudgery due to search of water and firewood. • Sustained and resilient crop yields in dry years where conventional agriculture approaches would have limited success	• Increased water availability for enhanced resislience and productivity of agro-ecosystems goods and services. • Increased knowledge on protecting catchment areas, water storage capacity, and reduced siltation rates • Increased knowledge on water use rights, governance,.
	Short to long term	**Short to long term**	**Short to long term**

Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees	• Increased employment opportunities resulting from fruits and forestry venture • Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species • Reduced drudgery as a result of improved availability of fuel wood • Improved nutrition of local communities as a result of access to fruits and vegetables	• Increased business opportunities throoug sales of timber and non-timbber forest products • Increased alternative sources of income generation from sales of fruits and forest tree seedlings from nurseries	• Improved ecosystem health and delivery of ecosystem goods and services including pollinators to serve the crop fields • Reduced land and forest degradation in the community landscape • Increased knowledge on environmental awareness, adaptation to climate change and resilience • increased understanding on selection of suitable germplasm of selected forest and fruit trees for adaptation and resilience
	Short to long term	**Short to long term**	**Short to long term**

Project component	**Social benefits**	**Economic benefits**	**Environmental benefits**

Component 3: Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture	• Improved household livelihoods through adoption of divesrsified sources of incomes, food, and associated technologies • Improved water use efficiency for farming and livestock needs by the community • Improved knowledge of farmers on fish farming practices, • Increased innovations options for resilience and adaptation to climate change • Enhanced efficiency in participation and contribution of women and other marginalized social groups in agriculture and local economy	• Increased income generation as a result of integrated climate resilient smart agriculture. • Reduced post harvest losses of horticultural crops through increased knowledge on postharvest handling • Increased income generation of local communities from fish, crop, livestock and domestic water use • Increased and diversified sources of income generation • Increased productivity of diversified crops, poultry, livestock and fish farming • Increased knowledge of farmers on production value chain of vegetables . • Increased income diversification from crops, livestock, fish, and forest products leading to increased household financial flow and stability to cope with hardships (hunger, floods, and drought).	• Reduced land degradation due to use of proper farming technologies • Improved pollination through apiculture integration • Increased knowledge on pasture species adaptation resilience
	Short to long term	**Short to long term**	**Short to long term**
Component **4:** Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity	• Reduced health risks to human and animals as a result of minimum pesticide application • Increased farmers' resilience to climate change impacts through adoption of IPM technologies for controlling emerging pests and diseases • Increased food security among community members • Increased knowledge and awareness on management of insect pest/vector and disease from use of developed IPM guidelines • Increased knowledge on types of technologies and status of adoption in crops,	• Reduced losses from climate change associated with emerging insect pest/vector and diseases • Improved crop and livestock productivity through adoption of economically feasible pest management options • Improved financial savings costs that would have been incurred to purchase pesticides	Reduced use of pesticides in crop and livestock production contributes to environmental health Increased knowledge on Identification of major insect pests and vectors that occur in the project areas affecting crop and livestock production .

Project component	Social benefits	Economic benefits	Environmental benefits
	poultry and livestock production		

C. COST EFFECTIVENESS ANALYSIS

Approach to ensuring cost-effectiveness

The National Adaptation Programme of Action (NAPA) of The United Republic of Tanzania conducted a multiple climate change vulnerable sectors analysis to prioritize adaptation actions according to their potential for positive effects on economic development, social capital and environmental management. Cost-effectiveness of the interventions was a criterion used to measure economic development. As such, the interventions proposed by the NAPA are the most urgent and were assessed to be cost-effective. The activities proposed in the SWAHAT project under AF are inline with those prioritized in the NAPA as described in Part II.D and as such are already identified as cost-effective by the United Republic of Tanzania.

The proposed project will address the agriculture, water and forestry sectors which were identified as the most vulnerable to climate change; ranking number 1, 2 and 4 respectively being the priority areas for adaptation interventions by NAPA in the URT. The proposed interventions in this project are also of top priority for each of the 3 sectors mentioned above. NAPA emphasizes establishment and development of irrigation systems and innovation of alternative farming systems as the top priorities in the agriculture sector. In the water sector, priority is on development alternative water storage technologies for communities and promotion of water harvesting interventions. Afforestation, which is also a component in this project, is given top priority in the forestry sector as indicated by NAPA. A number of interventions have been adopted based on those listed as climate change adaptation measures identified in the UNEP-GEF report[54].

The anticipated benefits from implementation of project components will greatly exceed the costs and prevent climate change-induced losses. Component 1 will benefit local community by increasing availability and access to water that will be used for domestic purpose, crops, fish and livestock production. This will lead to increased food and nutrition security as well as restoration of degraded ecosystem services. Component 2 of the project deals with participatory afforestation for locally adapted fruits and forest trees species, which have tangible benefits such as, afforestation and reforestation, reduced run off, prevention of soil erosion and siltation, increased fuel wood availability and improved ecosystem services. In addition, interventions of tis component will lead to increased alternative sources of income generation from sales of fruits and forest tree seedlings from nurseries. Activities in component 3 will lead into increased climate resilient livelihoods diversification through adoption of diversified income generation strategies, diversified food sources and use of smart agriculture skills. Adaptation benefits from activities in component 4 include: reduced health risks to human and animals as a result of minimum pesticide application, reduced losses from emerging insect pests/vectors and diseases, reduced use of pesticides[55] in crop and livestock production for environmental well being and increased farmers' resilience to climate change impacts through adoption of IPM technologies for controlling emerging pests and diseases.

There are several barriers that may hamper the implementation of the SWAHAT activities, thus calling for a need to address them. Apart from limited internal capacity to fund adaptation activities, the vulnerable

[54] The McKinsey Group, 2010. Shaping Climate-Resilient Development. http://www.mckinsey.com/App_Media/Images/Page_Images/Offices/SocialSector/PDF/ECA_Shaping_Climate%20Resilent_Development.pdf.

[55] FAO. 2011. "Climate-Smart" Agriculture – Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Food and Agriculture Organisation, Rome

communities in the project area are also constrained by: (i) extreme poverty, (ii) small and fragmented farm lands, (iii) illiteracy, (iv) the impact of HIV/AIDS creating a major drain on family energy, cash and food, and (v) Limited analytical capability of the vulnerable groups to effectively analyze the threats and potential impacts of climate change, so as to develop viable adaptation solutions. Funding the activities of this project will address these barriers at a lower cost compared to costs of dealing with the impacts of climate change in absence of the interventions.

Table 5: Summary of the costs and benefits of the SWAHAT interventions.

Project component	Project Cost USD	Tangible adaption benefits	Averted losses	Alternative interventions and trade-offs
Component 1: Installation, rehabilitation and establishment of community water harvesting dams	**408,370**	• Easy access to water resource for domestic use, crop and livestock production in the community • Improved technical capacity of local community members through participation (i.e. voluntarily and employed local beneficiaries) in dam construction as well as the associated infrastructures • Reduction of time spent by livestock herd drivers for walking long distances searching for drinking water • Reduced time spent by women and children in search for water. Time saved could be invested to other more productive activities • Increased knowledge on water harvesting, water use rights and	• Crop and livestock loss due to dependency on rain-fed agriculture, drought and floods, • High construction costs • Food insecurity and malnutrition based health problems • Water losses as a result of excessive runoff • Labour time wastage in search for water for domestic and livestock use	• Timely planting of locally adapted crops and use of early maturing crop varieties **Trade-off:** • Knowledge and information of meteorological forecasting is limited to farming community • Cost implication to farmers in term of inputs use due to erratic and unreliable rainfall • Limited access to expensive hybrid seeds, • Total use of external contractors and all labourers • High costs of construction • Denying employment opportunity for local people • Lack of local skills development • Dependence on food aids **Trade-off:** • High cost for importing and distribution foods • Food sovereignty is jeopardised • Dependence on rain-fed agriculture **Trade offs:** • Risks and uncertainties • Unreliable and erratic rainfalls • Digging of shallow wells and charcoal dams **Trade off:** • Not sustainable and dry easily during dry spell • Costly if done individually • Long distance walking in search of water • Drudgery and time consuming • Associated with conflicts and risks • Supply pipe water in the village community from deep wells and lake victoria by the Govt. **Trade-off:** • Extremely expensive to be afforded by the community

Project component	Project Cost USD	Tangible adaption benefits	Averted losses	Alternative interventions and trade-offs
		management for enhanced resilience to climate change		and government
Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees	**155,020**	• improved ecosystem health and delivery of ecosystem goods and services, • Reduced land and forest degradation in the semi arid landscape. • Increased alternative sources of income generation from sales of fruits and forest tree products	• deforestation • soil and land cover loss • land degradation • water losses as a result of excessive run-off and minimal water infiltration into the soil • food insecurity • Rivers siltation • Escalated poverty	• Implementing forest Act, by laws and regulations **Trade off:** • Limited enforcement capacity of law and regulations within local governments • lack of awareness and knowledge among rural communities • Mechanical soil erosion control measures such as gabions, trash lines, and contour bands **Trade offs** • Needs expertize • Poor existing institutional organization to spearhead High cost investment • Dependence on existing forest resources for income generation (wild fruits, charcoal and fire wood illegal logging) **Trade off:** • Inadequate supply • High deforestation • Depletion of natural forest • Aggravate impacts of climate change • Loss of biodiversity

Component 3: Develop integrated climate resilient livelihoods diversification through improved technologies in	**230,280**	• Increased climate resilient livelihoods through adoption of diversified income generation strategies, • Improvement and diversifications of food production through irrigation and	• Deforestation and land degradation • Human ressetlement and urban migration • Food insecurity and malnutrition • Engagement in illegal income generating	• Increased use of industrial fertilizers **Trade offs**: • Expensive • Have negative impact to soil microbial population • Pollution to water bodies • Have negative effect on soil physical and chemical properties • Dependence on forest resource for income generation (charcoal and fire wood illegal logging)

Project component	**Project Cost USD**	**Tangible adaption benefits**	**Averted losses**	**Alternative interventions and trade-offs**
agriculture		other technologies □ Increased knowledge on use of environmentally friendly improved agriculture technologies	activitis by rural dwellers (local spirit, logging, burglary and growing canabis)	**Trade off:** • High deforestation • Depletion of natural forest • Aggravate impacts of climate change • Loss of biodiversity • Rural to urban migration of youth □ **Trade off:** • Loss of agricultural manpower in rural areas • Increased urban population overwhelming the government capacity to provide social services • Engagement in illegal and antisocial activities like robbery, drugs and prostitution

Component **4:** Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity	**97,200**	• Strengthened early warning systems for pest surveillance • Reduced health risks to human and animals as a result of minimum pesticide application, • Reduced crop losses from climate change associated emerging insect pest/vector and diseases, • reduced use of pesticides in crop and livestock production for enviromntal well being and • increased farmers' resilience to climate change impacts	• Economic loss to farmers due to poor return to investments caused by crop and livestock failure • Crop and livestock losses due to infestation of pests and diseases subjecting farmers to more vulnerability • Increased health risks from pesticide use • Increased pesticide and herbicide pollution in rivers and environment • Food and nutritional security • Biodiversity loss due to increased death of non target beneficial insects and microbes as a result insecticide and herbicide	• Intensified agricultural production through heavy use of pesticides, herbicides and fertilizer **Trade off:** • Has high costs; • Build up of resistance • Has negative environmental impacts; and • Can still result in crop failure from climate change hazards. \ • Farmers resorting to use untested local knowledge practices to control emerging pests and diseases in climate change **Trade-off:** • Not always reliable and efficient • Lack of standard formulation • Limited availability • Limited up scaling to other communities • Not scientifically proven and documented
Project component	**Project Cost USD**	**Tangible adaption benefits**	**Averted losses**	**Alternative interventions and trade-offs**
		through adoption of IPM technologies for controlling emerging pests and diseases	use	

The implementation approach of the project will be participatory, whereas local target beneficiaries, including respective government authorities will be fully integrated throughout the interventions (i.e. working collaboratively in identification of key issues of concerns, planning for solutions, implementation and monitoring and evaluations of project activities). Wherever the need for paid unskilled labour is required, especially in activities like constructing the dams, then local people from respective areas will be hired-in/ employed. Through this costs for implementation of the project will be highly reduced. An alternative to this approach is to bring in external workers who will demand a higher pay to compensate for accommodation, expertise, travel as well as food costs.

D. CONSISTENCY WITH NATIONAL OR SUB-NATIONAL STRATEGIES

SWAHAT has been designed to align with national and subnational policies, strategies and plans on climate change as well as cross-sectoral policies such as those on forestry, agriculture, livestock, fisheries, water and environment. The United Republic of Tanzania has signed and ratified several multilateral agreements including those under United Nations such as the UNFCC, UNCCD and The CBD. All national level policy and legal documents takes into account these signed and ratified multilateral agreements. This project aims to tackle climate change related challenges facing semi arid communities of Tanzania by building their adaptive capacity as well as resilience against the adverse effects brought by climate change. Some of the policies, strategies and plans, which the project conforms with are summarized in the following paragraphs.

The National Climate change Strategy (2012) priorities and objectives:

Water is conceived being among the main source of livelihoods, harnessed for domestic, agriculture, industrial use. Climate change is negatively impacting water sources, therefore addressing these climate change induced impacts will allow continuous availability for these elements which are important for sustaining livelihoods, economic growth and social development. In response, as due to the growing concerns over negative climate changes and climate variability, Tanzania like many other countries has vested into several initiatives to curb the situation include developing the National Climate Change Strategy[56]. National Climate Change Strategy was devised seeking for enhancing the technical, institutional and individual capacity of the country to address the impacts of climate change. In order to achieve this aim, the National Climate Change Strategy has identified several strategic interventions (SI), among which are proposed by SWAHAT project component 1 and 3: C) - emphasizes on facilitating and promoting water recycling and reuse; D) – Promoting rain water harvesting; G) – facilitate access to water resources; J)– enhancing decentralization of water sources management.

Forest Policy (1998): With regards to the forestry sub-sector, climate change is reported to have affected many of forest and ecosystem processes. The National Forest Policy of 1998 and subsequent acts programs and plans have the overall goal of enhancing the contribution of forests to sustainable development and conservation biodiversity for the benefit of current and future society. In Tanzania, forests play a major role in building adaptive capacities and resilience of poor and marginalized vulnerable communities such as those living in semi arid areas. Protecting and conserving biodiversity through application of best practices in soil and water conservation; expanding forest cover and use of adaptive species as well as linking conservation areas is pivotal in adapting to climate change and ensuring continuity in the availability of ecosystem goods and services hence improving the livelihoods of Tanzanians. The proposed SWAHAT project will strengthen efforts invested by the Government Forestry Sector particularly on the following areas of emphasis: a) Enhancing control of forest fire, disease and pest breakout; b) Enhancing conservation of forests biodiversity and control of invasive species; c) Supporting alternative livelihood initiatives for forest dependent communities; d) Promoting establishment of woodlots; and f) Strengthening and up scaling of community based forest management best practices.

Agriculture Policy: In Tanzania, the agricultural sector is reckoned as the major economic development pillar employing more than 80% of the country population of 56 million people. Agriculture sector in the country unfortunately suffers from dependency on climate sensitive rain-fed agriculture[57] .Adverse effects of climate change have been recorded within different government reports[58] [59] as cited from CIAT and

[56] UNDP (2007). Human Development Report 2007/2008: Fighting climate change: human solidarity in a divided world. Palgrave Macmillan, New York

[57] United Republic of Tanzania - URT (2009a). Climate change and agriculture policy brief. Vice President's Offi ce, Division of Environment, Dar es Salaam

[58] United Republic of Tanzania - URT (2008). State of the environment report 2008. Vice President's Office, Division of Environment, Dar es salaam.

[59] CIAT; World Bank. 2017. Climate-Smart Agriculture in Tanzania. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); World Bank, Washington, D.C. 25 p.

World Bank. The dependence of agriculture on rainfall increases risks of droughts and floods. Therefore, reducing vulnerability of the sector to climate change will significantly contribute to socio-economic development and ensure food security. Cognizant of the situation, Tanzanian government through Agriculture policy and plans has set and implemented several priorities, of which the SWAHAT project will also thrive to make its contribution to enhance the resilience of the more vulnerable farming communities of semi arid areas to climate change induced impacts, through: a) Assessing crop vulnerability and suitability (cropping pattern) for different micro-site agro-ecological zones; c) Improve appropriate irrigation schemes tailored to semi arid areas which typically receive less rainfall in addition to negative impacts of climate change; d) Promoting early maturing and drought tolerant crops; e) Enhancing agro-infrastructural (input, output, marketing, storage) systems; f) Promoting appropriate indigenous knowledge practices; i) Strengthening post-harvest processes and promote value addition; j) Addressing soil and land degradation by promoting improved soil and land management practices/techniques; k) Strengthen integrated pest management techniques; l) Promote use of pest/disease tolerant varieties; and m) Strengthen early warning systems for pest surveillance.

Agricultural Sector Development Programme II (**ASDP II)**: In collaboration with development partners stakeholders, Tanzania has developed phase two of the Agricultural Sector Development Programme (ASDP II 2018) as the instrument of operationalizing the Agricultural Sector Development Strategy (ASDS), which is seeking to promote higher agricultural growth and improve rural incomes as well as food security by raising productivity and promoting profitability of agriculture. Section D of the ASDP II highlight Key Design Principles to which resilience and adaptation to climate change are factored in interventions. Extremes in rainfall and temperature are included in research and technology development with the aim of strengthening the adaptive capacity of farmers to ensure that impacts are understood and integrated in farming systems. The SWAHAT will contribute in fulfilling the agenda of ASDP II particularly on 4 priority areas: Priority Area 1 (PA 1) emphasize on sustainable water and land use management for crops livestock and fish and system's resilience to climate change. This priority conform with SWAHAT in component ONE**;** b) PA 2 of ASDP II emphasize on enhanced agricultural productivity and profitability (crops, livestock and fish) and this is in line with SWAHAT components 3 and 4.

Livestock sector adaptation initiatives: Tanzania is endowed with about 94 million hectares of land resources of which 60 million hectares are rangelands utilized for livestock grazing that are also vulnerable to climate change impacts. Increasing temperature and frequent droughts are likely to reduce rangelands production capacities. Yet weather variability and climate change have further diminished water volumes in many water bodies more severely in semi arid areas of Tanzania, which has challenged irrigation and contributed to increased nomadic pastoralism that causes fatal conflicts with farmers. Furthermore, droughts reported to have led into a decline in carrying capacity and a reduced quantity and quality of forages, which has already been witnessed in parts of Dodoma, Singida, and Tabora[60].

Likewise, livestock vector borne diseases and spread of tsetse flies have narrowed the area under rangeland. The spread and severity of such diseases have been accelerated by climate change, calling for urgent solutions that strengthen the capacity of the already vulnerable pastoralists to adapt and also to increase the resilience of the natural systems as well as of the community. The livestock sector adaptation initiative of Tanzania aims to enhance the resilience of the livestock industry to the impacts of climate change. This is especially important in rural semi arid areas where the livestock industry is quite dominant. This aim is in consistence with SWAHAT project strategic interventions spelt out in component 1,3 and 4. The proposed project will therefore contribute to the following national strategic interventions for improving livestock adaptation capacities to with stand negative impacts of climate change: a) Promoting climate change resilient traditional and modern knowledge on sustainable pasture and range management systems; b) Promoting development and implementation of land use plans in the semi arid areas; f) Promoting livelihood diversification of livestock keepers; and g) Improving the traditional livestock keeping system.

[60] URT (2013c). Climate change adaptation information toolkit for farming communities in Tanzania. 28pp.

Fisheries: As far as fisheries sector is concerned, the goal of Tanzanian Government is to have fisheries resource able to resist and/or adapt to climate change risks and continue supporting community livelihoods, productivity and diversity of the aquatic ecosystems and fisheries sector in general. The proposed SWAHAT interventions are also within the Government frameworks, and most particularly on: Promoting aquaculture, Enhancing protection and conservation of aquatic ecosystems productivity, and diversity.

National Adaptation Programme for Action (NAPA): The Government of The United Republic of Tanzania recognizes that the extreme vulnerability of communities and the surrounding natural systems to the effects of climate change escalates poverty and slows down achievement of Millennium Development Goals (MDGs) and several other National Development Strategies such as National Strategy for Growth and Poverty Reduction (NSGPR/MKUKUTA) and Vision 2015. The National Adaptation Programme of Action (NAPA) of 2007 was developed to respond to these challenges particularly to identify and prioritizing activities that addresses adaptation to climate change so as to avoid the risks of increased vulnerability and costs, which come along with effects of climate change. NAPA underscores that Agriculture, Water and Forestry are high priority sectors that requires interventions for adaptation to climate change. SWAHAT conform with the following NAPA activities described in each sector, which aims to enhance the resilience to the vulnerable semi arid rural communities of Tanzania to climate change.

i) ***Agriculture Sector*** **(Addressed by SWAHAT component 1, 3 and 4):** i) Increase irrigation to boost crop production in all areas; ii) Introduce alternative farming systems; iii) Create awareness on the negative effects of climate change; iv) Increase the use of manure and fertilizer; v) Range management for livestock production; and vi) Control pests and diseases.

ii) ***Water Sector*** **(Addressed by SWAHAT component 1 and 2):** i) Develop alternative water storage programs and technology for communities, (ii) Promote water harvesting and storage facilities; ii) Develop reservoirs and underground water abstraction; iii) Community based catchments conservation and management programs – partially addressed; iv) Develop new water serving technologies in irrigation.

iii) ***Forestry sector (Addressed by SWAHAT component 2)*****:** i) Afforestation programmes in degraded lands using more adaptive and fast growing tree species; ii) Develop community forest fire prevention plans and programmes; iii) Strengthen community based forest management practice; (iv) Promotion of appropriate and efficient technologies to reduce use of wood in particular to this rural household firewood usage and v) Enhance the development of buffer zones and wildlife migratory routes.

Therefore, the proposed SWAHAT project recognizes remarkable efforts made by the Tanzanian Government, include other stakeholders, whereas these initiatives must be sustained and deepened by enhancing resilient capacities of communities to climate change across all targeted areas of intervention, and the nation at large.

E. PROJECT ALIGNMENT WITH NATIONAL TECHNICAL STANDARDS, GUIDELINES AND REGULATIONS

I. National Standards

The Environment being a global agenda, Tanzania is under obligation to cooperate with other nations in managing the global environment. It is understandable that some national guidelines, policies and strategies may not be adequate in addressing the normally changing environmental and climate change needs. Bearing this in mind, the project will comply with the below national standards, guidelines and regulations, but will also adopt international guidelines, for reducing vulnerability and promoting adaptation and sustainable development while addressing climate change impacts. In this regard, the AF's environmental and social standards are invaluable and will be adhered to, as is further indicated in Section K.

The Constitution of the United Republic of Tanzania (1977)

The Constitution of the United Republic of Tanzania (1977) contains a provision on the protection of natural resources, which covers the environment. Natural resources include forests, vegetation, landscape and geographical layout of the country, lakes, rivers and other water bodies, land and minerals beneath and flora and fauna. Article 27(1) of the Constitution of Tanzania stipulates that: "Every person is obliged to safeguard and protect the natural resources of the United Republic, State property and all property jointly owned by the people, as well as to respect another person's property."

The Directive Principles of State Policy in the Constitution obliges the state and all its organs to ensure that the natural resources and heritage are harnessed, preserved and applied to the common good of Tanzanians. This shows that the Constitution, which is the above, all laws lays a firm constitutional foundation for the sustainable management of the environment in Tanzania. This proposed SWAHAT project would serve for conservation of the resources, namely: forests, vegertations, landscape and enhance sustainable use of water resource through water harvesting technologies.

The National Climate Change Strategy (2012)

This Strategy has been developed in response to the growing concern of the negative impacts of climate change and climate variability on the country's social, economic and physical environment. Its overall aim is to enhance the technical, institutional and individual capacity of the country to address the impacts of climate change. The Strategy covers adaptation, mitigation and cross-cutting interventions that will enable Tanzania the benefit from the opportunities available to developing countries in their efforts to tackle climate change. The goal of the Strategy is to enable Tanzania to effectively adapt to climate change by among other strategies: a) To build the capacity of Tanzania to adapt to climate change impacts; b) To enhance resilience of ecosystems to the challenges posed by climate change; c)To enhance public awareness on climate change; d) To enhance information management on climate change; e) To put in place a better institutional arrangement to adequately address climate change; and f) To mobilize resources including finance to adequately address climate change.

The national climate strategy recognizes that agriculture is the most vulnerable and severely affected sector of the country's economy to climate change (URT, 2013). The strategy notes that the effects of climate change on agriculture includes crop failure, increased incidents and severity of pests and diseases as well as shifting agro-ecological zones (AEZs). Agriculture employs more than 80% of people in semi arid areas of Tanzania. Through SWAHAT interventions, which will address agriculture and land use, a significant amount of semi arid population will be empowered to adapt to climate change. The surrounding environment and ecosystem resilience to climate change will also be increased through concerted afforestation and catchment conservation activities.

National Environmental Policy (1997)

The United Republic of Tanzania has promulgated a number of national policies on different aspects including environmental and natural resources management in the 1990s. There are number of existing policies that relate to environmental management in Tanzania. These are policies that provide guidance or impact the implementation of management at different levels of governance in the country. Environmental management is complex, multi-sectorial and cross-sectoral; it requires a holistic approach and multi-level operation. Effective environmental management involves many actors and incorporates many different and sometimes overlapping institutional and legal mandates, which require cooperation and coordination[61].

The overarching policy framework for the Country is the National Environmental Policy (NEP) of 1997. One of the major thrusts of NEP is that it provides for the need to develop ways for encouraging a holistic multi-sectorial approach to environmental management by integrating environmental concerns in sectorial policies, strategies and decisions. In that way it creates the context for cross-sectorial planning and

[61] URT (2006) State of Environment Report

coordination. NEP articulates the concept of shared responsibility and distinct accountability for environmental management so as to inculcate collective responsibility in environmental management.

Therefore every other sector in the country needs to integrate environmental aspects in their policies and strategies. SWAHAT project activities are multispectral by nature and will comply to NEP and other relevant cross-sectoral policy provisions as directed by the National Environment Management Council (NEMC), which in this project is the implementing entity.

The Environmental Management Act, 2004 (EMA)

The Environmental Management Act (EMA) is an important regulation in the country which SWAHAT project aligns itself with. EMA is multi-sectoral and provides the legal and institutional framework for sustainable management of environment including land, waters; forests and all other types of vegetation. It is a legal document in place, which outline principles for management, impact and risk assessments related to human interventions in all sectors of the economy that have a relationship with any form of environment. EMA has been developed to promote implementation of the Environmental Policy of
Tanzania. SWAHAT project will involve dam construction, water harvesting, and installation of irrigation channels as well as strategic intervention in agriculture, aquaculture, livestock, horticulture and forestry. All of these activities will align to EMA.

The National Land Policy (1997)

The objective of the National Land Policy is to promote and ensure secure land tenure system, to encourage the optimal use of land resources and to facilitate broad-based social and economic development without endangering the ecological balance of the environment. The policy seeks to establish, support and guarantee a secure land tenure system, which will facilitate the sustainable use of resources and land management. It also seeks to ensure that sensitive areas, such as forests, river basins, areas of biodiversity and national parks are not allocated to individuals for the purpose of development activities. National Land Policy enables all citizens' access to land and promotes an equitable distribution of land. However, the policy also ensures that existing rights to land, especially customary rights of small holders are recognized, and secured.

Tenure regimes in Tanzania and Africa in general are diverse and change over time. Some consider individual titling to be the best options, but there are possibilities for improved community managed individual schemes and limited access communal schemes. Tenure reform is sensitive, takes considerable time and must pay particular attention to the needs of the most vulnerable in rural areas i.e. women and the emerging youth generation. Small-scale farmers would need assurance of right of ownership of land where they have to invest in Sustainable Land Management (SLM). In Implementation of this SWAHAT project, the land policy will be adhered to. Land to be used for project activities should be contributed by villagers through agreement with village local governments and should not be in areas considered sensitive by this policy. Activities carried out by the project should promote sustainable land use practices and principles and aim to make land more productive

Land Tenure and Land Use

Land tenure in Tanzania is governed by the Land and Village Lands Acts of 1999 and amended in 2003.
Under these Acts, all land in Tanzania is vested in the President as the trustee for the citizens. The
Ministry of Lands and Human Settlements (MLHS) in collaboration with the Local Government Authorities, Ministry of Agriculture and Food Security, and Ministry of Water and Livestock
Development are mandated under the Government's Agricultural Sector Development Strategy to undertake land surveys and demarcation to identify potential land for private investors. The facilities to be installed within project areas will be based on the existing land use plans of respective villages/ District Councils.

The Agriculture and Livestock Policy (1997)

The Agriculture and Livestock policy signifies that agriculture is critically dependent on environmental resources such as land, water, forest, and air. There is no substantial voice about Small Scale Climate Smart Agriculture (SSCSA) in the agricultural policy. The policy acknowledges that climate change has serious

impacts on agriculture and livestock sectors and that agricultural practices could have a contribution on climate change through e.g. slash and burn practices. Through one of its objectives which is to ensure food availability, the policy encourages more food production but it does not clearly warn doing this through (i) area expansion which in many cases is done at the expenses of the existing vegetation cover (clearing vegetation) and (ii) extension of cultivation to the sensitive and marginal lands such as wetlands, will be contributing to climate change as more carbon dioxide is added to the atmosphere. This few but important shortcomings need to be addressed during implementation of the SWAHAT project activities. Improved agricultural practices that maximises productivity per unit area of land will be promoted. Semi arid farming and livestock keeping communities will be empowered with knowledge and skills to improve their resilience to impacts of climate change on land resources and productivity

The Tanzania Agriculture Sector Development Programme (ASDP I & II)

This programme was formulated from 2002-2005 with revisions to phase II in 2018. It attempts to address issues such as enabling farmers to have better access to and use of agricultural knowledge, technologies, marketing systems and infrastructure. In so doing, ASDP contribute to higher productivity, profitability, and farm incomes. The ASDP further promotes private investment in the agricultural sector in partnership with public sector but emphases such partnership needs to be based on an improved regulatory and policy environment. It is well known that agriculture is the hardest-hit sector by climate change in Tanzania (NAPA, 2007). Therefore ASDP should mainstream climate change, particularly adaptation and mitigation measures. But analysis shows that climate change was not integrated in ASDP I. This shortcoming was amplified by the ASDP review conducted in 2008, which indicated that climate change was found to have significant impact on crop production, water availability for irrigation and other uses (ASR/PER report 2008). However, integration of adaptation to climate change in planning and implementation of ASDP interventions has been well covered in ASDPII. ASP II recognizes 7 thematic areas, which this SWAHAT project aligns with almost all of them. They include: (i) Irrigation Development, Sustainable Water Resources and Land Use Management; (ii) Agricultural productivity and Rural Commercialization; (iii) Rural Infrastructure, Market Access and Trade; (iv) Private Sector Development; (v) Food Security and Nutrition; (vi) Disaster Management, Climate Change Adaptation and Mitigation; and (vii) Policy Reform and Institutional Support.

National Strategy for Growth and Reduction of Poverty (NSGRP) – MKUKUTA

This is the backbone of the Country's Development Agenda. Higher and sustained agricultural growth is needed to meet Tanzania's National Strategy for Growth and Reduction of Poverty (NSGRP, also called MKUKUTA in Kiswahili) and the then (at time of writing the strategy) Millennium Development Goals of halving poverty and food insecurity by 2015 for four main reasons: (i) about 80% of the poor live in rural areas and agriculture accounts for 75% of rural household incomes, hence significant reductions in overall poverty levels, particularly rural poverty, will require raising agricultural incomes; (ii) agriculture accounts for about 46.2% of Tanzania's GDP (2004) and for about 50% of exports, with agricultural growth having a larger direct impact on GDP growth than comparable growth in other sectors; (iii) agriculture stimulates economic growth indirectly through larger consumption linkages with the rest of the economy than other sectors. For example, US$ 1 of new household income from export crop sales can lead to an addition US$ 2 in local employment in the production of non-tradable; and (iv) meeting the country's food security needs in both rural and expanding urban areas requires higher agricultural growth contributing to higher incomes and lowering food prices. Food insecurity and malnutrition both reduced productivity and the ability of individuals to contribute to growth. SWAHAT project aligns with country's efforts towards achieving the goals of this mainstream National Strategy.

The National Forest Programme (NFP, 2001-2010)

The NFP is an instrument meant to implement the National Forestry Policy. This was developed in order to address the challenging responsibilities and to increase the forest sectors contribution to the national economy and more so in poverty reduction. The NFP document discusses crosscutting issues, linkages and implications and underscores the need for formal cross-sectorial coordination. Similarly, the NFP document stresses that the government of Tanzania has realized that, more comprehensive approaches are needed to

ensure sustainable forest management in the country. However, climate change is not discussed and addressed comprehensively. The document only outlines obligations, opportunities and implications of international initiatives to Tanzania's forest management in the context of the international treaties and initiatives such as United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Combating Desertification (CCD), but without providing a clear roadmap on how climate change related issues would be addressed. This is a notable shortcoming given the clear linkages between forestry resources and climate change; and so is with agriculture. SWAHAT project involve rehabilitation of natural catchment areas as well as afforestation of degraded landscapes of semi-arid areas. These activities will be done and aligned to fulfil the NFP broader objectives as well as related international agreements and principles. The resilience capacity of semi arid communities to adapt to climate change will be built and improved through rehabilitation of the green infrastructure. Their knowledge and skill to raise trees from nursery to field level and well as sustainable utilisation of tree resources will be enhanced so that they become less vulnerable to the impacts of climate change. In addition to provision of sustainable income to semi arid households, the resultant improved ecosystem/green infrastructure will increase the resilience of the agricultural systems to produce better yields through supply of goods and services such as more availability of irrigation water, pollination services and reduced floods and land degradation.

Strategy on Urgent Actions on Land Degradation and Water Catchment (2006)

The Strategy was developed in 2006 with the overall objective of halting the environmental degradation particularly degradation of land and water catchments. The Strategy has identified twelve challenges, which need to be addressed in order to halt this degradation. The conservation of biodiversity and sustainable use of its resources is one of the issues being addressed under this Strategy. It is being implemented at all levels from the central government, local government, private sector and local communities.

Cognizant of the fact that the country is faced with widespread environmental degradation particularly degradation of land and water catchments, the environmental problem due to unsustainable agricultural activities in water catchments, on mountain tops, mountain slopes and in other fragile sections of mountain ecosystems. The SWAHAT project recognises that land and water resources are under serious threats especially in semi arid regions and thus thriving to address and minimise them.

Gender Mainstreaming

Tanzania is committed to gender equity and has ratified international and regional conventions aimed at eliminating the different forms of discrimination against women and the vulnerable groups in society. This commitment is manifested in the adoption of a National Gender Policy, the establishment of gender focal points in Ministries, Departments and Agencies, and the amendment of the Constitution raising the percentage of seats reserved for women in Parliament from 15 to 20%, and to 30% in local governments. The government strategy is to achieve a 50% involvement of women through representation in all endeavours including the job sector. Women participation in SWAHAT activities will be implemented with the aim of reaching the 50% involvement. Not only that also the proposed SWAHAT project will entail involvement of other disadvantaged social groups from across the whole project period. Major focus gender mainstreaming within SWAHAT project particularly in aquaculture, nursery management and tree planting, water governance interventions is to reduce drudgery in search for water, fuel woods, include enhancing their livelihood resilience.

National Environment Management Council

EMA repealed the National Environment Management Act, 1983 which established the National Environment Management Council (NEMC) as an advisory and policy making parastatal organization. Despite the repeal of that Act the new Environmental Management Act, 2004 has retained NEMC as a statutory body under the Act charged with, among others, the following functions: (i) carrying environmental audit; coordinate survey, and research in the field of environment and disseminate the information; (ii) review EIAs and recommend for their approval; enforcing and ensuring compliance to the national environmental quality standards; (iii) in co-operation with relevant sector Ministries undertake programmes intended to enhance environmental education and public awareness; (iv) render advice and

technical support to entities engaged in natural resources management and environmental protection; (v) publishing and disseminating manuals, codes or guidelines relating to environmental management; (vi) establishing and operating a Central Environmental Information System which may bring together any findings, data and statistics generated by both public and private institutions in the course of environmental observation and management; and (vii) managing Environmental Protected Areas that may be established under the EMA, 2004. Activities under SWAHAT project relate with the functions of NEMC, which in this project will serve and the Implementing Entity thus making sure the executing entity will comply with the standards.

Local Government Authorities

The bulk of implementation of Government functions under the policy of decentralization by devolution espoused in the Local Government Reform Programme (LGRP) and provided for under the Local Government Laws lies with Local Government Authorities. It is recognition of that fact that EMA has given the responsibility of implementation of the Act at the local government level to the same institutions that have been established under the Local Government (District Authorities) Act, 1982 and the Local Government (Urban Authorities) Act, 1982 as amended to effect changes introduced by LGRP. At the local government level, it is the standing committees dealing with environment that have been designated as environmental management committees under EMA. The cross-referencing to the Local Government Acts makes sure that all the existing committees at that level and that will be created in future are automatically committees under EMA. That ensures that there is no discrepancy or gap of the existence of committees responsible for environmental management under EMA and Local Government Acts.

In Tanzania, district and village authorities intervene environmental challenges though Village Environmental Committees (VECs). The committees are responsible in formulation and foreseeing various bylaws. Before the bylaws are enacted, they must be approved by the village assembly where all or majority of villagers participate. Involvement of VECs in participatory planning and implementation of SWAHAT activities is key to successfully achievement of the goals and achievement as well as sustainability of the outcomes and impacts.

II. Compliance with the Adaptation Fund Policy

The project will commit to environmental and social policies, and regulations of the adaptation fund. As a matter of principal the project will ensure that environmental and social risks will be assessed to identify any potential problems. Any risks identified must have a plan in place for avoidance and/or minimisation during project implementation. A mechanism to monitor and report on the status of the measures taken will also be put in place. Access and equitability of the project benefits will be promoted to vulnerable communities in semi-arid areas. The project will be participatory by allowing local communities and other stakeholders to bring ideas on board from the onset of the project. The project will ensure that all marginalised and vulnerable groups of people in the project areas are engaged. In particular with this project, women and children who are the most affected by the repercussions of drought and low farm productivity will be relieved from a huge burden. Other expected vulnerable people are the disabled, the elderly and people living with HIV. Gender consideration will be given emphasis in the project so that women and men access to the benefits of the project is scrutinised to ensure equality and inclusiveness.

The land to be used for the project will be donated by the villages through mutual agreement of all the villages to avoid resettlement or taking off land from those with weak or no voice to defend themselves. The project will ensure that important habitats and biodiversity are conserved and not converted into dams of other activities. Enrichment planting of local species to such habitats will be done to enhance their vitality. All activities will be conducted to ensure avoidance of pollution or where difficult, to ensure the minimum possible pollution. Public health and climate change risks will be minimised as outcomes of this project. When the ecosystem health and farm productivity is enhanced communicable diseases risks will be reduced while the nutritional standards of the people will be improved.

To comply with national and international standards of safe domestic water use, the project will incorporate water sanitation and hygiene technologies. These include boiling drinking water; use of water guard for

domestic water treatment and installation of raised plastic tanks that will store treated water for domestic supply. In addition awareness creation will be done to local communities to avoid pollution of the catchments and the established dams.

F. DESCRIBE IF THERE IS DUPLICATION OF PROJECT WITH OTHER FUNDING SOURCES

Tanzania has received multilateral projects aiming at solving a multiple array of challenges, including those related to climate change. Climate change projects are active in the country at the moment while others are expected to be funded in the near future. The selected semi arid areas are characterised with severe impacts from climate change especially because they are naturally dry and vulnerable to environmental calamities. They are areas of international (e.g. UNCCD) as well as national priority for investments aimed to address environmental and developmental challenges. Previous and existing projects have achieved success but also have failed to address critical and pressing challenges. Escalation of poverty and environmental degradation exacerbated by climate change, continue to face the fragile and vulnerable semi arid areas communities and environment. Where activities of SWAHAT are similar or related to existing projects, scale up of successful practices will be done avoiding duplication of efforts and dwelling on strengthening of complementarity. Table 6 list some of related projects for climate change adaptation conducted in Tanzania:

Table 6: Climate change related programs/projects in Tanzania

Project/Program	Objectives and funding agency	Duplication
Reversing Land Degradation trends and increasing Food Security in degraded ecosystems of semi-arid areas of Tanzania	To improve food and nutrition security in the targeted villages	**No Duplication:** The SWAHAT project is centered around water harvesting technology that will integrate farming and afforestation systems for the purpose of enhancing resilience and adaptation to climate change
Supporting the implementation of integrated ecosystem management approach for landscape restoration and biodiversity conservation in Tanzania	To strengthen integrated natural resource management and restoration of degraded landscapes for resilient socioecological systems in Tanzania	**No Duplication:** The SWAHAT project is centered around water harvesting technology that will integrate farming and afforestation systems for the purpose of enhancing resilience and adaptation to climate change
Ecosystem-Based Adaptation for Rural Resilience	To strengthen climate resilience in rural communities of Tanzania by building adaptive capacities to implement EbA approaches and diversifying livelihoods	**No Duplication:** The SWAHAT project is centered around water harvesting technology that will integrate farming and afforestation systems for the purpose of enhancing resilience and adaptation to climate change

Enhancing Pro-poor Innovations in Natural Resources and Agricultural Value-chains – EPINAV. A climate chance adaptation program funded by NORAD (2010-2015).	Program was aimed at empowering and enhancing communities and institution's capabilities and readiness to adapt and be more resilient to the impacts of climate change.	**No duplication**: The SWAHAT is enhancing resilience of rural community to climate changeinduced challenges of drought, floods and high temperatures for improved crops and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases. Interventions are driven by water harvesting technologies.
Programme on climate change	To develop and sustain adequacy	**No duplication**
Project/Program	**Objectives and funding agency**	**Duplication**
impacts, adaptation and mitigation in Tanzania (CCIAM) - Cooperation between the government of the united republic of Tanzania (URT) and the government of the kingdom of Norway 2009 -2014.	in national capacity to participate in climate change initiatives and address the effects and challenges of climate change with particular emphasis to the REDD initiatives – this project addressed more on mitigation measures	The project is focused on adaptation and enhancing resilience to climate change using water harvesting and integrated technologies.
Proposed project on Improving water availability in drought stricken communities in central part of the of the country NAPA team	Project aims at efforts to Provide water and ensure sustainable utilization of water in the drought stricken areas using reservoirs and underground water.	**No duplication:** SWAHAT advocates integrated water harvesting in a larger scale, for increased productivity of crops, livestock, fish farming, nursery and improved forest ecosystem services to enhance livelihoods resilience to climate change.
The Tanzania UN-REDD National Programme – National Framework for Reduced Emission from Deforestation and Forest Degradation in Tanzania	The Tanzania UN-REDD National Programme aims to support Tanzania to be ready for REDD+ implementation and forest carbon trading and is a mitigation project.	**No duplication.** The SWAHAT project provide knowledge and skills on water harvesting tachnologies for forest restoration, agriculture and ecosystem services.

G. LEARNING AND KNOWLEDGE MANAGEMENT

Climate change challenges are recognized by many sectors of the government as major impediments to national development agenda. Lessons from this project will provide an invaluable resource to the government and other stakeholders for synthesis and integration into present and future interventions aimed at dealing with the effects of climate change in Tanzania. Dissemination of project results is useful to: i) inform future projects about best practices; ii) effectively overcome information barriers to the uptake of adaptation measures; and iii) prevent duplication of efforts. It is therefore a crucial interest of the Government of Tanzania, NIE and NEE to develop a robust mechanism of documenting and disseminating lessons learned from the SWAHAT project.

The project will collaborate with national and international academic and research organizations with the aim of obtaining up to date knowledge and information related to climate change and adaptation. This information will be integrated with local knowledge to develop a lesson package, which is rich and

comprehensive. The new knowledge and lessons generated from this project will be captured from case studies, rapid evidence review and project reports as per project outputs 1.3, 2.4, 3.4, 3.5 and 4.2. Knowledge captured will be stored and accessed through web-based data network portals (for instance through NEMC, SUA, government, NGOs websites and YouTube) which will disseminate lessons about the water harvesting technologies and integrated interventions to central and local government authorities responsible for policy and planning development as well as other stakeholders. Website and YouTube are critical in the process of dissemination because the information will be stored and made available for a long time and to both local and global audience. This dissemination will extend to regional and international learning platforms. The SWAHAT project will use social networking platforms such as twitter, Facebook, Telegram, Instagram and WhatsApp to promote information generated in the project in form of texts, pictures and documentary video clips. These social media approach will be very practical to youth groups, which represent over 50% of the population in the target communities.

On the other hand, Project formulation and implementation will be in a participatory manner thus allowing sharing of experiences from researchers members of and local community that will eventually enhance knowledge sharing from different outputs of the project. In this way, farmer-to farmer experience sharing will be promoted; local leaders and decision makers will be constantly engaged from the start to the end of the project to enhance promotion of the interventions. Promotion of the intervention strategies to villages or districts with similar challenges will be conducted using field tours, farmer to farmer learning, signboards, posters, booklets, pamphlets and other publications to be distributed during planned workshops and exhibitions. Promotion through various news channels will be done to reach the wider public. Documentary films on tangible benefits for resilience to climate change and improved livelihoods will be developed in components 1 through 4. They will demonstrate technologies and insights such as the complete model idea in fish farming, nursery and tree management, water and nutrient recycling techniques.

Since, SWAHAT project will emphasize and put significant weight in knowledge management component to capture and disseminate lessons learned. Follow up of the realization of learning outcomes will be done through i) monitoring and evaluation, ii) site visits to verify number of people applying the knowledge, iii) to trace the number of people trained iv) obtain feedback from project participants through focus group discussion or administering structured questionnaire; and v) online monkey surveys for the case of workshops.

Table 7: Learning and knowledge management

Expected Concrete outputs	Learning objectives and indicators	Knowledge products
Output 1.1: Six (6) waterharvesting dams constructed and rehabilitated for increased water availability	Increased awareness on water harvesting and conservation of dams infrastructures	Documentation of good water harvesting and utilization practices, effective conservation of dams infrastructure and lessons learned
Output 1.2 Improved Management and conservation of the dams' catchment areas	Community trained in better management of dam catchments to prevent siltation.	Guidelines for sustainable management of water resources and associated infrastructure
Output 2.1: Six community fruits and forest trees nurseries established.	Community trained on nursery management	Training materials on nursery management of fruits and forest trees
Output 2.2: At least 100,000 locally adapted fruits and forest trees per project site planted in local communities' farms and catchments	Training of community on forest restoration and planting of fruit trees for improved livelihoods of target community.	Brochures, leaflets with practices on forest and fruit trees establishment and a list of well adapted and established fruits and forest trees

Output 2.3: Enhanced capacity of community members on establishment and management of fruits and forest tree species for conservation and income generation	Strengthened capacity of semi arid communities on integration of conservation and income generation	Engagement of community members on income generation actvities and capture of lesson learned
Output 3.1: Twelve aquaculture model farms established.	Training communities on fish farming technologies for better ulitization of harvested water	Training materials on outscaling of fish farming as income generating activities for resilianec to climate change
Output 3.2: Six vegetable model farms established	Training on vegetable production and horticultural practices	Documentation of good vegetable production practices and types of well adapted vegetable crops
Output 3.3: Establish water	Train livestock keepers on	Training materials and
Expected Concrete outputs	**Learning objectives and indicators**	**Knowledge products**
drinking points, pasture and fodder for livestock production	improvement and conservation methods for pasture and fodder	guidelines for pasture and fodder management and conservation practices
Output 4.1: Six dip tanks for control of tickborne diseases constructed	Regular and timely utilization of dip tanks for improved livestock health and productivity	Awareness creation materials for tick borne diseases and guidelines for regular dipping of livestock
Output 4.2: Model plant health clinics and pest surveillance systems established	Increase community awareness, adoption and practices on control of emerging plant pests due to climate change.	Awareness creation materials for diagnosis and IPM methods for emerging plant pests as a result of climate

H. THE CONSULTATIVE PROCESS

During implementation of agricultural related research projects by the SWAHAT proposing team in the same regions, discussions with participating farmers and extension officers pointed out the challenges experienced in agriculture activities and environmental conservation due to climate change. They emphasised on the role of water reservoirs in rural water supply for domestic and agricultural use. This was evidenced by their dependence on dams formed on excavated borrow pits left behind during road constructions and locally dug ponds as source of water. The dams and ponds are usually shared by both humans and animals (Figure 11: Livestock keepers leads large herds cattle to water points near a local village dam (with low water storing capacity) in Manyoni District, Figure 12: Evidence of limited water supply for animals and human in Nguriti village, Igunga district where dams have undergone siltation, forcing farmers to dig local pits to collect capillary surface water for domestic use and animal drinking pointsFigure 13: Drinking point established for livestock and domestic use along the seasonal rivers in Bahi District (who would normally bath and wash their clothes within dams while others fetch water for domestic use). However, these local ponds are not enough to address community needs of water resource for agriculture, livestock and domestic use. Both men and women were consulted collectively and individually, as well as youth, to fully capture respective needs and priorities on climate change adaptation, resilience. and livelihood diversification. Through these preliminary surveys and consultative meetings in semi-arid regions of the study area, the following significant climate change associated challenges were prioritized by farming target communities: i) poor crop performance and crop failure due to insufficient and unreliable rainfall, ii) land degradation due to surface runoff and flooding, iii) scarce water supply for agriculture, domestic use and livestock, iv) available water resources are shared between humans, livestock and wildlife

posing risks of zoonosis; v) lack of alternative means for income generations, and vi) emergence of new crop pests and diseases.

Figure 11: Livestock keepers leads large herds cattle to water points near a local village dam (with low water storing capacity) in Manyoni District

Figure 12: **Evidence of limited water supply for animals and human in Nguriti village, Igunga district where dams have undergone siltation, forcing farmers to dig local pits to collect capillary surface water for domestic use and animal drinking points.**

Figure 13: **Drinking point established for livestock and domestic use along the seasonal rivers in Bahi District**

Based on these challenges highlighted by the target communities, the idea for strategic water harvesting technologies were sought as adaptation measure to ensure community resilience to climate change, and therefore development of the SWAHAT Project proposal. In view to this, the proposing team carried out consultative meetings in order to establish the relevance of the project idea as well as gaining experiences and support from different stakeholders' participation in implementation of the project if approved and funded. The consulted stakeholders include:

(i) Local communities: The local communities are involved in project design particularly in identifying problems, specific needs related to resilience to climate change, sites for project implementation and the role they play in project implementation;

(ii) District and Local Government Authorities: The participating Local Government Authorities (LGAs) will be contributing in providing baseline information and data on the catchment in their areas of jurisdiction as well as mobilizing local communities to ensure their effective participation and engagement. The LGAs will also provide subject matter specialists during implementation of the project. It is expected that the LGAs will ensure continuation and sustainability of the innovations that will be established in the project .;

(iii) Academic, Research and Development Institutions: These will provide technical support on land use planning, water and sanitation as well as capacity building to both technical staff and communities in various aspects especially on land use and catchment conservation and management. This will include SUA and partner from Ardhi University in project design and implementation.

(iv) Government Ministries and Institutions: The Vice President's Office through NEMC has provided overall guidance and coordination during preparation, implementation and monitoring of the project. In addition to VPO, Ministry of Water will be consulted for better installation and reconnaissance of the catchment points. Natural Resources and Tourism through Tanzania Forest Services (TFS) are engaged on aspects of nursery establishment, and tree planting. Lands and Human Settlements Development are involved in land use planning and governance of issues related to land use in a given community. Livestock and Fisheries Development will liaise with experts in pasture and rangeland establishment in the target community including estimates of carrying capacity; Agriculture, Food Security and Cooperatives experts from this are involved in implementation of technologies that will lead into increased crop productivity, diversifying types of adapted crops in target communities. and President Office - Regional Administration and Local Government (PORALG) provide institutional support to sectors in the local government in project implementation.

I. JUSTIFICATION FOR FUNDING REQUESTED

Funding is being requested for the implementation of **Strategic water harvesting technologies for enhancing resilience to climate change in rural communities in semi arid areas of Tanzania**

The aim of this **SWAHAT** project is to use water harvesting and utilisation technologies to restore degraded semi arid landscapes as well as attaining sustainable and resilient increase in agriculture productivity that will reduce vulnerability of rural communities to climate change. The total funding requested for this project is US$ 1,280,000 to cover project management and project execution costs. This project is proposed for the dry and semi arid regions of central and western Tanzania particularly: Dodoma, Singida, and Tabora. These regions, which are in drought and flood prone environments, are exposed to a range of serious climate change related problems such as agriculture failure, deforestation and environmental degradation. These semi-arid areas are highly vulnerable to climate change. The naturally poor soils continue to be degraded by floods and erosion caused by erratic short-term heavy rainfalls and high temperatures on deforested bare-landscapes. Climate change significantly reduces agricultural productivity of smallholder farmers who predominantly depend on rain-fed Agriculture. Both agriculture and livestock productivity are heavily impacted by the frequent droughts and floods that arise in semi-arid regions of Tanzania significantly intensifying the vulnerability of the farming communities. The social and economic costs arising from increasing climate change risks and lack of action taken is significant, and expected to become even more severe necessitating urgent and multi-pronged approaches for adaptation interventions. The ever-increasing demand for irrigation water in Tanzanian agriculture is one of the limiting factors for food production. In Tanzania at the moment, few dedicated farmers dig small ponds for water harvesting intended for irrigating vegetables in small plots and keeping fish on a small scale. The proposed project is divided into four components as described below.

Component 1: Installation, rehabilitation and establishment of community water harvesting dams

Baseline Scenario (Without Funding)

Semi arid regions are naturally characterised by having low and erratic annual rainfalls. Less rainfall reflects less water availability for agriculture and domestic use. Climate change exacerbates these challenges subjecting semi arid communities to more vulnerability and vicious cycle of poverty. In absence of the proposed dams, non-harvested water will continue to be lost rapidly through run off, floods and evaporation. This will make the rural communities in the target areas become more food insecure, poor and thus less resilient to climate change. According to the FAO[62], Tanzania's arid and semi-arid areas cover more than 50% of the country, representing a large population of vulnerable community. If the communities living in these areas are left without support to cope with these challenges, the government will incur high costs to support them for food, and provision of other livelihoods services like education, infrastructure and health. Eventually it will save government investment in water supply provision of food aids and other livelihoods services. Despite the significant government investment in water supply, coverage is not satisfactory with only 50% of the population having access to clean water.

Additionally (With funding)

SWAHAT project will be able to construct water harvesting dams and associated distribution schemes and modalities in order to solve the water scarcity challenges facing communities in the semi-arid areas.

With AF funding at least 6 water harvesting dams with variable capacity ranging from 1 -3 million cubic meters will be established to serve an average of 129,000 people. By making water available, significant improvements in agriculture, livestock and fish sector will be achieved. Water availability will also enhance growth of vegetation in the degraded land eventually restoring habitats and ecosystem services vital for strengthening community and environmental resilience to vulnerabilities of climate change. The distance travelled and hard labour invested by women to fetch domestic water form distant unsafe sources will be reduced and time and energy saved can be invested in more effective and productive activities. Also livestock will manage to access drinking within proximities following construction of water dams, hence curbing the existing problem. The existing small water dams and ponds are poorly managed and shared by both humans and animals prompting the risk of transmission of diseases between the two. This proposed intervention will eventually translate into improved livelihoods in term of food security, income, health and restoration of ecosystem services making the communities and surrounding ecosystems more resilient to impacts of climate change.

Component 2: Integrated participatory and sustainable afforestation program

Baseline Scenario (Without Funding)

Semi arid areas are characterised by inherent poor vegetation cover[63]. Anthropogenic activities have extensively modified these types of vegetation, with deforestation and land degradation on the increase (Shechambo et al., 1999). The impacts of deforestation are exacerbated by the adverse effects of climate change causing loss of soil cover due to water runoff, floods and drought in farm lands[64] . Deforestation could make Tanzania lose 3.5bn USD by 2033 which is at a rate of 370,000 ha per year (FAO, 2015), with a forest cover of roughly 48 millions ha (NAFORMA, 2015). On the other hand, the cost of land degradation between 2001 and 2009 was estimated to be 2.3bn USD (Kirui, 2015). The cost brought about by climate change through floods and drought is very high. In Tanzania, more than 92% of energy is wood based obtained mainly from natural forest resources contributing to deforestation and green house gases[65].

[62] FAO (Food and Agriculture Organization of the United Nations) (2012) 'Adaptation to Climate Change in Semi-Arid Environments Experience and Lessons from Mozambique'. Rome: FAO.

[63] Kisanga, D. (2002) 'Soil and Water Conservation in Tanzania – A Review', in Blench, R. and Slaymaker, T. (eds) Rethinking Natural Resource Degradation in Sub-Saharan Africa: Policies to Support Sustainable Soil Fertility Management, Soil and Water Conservation Among Resource-Poor Farmers in Semi-Arid Areas. Tamale: University of Development Studies.

[64] OECD. (2016), Mitigating Droughts and Floods in Agriculture: Policy Lessons and Approaches, OECD Studies on Water, OECD Publishing, and Paris. http://dx.doi.org/10.1787/9789264246744-en

[65] Fred Håkon Johnsen (1999) Burning with Enthusiasm: Fuelwood Scarcity in Tanzania in Terms of Severity, Impacts and Remedies, Forum for Development Studies, 26:1, 107-131, DOI: 10.1080/08039410.1999.9666097

Based on these facts, it is obvious that climate change will accelerate the dependence of vulnerable rural community to forest resources for their livelihoods support leading to further forest and land degradation. Alternative integrated interventions are needed to address these challenges without which these community will be subjected to more risks and vulnerability to climate change.

Additionally (With funding)

Funding will be used to establish nurseries aimed at raising 1 million seedlings for locally adapted multi purpose fruits and forest trees to plant in strategically selected sites on the degraded and farming landscapes. Among others, the planted multipurpose fruit and forest trees will provide food, fodder, timber, and fuel woods as well as reduce the rate of deforestation and land degradation. This will enhance vegetation cover and reduce vulnerability, increase incomes, and will have ancillary benefits on the environment (as land-water-forest integrated solutions). The proposed project will target farmers and communities, reducing the adaptation deficit, and avoiding the costs of land degradation while enhancing incomes from production benefits. Through the use of forests and land restoration, it will also deliver improved ecosystem services

Component 3: Strategic interventions for improved agriculture, livestock and fish production

Baseline Scenario (Without Funding)

Agriculture and livestock sectors are depended upon by up to 85% of semi arid households as source of livelihood supporting them for income, food and the overall local economy. Aquaculture is an emerging sector in Tanzania with promising potentials to contribute to nutrition and employment hence alleviating poverty. Without the AF project, rural communities in semi arid areas will continue to be exposed to periodic climatic shocks that impact will their major livelihood sectors. These impacts will be exacerbated by the under-developed farming systems and the lack of diversified income sources and innovations. With aggravated impacts of climate change, community vulnerability will increase and consequently making local communities more food insecure, poor and vulnerable. Strategic interventions for improvement and diversification of livelihoods are highly needed to relieve vulnerable communities from the adverse effects of climate change. Without funding the communities poverty will increase, thus requiring humanitarian assistance and social protection that deplete national resources and expose communities to a series of shocks.

Additionally (With funding)

The integrated interventions will diversify and improve the livelihood security of vulnerable communities of semi arid areas. This is consistent with the national development strategies that aim to increase resilience through diversification of agricultural activities (e.g. aquaculture, beekeeping, and horticulture), as well as livestock and poultry production. The proposed interventions will support local communities who currently depend on rain-fed agriculture, which is often unimproved and un-integrated system, to increase and diversify their production systems. There will be special focus on women who are normally the main rural workforce and more vulnerable to the consequences of climate change and therefore to relieve them from the burden of poverty.

Component 4: Integrated management of climate change related emerging pests and diseases

Baseline Scenario (Without Funding)

Without AF funding, Climate change related emerging insects and disease would continue to cause losses to crops, fish, poultry and livestock. A growing number of pests and diseases could lead to higher and even unsafe levels of pesticide and drug residues in food. As a result food insecurity will hit hard these semi arid

communities who are already vulnerable to climate change. Use of pesticides poses health risks that may require the usually poor households to incur or fail the costs for treatment and in worst cases lead to loss of lives. Pesticides are also harmful to biodiversity and ecosystems and may for instance lead to extermination of important crop pollinators consequently reducing yields per hectare and hence affect investments done under component 3. This will lead into sustained vulnerability, poverty and food shortages. Under such scenarios women and children under the age of five are particular affected by malnourishment and other associated hardships. Therefore the communities will be rendered to seek aid and other types of support from the government and development partners.

Additionally (With funding)

The funds will be used to design integrated pests and diseases management interventions to reduce losses from climate change associated pests and diseases. The capacities of farmers to deal with incidences of crop damage due to pests and diseases will be significantly enhanced. Expenses incurred to buy pesticides and insecticides, as well as the associated detrimental effects to the environment and human health will be reduced. The funding will save the loss of invested money and labour in crop and livestock production that would occur due to infestation by pests and diseases. Concrete project in this component will involve establishment of dip tanks for control of tick born diseases commonly affecting cattle in face of climate change. In addition plant helath clinics for diagnosis, identification giving management options for pests and diseases. This will result into improved crop and livestock productivity consequently increasing farmers' food security and resilience to climate change impacts.

J. SUSTAINABILITY OF THE PROJECT OUTCOMES TAKEN INTO ACCOUNT WHEN DESIGNING THE PROJECT.

A large number of factors might affect project sustainability. Factors that increase the likelihood of sustaining a project relate to: project design and implementation; the implementing entity; political will and the broader community integration. Self-contained projects are less likely to be sustained than projects that are well integrated with existing systems. The primary idea of the project emerged from the semi arid community members. Drought and water scarcity are adaptation challenges most pressing in their livelihoods. A solution to these problems will translate into multifaceted benefits. Based on this, the project is designed to have full support from the communities and their respective local governments which will create and enhance ownership of project, as the SWAHAT team builds on their original idea and they (as beneficiaries) will be put at the centre of participation during identification, designing, implementation, monitoring and evaluation of all interventions. The project is in line with the Government of Tanzania development agenda. It aligns with most of Government's policies and strategies as summarized in Section E above such that the Government buys in the project interventions.

This project will therefore be included in governments' plans and interventions. Below is an explanation of social, institutional, technical, financial and environmental sustainability factors of the project.

Social sustainability: The project problem was identified by participatory prioritization and analysis of climate related risks affecting local rural communities in selected semi arid areas of Tanzania. Relevant District level departments and officers, village authorities, village environmental committees (VECs), schools, traditional authorities and local NGOs are among the community institutions that are engaged in designing and implementation of the project. In this context, local people's ownership of the project is inclusive and this will incentivize people participation in project activities and ensure sustainability of the project even after project funding ceases. The project is designed so as to align with the social and environmental framework of the Adaptation Fund.

Institutional sustainability: The implemented project interventions will be based on the sound/thorough understanding of local realities in respective target areas. A thorough understanding of the areas and its people will serve as a springboard for collaborative interventions, while putting people's participation at the center stage. Village members, local government officials/District Councils, and other development actors in the area will participate. The implemented project will still draw on the indigenous knowledge and wisdom of the people, including successful experiences/lessons from other development actors and

projects for revitalizing and enhancing climate resilience and adaptation capacities of the people and ecosystems. Through such institutional arrangement amongst key stakeholders, including villagers themselves it will serve for building their capacities for developing problem-solving initiatives (i.e. identifying, planning, implementing, undertaking monitoring and evaluations of their own community based initiatives). Similarly, it will lead to attitudinal support from the people as well as enhancing a sense of ownership of the project's interventions amongst the stakeholders.. The project will also be implemented using existing government and community institutional infrastructures. As a result technical support will continue to be provided by the government. Final ownership of the intervention will be vested in the village and the local government. Project assets such as dams, distribution channels established forests and farms, orchards, tree nurseries, fish farms and apiary units will handled over to the local institutions for continued management and operations. This project approach serves as the cornerstone for sustainability of the project interventions even beyond after the project has come to an end.

Technical sustainability: During the project, district technical staffs that are largely extension officers will be engaged. These subject matter specialists have also been involved in project formulation. Capacity building that will be an integral part across all components in the project, which will improve their technical capacity. These capacitated/empowered local experts will eventually continue to provide technical backstopping to the target communities beyond the project life. The project will also have a dissemination component of the lessons learnt to the wider audience thus, making them aware of the successful interventions to be applied elsewhere. The participatory nature of the project will equip the local community members with technical knowledge and skills through hands on practice to instill the sense of ownership and will be obliged to offer management services to the investment.

Financial sustainability: Another important ingredient for sustainability is the income generation aspect attached to the project. Farmers are always sensitive in venturing into practical interventions that does not give them returns within a short time (in terms of income/ food). The proposed integrated technologies for crops, fishery, livestock, fruits, vegetables and forestry activities are designed in such a way that there is short term but sustainable income generation from the investment. This will motivate project and nonproject farmers to adopt the interventions and hence a sustainability window. Community mobilisation and awareness interventions will help them to organise financial mobilisation that will contribute in financing management of the project investments after project ends. In addition to the financing from the community, local and central governments are expected to mainstream these interventions into their respective development plans and budgeting.

Environmental sustainability: Environmental sustainability will be ensured through – i) Planting of locally adapted forest tree species will lead to restoration of vegetation cover. These restored vegetation cover is a permanent asset that will remain in the project area. Since the communities will already understand and gain benefits from the project, they will sustain interventions that ensure the vegetation is well managed; ii) Use of energy saving cook stoves and renewable energy supply such as solar powers will reduce environmental burden and save biomass infrastructure; iii) Protection of catchment area of the dams will be done through maintenance of vegetation cover to minimize erosion; iv) Continuous use of animal manure, water reuse, and nutrient recycling will minimise environmental pollution and other types of damage and v) Application of IPM technologies and climate smart agriculture will reduce pesticide use and the associated pollution.

In order to ensure sustainability of the project intervention during and after the project, the project is designed in such a way that:

- The nature of the project is participatory and therefore local communities will have a sense of ownership of the investment thus assuming responsibilities after project completion
- Local government authorities with expertise in different fields of the intervention systems will be engaged in the project from the very beginning in order to take lead and contribute to intergrade the innovation into local government development strategies. The local district authorities under the District Executive Director (DED) will be the overall in charge and has the capacity to integrate the investment into District development plans and therefore sustain the activities after the project life.

- A water users committee will be formed to be responsible for overseeing the management and maintenance of constructed dams. This committee will empowered through training and networking in order to develop their inherent decision making that will enable them to seek for other funding opportunities after the project ends
- Capacity building of farmers in each village on maintenance and management of the water harvesting systems will be done to capacitate the community with knowledge and skills to maintain the investment
- The established dams and the various interventions are expected to generate income from fish farming, sales from nursery tree seedlings, sales from fruits and vegetables sales of livestock products, honey and other crops. Through these sales a percentage that will be agreed upon will be contributed to be used for management and maintenance of the water system.
- Since the innovations generate income, farmers will be incentivised to maintain the investment during and after the project

It is expected that a successful implementation of the proposed climate change adaptation and resilience interventions will open window for establishment of a similar interventions in other areas. This is because the project will engage national and ministerial level stakeholders who can take up the project idea to other areas. The project will also create different fora to engage district executive officers, planners and policy makers from semi arid areas to participate in workshops and field excursions to sensitize and promote the best practices/innovations and lessons learnt for them to adopt and apply to their respective districts. This intervention can be duplicated in other Districts/Regions by applying funds from development partners. In addition, farmer field schools will be set up and capacitated to train and collaborate with other farmers (including from outside the project areas), researchers and institutions with interest on the interventions (climate smart agriculture, aquaculture, horticulture, forestry and livestock husbandry). Dissemination of the project technologies and the resulting adaptation benefits will be done through TV and Radio programs as well as through newspapers aiming to reach more than 5 million Tanzanians. The disseminated information will reach a wider audience who can tailor the technologies into their individual areas.

K. ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS IDENTIFIED AS BEING RELEVANT TO THE PROJECT.

The project will align with the Adaptation Fund's Environmental and Social Policy as well as national and international standards and guidelines for safeguarding the environment and social settings. Interventions in the SWAHAT project are expected to generate outputs which will translate into adaptation benefits. Potential environmental and social risks are described in the table below in terms of their levels of risks and the corresponding approaches for avoiding or minimizing them.

Checklist of environmental and social principles	**No further assessment required for compliance**	**Potential impacts and risks – further assessment and management required for compliance**
Compliance with the Law	No further assessment required for compliance	No Risk The project components and outputs align with many national legal and regulatory aspects including mainframe which is the Constitution of the United Republic of Tanzania as well as other laws and policies as described in section E.

Access and Equity	Compliance assessment during implementation may be required	Low Risk The project is participatory and will include women, youth, the elderly, and community leaders. They have participated in project design and will be engaged in implementation. In this way access and equity will be maximized. However continued assessment and monitoring is essential to ensure all social groups are able to participate fully and equitably so as to receive comparable social and economic benefits from the project
Marginalized and Vulnerable Groups	Compliance Assessment during implementation may be required	Low Risk Vulnerable women, youths, disabled, elderly and people living with HIV/AIDS receive special attention in design and implementation of the project. Their adaptation needs and vulnerabilities will be carefully analyzed and integrated in the implementation. Additionally, The project will empower vulnerable groups to make decisions on concrete adaptation measures, valuing their traditional and local knowledge. Periodic assessment of vulnerability status in project site/wards and village levels will be done. Environmental and Social Impact Assessment (ESIA) during screening phase, and compliance assessment during implementation will be done to ensure any potential risks are checked and amended
Human Rights	No further assessment required for compliance	No Risks The constitution and legal proclamations respect human rights and the interventions of this projects abides to all national laws
Gender Equity and Women's	Further assessment	Low Risk The project team will comprise a gender expert will ensure that

Checklist of environmental and social principles	**No further assessment required for compliance**	**Potential impacts and risks – further assessment and management required for compliance**
Empowerment	required, as this is one of the focus areas of project and compliance is key.	gender and women empowerment is central to all interventions. All project components have capacity building activities which among others will ensure the capacity of women to participate and benefit from the project is especially enhanced. Project activities have been designed to be gender sensitive. The project will promote and empower women leadership in public spaces and decision making. Views and interests of women and men will be analyzed and integrated into the project to ensure that gender inequality is eliminated. Initial and follow up assessment and monitoring of gender equity and women empowerment will be done. ESIA during screening phase, and compliance assessment during implementation will be done to ensure any potential risks are checked and amended
Core Labour Rights	No further assessment required for compliance	No Risks Labor proclamation protects the rights of contract employees and contains similar provisions with that of Adaptation Principle. The

		project will ensure respect for international and national Labour laws as prescribed by the International Labour Organization
Indigenous Peoples	No further assessment required for compliance	Low Risk There is no specific national legislation on this aspect. However, there is no record of presence of indigenous people in the project areas but just traditional and tribes people with certain traditions that are largely influenced by other cultures including the western one. Nevertheless, the existing traditions, religious and tribal cultures in the project areas will be respected and incorporated in implementation. Their rights and way of life will be protected as a means to respect local traditions but also of ensuring total support from these immediate project recipients.
Involuntary Resettlement	No further assessment required for compliance	No Risk There will be no Involuntary Resettlement in this project. All land to be used for project activities will come from village land reserve or voluntary donations from villages
Protection of Natural Habitats	No further assessment required for compliance	Low Risk The project involves catchment conservation, water harvesting, afforestation and improved agriculture interventions. The project will result into restored vegetation and rehabilitation of degraded landscapes and soils. All of these will lead to enhanced protection of the ecosystem hence the natural habitats and assets. Should any activity trigger a high risk, a full environment and social impact assessment will be performed and recommendation from it incorporated accordingly
Conservation of Biological Diversity	Compliance Assessment during implementation may be required	This project will involve afforestation using locally adapted species. This will avoid biodiversity risks associated with introduction of species from other areas. Should that be a necessity, such as local community demanding certain improved varieties of fruit species; thorough assessment will be done to ensure that the species does not have invasive behavior and other niche characters that may jeopardize biodiversity.

Checklist of environmental and social principles	**No further assessment required for compliance**	**Potential impacts and risks – further assessment and management required for compliance**

		Construction of dams and associated infrastructure will ensure that microhabitats and species status are not subjected to any risks in accordance with IUCN guidelines and provisions. Assessment to inform and strengthen the capacity of local communities and institutions on conservation of biodiversity will be done and implemented. Should any activity trigger a high risk, a full environment and social impact assessment will be performed and recommendation from it incorporated accordingly
Climate Change	No further assessment required for compliance	No Risk The proposed project will involve use of machinery and vehicles in construction of the dams and also outputs such as crop harvests may need vehicular transportation. Emissions from these activities are insignificant and are not expected to execrate climate change. On the contrary, it is the project outcomes that will lead to adaptation and mitigation of climate change. The vulnerability of semi arid communities to impacts of climate change will be reduced the integrated interventions of component 1-4 while the increased vegetation cover through component 2 will improve the national capacity in carbon sequestration.
Pollution Prevention and Resource Efficiency	Compliance Assessment during implementation may be required	The machinery to be used in construction of dam infrastructure will use fuels and oils that if poorly handled and spilled may cause soil and water pollution. Machinery and vehicles can also cause noise and air pollution especially if old and unmaintained units are used. Despite these facts, pollution levels will still be very low and insignificant since the interventions are considered small scale. Oil and any other types pollutants will by no means be released to the environment. Also the project will ensure that contractors use new and well maintained units. Any waste generated will be handled and disposed using standard procedures. Should any activity trigger a high risk, a full environment and social impact assessment will be performed and recommendation from it incorporated accordingly.
Public Health	No further assessment required for compliance	Low risk The project will be designed and implemented in a way that avoids any negative impact on public health. Particular attention will be given to activities related to water harvesting and storage and communities will be sensitized on how to use and store the water in a safe and efficient way. The communities will be capacitated to separate domestic water collection centers and animal drinking ponds. In addition, the component 4 will introduce IPM technologies that will significantly reduce use of pesticides and fertilizers, hence minimizing contamination and risking of human health. Initial and continued screening, assessment and monitoring will be done to address any risk triggers.
Physical and Cultural Heritage	Initial screening to verify that physical and cultural heritage	Low Risk The project involves participatory consultation and implementation process. Local knowledge will be captured, analyzed and integrated with scientific knowledge and ensure that local cultural and physical

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
	sites are not in the vicinity	heritage is protected. The criteria for selection of project sites will avoid locating project activities in the vicinity of physical and cultural heritage sites
Lands and Soil Conservation	Initial assessment and reconnaissance survey will be conducted during selection of placement of the project site	No Risks Adaptation interventions of component 2 and 3 will lead to restoration of degraded landscapes and soils. Capacity building in all 4 components of the project will enhance land and soil management capacities of local communities for sustainability. – Reduction of use of fertilizers and pesticides will minimize pollution and associated components of semi arid landscapes such as rivers, ponds and oases. Elements of land and soil conservation will be evaluated before the execution of the project to establish baseline status for monitoring of impacts

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project implementation.

The proposed project will be implemented by the Vice President's Office, Department of Environment (VPO-DoE) through the National Environmental Management Council (NEMC) of Tanzania. NEMC is the National Implementing Entity (NIE) of the adaptation fund. Sokoine University of Agriculture (SUA) who is the Executing Entity (EE) will execute the project. SUA through its Directorate of Postgraduate, Research, Technology Transfer and Consultancy (DPRTC) will ensure the planned activities for the project are executed in accordance with institutional financial regulations and guidelines as planned in the budget. There will be a project implementing team composed of technical researchers and executing officers who will have a team leader and component lead people. The Project implementing team will with district and village level platforms to ensure smooth uptake of the project, participation and ownership at the local level.

NEMC is the National Implementing Entity (NIE) and will provide project management support, oversight and will act as the secretariat of the Project. It will also be part of the team that implements the project, where it will provide technical knowledge and expertise based on its experience implementing other climate change projects in Tanzania. The NIE further oversee compliance with its Environmental and Social Safeguard System and the Environmental and Social Safeguard Policy of the Adaptation Fund.

SUA is the Executing Entity (EE) responsible for management, execution and delivery of project outputs. It will deliver the full range technical knowledge and expertise to the project from its wide range of professionals and experience in handling internationally funded projects. SUA will coordinate all the executing partners, by managing all subcontracts and monitor their performance. SUA will be expected to ensure that The AF and NEMC Communication and Visibility Policies are adhered to. SUA will notify NEMC, in writing, about any expected variations on the project budget or co-finance.

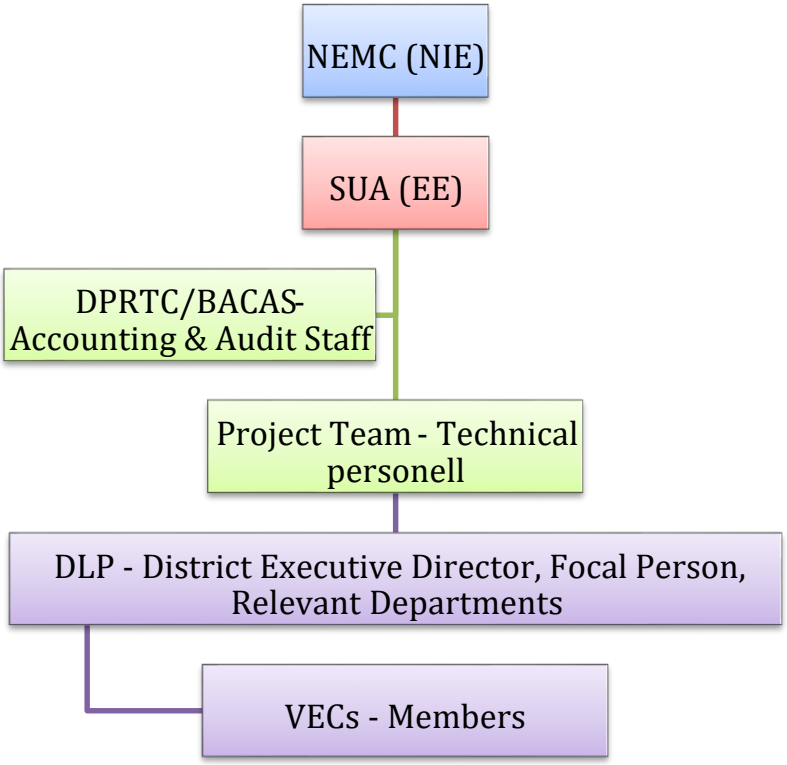
SUA will provide project implementation infrastructure as well as staff time. A team of multidisciplinary experts who will be coordinated by the Project coordinator will implement the project. The project team will coordinate the execution of the project with key project partners made up of key sectorial institutions and Local Government Authorities. The project coordinator will report all implemented project activities and financials to DRPTC and NEMC. Each component will have a leader who will foresee activities under the particular component and report to the coordinator. The project coordinator will be the overall in-charge of the project activities on behalf of SUA.

District Level Partnership (DLP) – At the local government level, there are departments and committees dealing with environment, agriculture, livestock, fisheries and water that have a close link with areas of SWAHAT project intervention. In this regard, the project will use the existing structures at the District level to steer the project implementation in the selected sites. The DLP will be made up of members of technical and administrative teams that will ensure smooth implementation of the project in their respective districts. The DLP will be under the District Director and a selected Project focal person will serve as the secretary and the lead contact person of the District to the EE. The duties of the DLP will include:

- Selection of project sites using an objective criterion
- Facilitating community mobilization
- Approval of work plans at the District level
- Monitoring project progress
- Coordination of project implementation and ensuring synergies with other related projects and programmes at District level.
- Integrate and implement sustainability plan after the SWAHAT project life

Village/Catchment Environmental Committee – In Tanzania, The Village Environmental Committees (VECs) are responsible in formulation and foreseeing various by-laws and are recognised by the law. Much of the project activities will be undertaken at the village or sub-catchment level and they relate to climate change (an environmental aspect) and therefore under the jurisdiction of VECs. In this regard, the project will work with the VECs as entry points to the villages and community groups.

Legal and Financial Arrangements: SUA and the NEMC will sign a joint Memorandum of Understanding (MoU) as a legal commitment to implement the project. SUA will the enter into an Agreement of Cooperation with NEMC. This is the legal basis to transfer funds to be invested under the project. This agreement will specify in significant detail the activities to be implemented by the project, the timeframe and the deliverables required. The Permanent Secretary, VPO, will authorize the payments against the contractual agreements, upon recommendations from NEMC.



B. Description of measures for financial and project risk management

Identified Risk	Risk rating	Mitigation Measures
Conflict among users of water and forest resources	Low	• Capacity building on governance of water rights and forest resources • Participatory governance and management of water forest resources user rights • Implement water resources management irrigation laws at target village
Political will at regional and district and village local government to accept and support project objectives	Low	Participatory engagement of stakeholder from the beginning of the project Communication and transparency with politicians from local to national level
Limited capacity and willingness to understand and implement project interventions	Medium	• Capacity building of target village communities • District level capacity building • Participatory prioritization and decision making
Change price of materials for project implementation	Low	Budget reviews
Delays in disbursement of funds	Low	• Timely reporting and application of funds • Encourage site/field visits and engagement of executing entity for visibility of project implementation.

C. *Measures for environmental and social risk management, in line with the **Environmental and Social Policy of the Adaptation Fund.***

Environmental and Social Risk Management

Through the consultative process done in preparing and designing this project (Annex 5: and Fig 20), thorough screening and assessment have classified intervention under SWAHAT project to be of category B hence requiring Environmental and Social Management Plan (ESMP) and not needing Environmental and Social Impact Assessment (ESIA) and category C requiring no action. Sections E and K shows that SWAHAT project is fully aligned with the Adaptation Fund's Environmental and Social Policy (ESP) as well as national environmental and social standards as well as outlining areas where further screening and assessment may be required during project implementation. Therefore additional environmental and social risks and impacts of the project and related activities need to be identified and addressed (so that the project does not unnecessarily harm the environment, public health or vulnerable communities). This will ensure that remaining or unforeseen risks are well managed by the project. In addition, an Environmental and Social Management Plan (ESMP) will be developed to ensure full compliance with the Adaptation Fund's Environmental and Social and Gender Policies.

The Project will ensure that risks are actively identified, analyzed, and managed throughout the implementation of interventions. Risks will be identified as early as possible in the project so as to minimize their impact. The steps for accomplishing this will be given in a fully developed Environmental and Social Management Plan (ESMP). Risk identification will involve the project team, national and local stakeholders, village environmental committees (VECs) and the general public of the target communities. The risk identification will include an evaluation of environmental factors, culture, gender, benefit sharing s well as the overall project management plan and conduct. A Risk Management Log will be generated and updated as needed and will be stored electronically by the project team. All risks identified will be assessed to identify the range of possible outcomes. Qualification will be used to determine which risks are the top

risks to pursue and respond to and which risks can be ignored. The table below outline risk types identified during the consultative process, their nature, scale and proposed mitigation measure. As mentioned above, these and other unforeseen risks will continue to be further studied and appropriate measures taken as per the ESMP.

Identified risks	Risk Rate	Mitigation Measures
Access and equity (Social)	Low	• Capacity building • Participatory resource management
Marginalized and vulnerable (Social)	Low	• Sensitization of all social groups • Institutionalization of the project activities for continued execution
Conservation of Biological Diversity (Environmental)	Low	• Prior assessment of biodiversity status • Sensitization of all social groups • Participatory development and implementation of conservation practices
Pollution (Environmental)	Low	• Compliance to environmental laws • Integrated soil fertility and pest management
Land and soil conservation (Environmental)	Low	• Promoting integrated soil conservation practices • Minimize soil disturbances by machines during dam construction

Figure 20: Cosultative meeting with villagers in one of the project area during baseline survey

Grievance Management Mechanism

A grievance management mechanism will be set in place in order to allow any affected stakeholder to communicate grievances associated with the project. This can be communicated in various forms which include: stakeholders meetings, confidentially by individuals from the communities and village grievance management desk will be established at each project site for verbal reporting of grievances. The grievance management mechanism will be set at different levels depending on the nature and confidentiality of the issues the levels will include: community leaders on the local coordinating committee, District coordinators and project management team. These levels of communication will allow accessibility, transparency, fairness and effectiveness in communicating various grievances emanating from project implementation. Others windows of lodging grievances will include the use of free mobile calls and SMS, official letters and suggestion box. Establishment of grievance management at the village level provides an opportunity of using local languages so as to accommodate disadvantaged members of the community who cannot use other languages.

Information related to different grievance issues will be collected and analyzed by the Project National

Executing Entity (EE) and eventually shared to Project National Implementing Entity (NIE) in this case NEMC has the mandate to provide option of grievance management in collaboration with stakeholders. In order to minimize grievance and increase awareness on some project issues, training of local communes through seminars and workshops designed in different project components. These training will also be conducted to local staff in the project sites in order to enhance a problem solving policy that accommodate room for community members to address their grievance related to project design and implementation.
Feedback of the received grievances will be communicated back to the community or individuals openly or confidentially depending on the nature of the complaints. The Project management team under guidance and advise from the NIE (NEMC) will organize and communicate feedback accordingly. The whole process should be carried out in a way that will effectively resolve the grievances while maintaining high level of confidentiality and transparency depending on specific cases.

D. MONITORING AND EVALUATION ARRANGEMENTS

The Monitoring, Reporting and Evaluation of SWAHAT project will abide to the AF, National, NEMC and SUA guidelines. M, R&E will focus on in achievement of project results based on targets and indicators established in the Project Results Framework as shown in the table next section. In addition, the status of identified environmental and social risks, including those measures required to avoid, minimize, or mitigate environmental and social risks, will be monitored throughout the project (at the activity level and through annual project performance, mid-term and terminal reports). The same applies to financial and project management risks and mitigation measures.

NEMC will be responsible for managing the mid-term review/evaluation and the terminal evaluation. The Project Coordinator and his Team will participate actively in the process. The project will be reviewed or evaluated on bi-annual basis (mid-year and end of the year basis). The purpose of the review/evaluation is to provide an independent assessment of project performance at mid-term, to analyse whether the project is on track, what problems and challenges the project is encountering, and which corrective actions are required so that the project can achieve its intended outcomes in the most efficient and sustainable way. In addition, it will verify information gathered through the Adaptation Fund tracking tools. Representative from the directorate (DPRTC) and Project members will participate in the evaluations and develop a management response to the evaluation recommendations along with an implementation plan. It is the responsibility of the NEMC to monitor whether the agreed recommendations are being implemented.

An independent terminal evaluation (TE) will take place at the end of project implementation. The executing entity (SUA) will be responsible for the TE and liaise with the NEMC secretariat throughout the process. The TE will provide an independent assessment of project performance (in terms of relevance, effectiveness and efficiency), and determine the likelihood of impact and sustainability. It will have two primary purposes: to provide evidence of results to meet accountability requirements, and to promote learning, feedback, and knowledge sharing through results and lessons learned among implementing entity (NEMC) and executing entity (SUA). While a TE should review use of project funds against budget, it would be the role of a financial audit to assess probity (i.e. correctness, integrity etc.) of expenditure and transactions. The TE report will be sent to project stakeholders for comments. Formal comments on the report will be shared by the implementing entity in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six point rating scheme. The final determination of project ratings will be made by the implementing entity when the report is finalised. The evaluation report will be publically disclosed and will be followed by a recommendation compliance process. The direct costs of reviews and evaluations will be charged against the project evaluation budget.

Table 8: Monitoring and Evaluation Budget

Activity	Responsible person	Budget (USD)	Timeframe
Inception meeting	Executing entity project coordinator	2,541	Within 2 months of project starting

Annual meetings	EE & NIE	4,530	Annual
Final evaluation report	External consultant	5,000	48 months
TOTAL		12,071	

E. RESULTS FRAMEWORK FOR THE PROJECT PROPOSAL, INCLUDING MILESTONES, TARGETS AND INDICATORS.

Expected results	Indicators	Baseline	Targets	Means of verification	Milestone
Overall Objective: Enhancing resilience of rural community to climate change-induced challenges of drought, floods and high temperatures in semi-arid regions in Tanzania					
Enhancing resilience of rural community to climate changeinduced challenges of drought, floods and high temperatures in semi arid regions in Tanzania	Percentage of people with improved livelihoods and resilient to climate change Number of households disaggregated by gender with improved food and nutrition security Number of people adopted diversified sources of income generation activities Number of households having access to water supply	Communities affected by low levels of income, food insecurity and water scarcity	At least 30% increase in crop and livestock productivity at the end of the project At least 240 ha of land planted with adapted fruits/forest tree by the end of the project At least 50% of people adopt diversified sources of income generation activities i.e. at least 30,000 females and 20,000 males having access to water supply	• End of project M&E reports • Report from local authorities, • Journal articles published in peer reviewed journals and thesis submitted for award of degrees • Quarterly, annual, Midterm and final project evaluation reports	Within and beyond the project life
Component 1: Installation, rehabilitation and establishment of community water harvesting dams					
Expected results	**Indicators**	**Baseline**	**Targets**	**Means of verification**	**Milestone**
Community water harvesting dams for integrated agriculture, livestock, tree planting and aquaculture designed and constructed	• Number of sites where physical water dams has been constructed to deal with climate risk • Number of constructed water supply channels	Scarcity of water affecting domestic supply, crop performance and livestock supply	Six (6) water harvesting dams constructed Improved governance on water use rights, management and distribution At least 6 bore holes for domestic water use established in needy villages 80% of women relieved from drudgery and time wasting in fetching	Periodic project reports surveys, studies Project annual impact assessment reports Mid-term project reports final project evaluations Village data	Within year one of the project implementation

Expected results	Indicators	Baseline	Targets	Means of verification	Milestone
			water from long distances		
Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees entailing nursery establishment, tree planting, management and sustainable harvesting and utilization					
Participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization developed village established	• Number of community members trained on, nursery techniques, tree planting, management and sustainable utilization of fruit and forest tree species • Number of nurseries established • Number of fruit and forest trees produced and planted on farmlands • Area size of catchments planted with forest trees	Poor availability of trees on highly degraded landscapes Low capacity of communities to establish nurseries and plant and manage trees	At least 6 nurseries with multi purpose fruits and forest trees per village established At least 100,000 locally adapted fruits and forest trees planted in the projct areas. Increased number of people (i.e. least 30% being women) with knowledge on establishment, propagation and management of fruits and forest tree species. Sustainable use of fruits and forest tree products developed	Periodic project reports surveys, studies Project annual impact assessment reports Mid-term project reports final project evaluations Village data	At the end of the project implementation
Component 3: Develop integrated climate resilient livelihoods diversification through improved technologies in apicultures, aquaculture, crop and livestock production					
Expected results	**Indicators**	**Baseline**	**Targets**	**Means of verification**	**Milestone**

Integrated climate resilient livelihoods diversification through improved technologies in agriculture developed	• Number of farmers in the target communities with built capacity and practicing profitable apiculture, fish farming, crop and livestock production (disaggregated by sex). • Number of established model fish ponds and horticulture fields downstream of the water	High incidents of crop failure due to drought, poorly performing livestock sector	At least 30% of whom are women practicing profitable apiculture, fish farming, crop and livestock production. Twelve model aquaculture farms each with at least 4 ponds established in the	Periodic project reports surveys, studies Project annual impact assessment reports Mid-term project reports final project evaluations Village data	At the end of the project implementation

Expected results	Indicators	Baseline	Targets	Means of verification	Milestone
	harvesting dams • Number and size of apiary units and livestock water points • Amount of honey and fish; and crop and livestock harvests yielded per household 	infested with long distances travelled by herdsmen to walk livestock in search for drinking water, poor apiculture and aquaculture practices	project districts Twelve model horticulture farms with diversified vegetable crops established 4 livestock water drinking centers established per project district 12 model apiary units established in the entire project area At least 30% of households (of which at least 20% are of women) within target community are integrated in aquaculture, horticulture, livestock and apiculture.		
Project Component 4: Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect fruit trees, fish, crops and livestock productivity					

Expected results	Indicators	Baseline	Targets	Means of verification	Milestone
Interventions for integrated management of emerging climate change related pests and diseases formulated and implemented	• Number of major insect pests and vectors affecting crop and livestock production in target areas • Number of crops diseases in the target areas • Developed IPM technologies for management of pests and diseases	High level of crop failure caused by pests and diseases	At least one guideline for each insect pest/vector and disease produced and distributed to target farmers At least 70% of which 50% are women farmers involved in the project adopted and implementing the IPM	• End of project M&E reports • Report from local authorities, • Publications in peer reviewed journals and thesis. • Project progress reports	At the end of the project implementation
Expected results	**Indicators**	**Baseline**	**Targets**	**Means of verification**	**Milestone**
			technologies for resilience climate to change		

F. Demonstration of how the project aligns with the **Results Framework of the Adaptation Fund.**

Project Objective(s)	*Project Objective Indicator(s)*	*Fund Outcome*	*Fund Outcome Indicator*	*Grant Amount (USD)*
Installation, rehabilitation and establishment of community water harvesting dams	Number of established water harvesting dams in three project regions	Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	408,400

Participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization	• At least 6 nurseries with multi purpose fruits and forest trees per village established • At least 100,000 locally adapted fruits and forest trees per project site (6 sites) established in local communities per district (three districts) • Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species Sustainable use of fruits and forest tree products developed	Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	5. Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress 3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses 3.2. Modification in behavior of targeted population	155,020
Integrated climate resilient livelihoods diversification through improved technologies in agriculture developed	• Six model aquaculture farms established in the project villages; • Twelve model vegetable gardens with diversified vegetable crops established • Three livestock water drinking centers established per project site • Six model apiary units established in the entire project area • At least 30% of households (within target community are integrated in aquaculture, horticulture, livestock and apiculture. • At least 30% people with knowledge on integrated and diversified technologies for fish, crops and livestock production	Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	6.1 Percentage of households and communities having more secure (increased) access to livelihood assets 6.2. Percentage of targeted population with sustained climate-resilient livelihoods 3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of Appropriate responses 3.2. Modification in behavior of targeted population	230,280

Interventions for integrated management of emerging climate change related pests and diseases	• At least one guideline for each insect pest/vector and disease produced and distributed to target farmers. • At least 70% of the farmers involved in the project adopted and implementing the IPM technologies for resilience to climate change • At least Diagnostic Unit established per village for early warning of the pest	3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses. 3.2. Modification in behavior of targeted population	97,170

Project Outcome(s)	***Project Outcome Indicator(s)***	***Fund Output***	***Fund Output Indicator***	***Grant Amount (USD)***

1.1 Improved livelihoods and resilience to climate change of the rural communities, improved food and nutrition security, and ecosystem services *1.2* Reduced drudgery for women and children from long distance walk in search of water and firewood 1.3 Strengthened capacity on sustainable water resource management and utilization	• Number of people with increased resilience to climate change • Number of households with increased food and income security • Proportion of people with enhanced social security (by improved literacy and health) • Increased number of people with knowledge on sustainable management and utilization of water resources	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change Impacts, including variability Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types) 1.1 No. and type of risk reduction actions or strategies introduced at local level 3.1.2 No. of news outlets in the local press and media that have covered the topic	408,400
2.1 Improved ecosystem health and delivery of ecosystem goods and services *2.2* Increased sources of employment opportunities resulting from fruits and forestry venture *2.3* Reduced land and forest degradation in the community landscape 2.4 Strengthened knowledge and skills on establishment, propagation and management of fruits and forest tree species	• Percentage increase in forest resources for resilience to climate change • Number of people sustainably using fruits and forest products • Proportion of land and forest rehabilitated • Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species	Output 5: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets) 3.1.1 No. and type of risk reduction actions or strategies introduced at local level 3.1.2 No. of news outlets in the local press and media that have covered the topic	155,020

3.1 Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use. *3.2* Improved equitable water use for multiple agroecological needs by the community; *3.3* Improved governance of water and use of forest resources for climate resilience in target village communities 3.4 Improved capacity on governance of water and use of forest resources for climate resilience in target village communities 3.5 Enhanced capacity of people with knowledge on integrated and diversified technologies for fish, crops and livestock production	• Percent increase in income, • Reduced nutrition related illnesses • Increased number of households with food and nutrition security • Number of farmers, students, policy makers and other stakeholders with improved capacity in strategies for climate change adaptation. • Number of people adopted technologies for adaptation and mitigation of impacts of climate change. • Increased number of people with knowledge on integrated and diversified technologies for fish, crops and livestock production.	Output 6: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities Output 7: Improved integration of climateresilience strategies into country development plans	3.1.2 No. of news outlets in the local press and media that have covered the topic 7.1. No., type, and sector of policies introduced or adjusted to address climate change risks 7.2. No. or targeted development strategies with incorporated climate change priorities enforced 3.1.1 No. and type of risk reduction actions or strategies introduced at local level	230,280

4.1 Reduced losses from climate change associated emerging insect pest/vector and diseases, hence leading to improved crop and livestock productivity consequently increased farmers' resilience to climate change impacts. 4.2 Strengthened awareness of people on adoption and application of IPM technologies in agriculture	• Percent reduction in crop losses in the target community in the face of climate change • Increase in diversity of plants, pollinators, and other beneficial organisms • Number of people with increased awareness, adopted and practicing insect/disease protection technologies.	Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level 3.1.2 No. of news outlets in the local press and media that have covered the topic	97,170

G. *Detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.*

Component Budget	OUTPUTS	ACTIVITIES		Year 1	Year 2	Year 3	Year 4	Total (USD)
Component 1 Installation, rehabilitation and establishment of community water harvesting dams	**Output 1.1**	1.1.1:	Land Survey, dam site mapping and land clearing of dam sites:	16,800				16,800
		1..1.2 :	Excavation of dams to water storage depth/capacity, re-installation of dykes and construction of spillway	126,520	126,520			253,040
		1.1.3:	Installation of water supply canals for strategic intervantions	36,000	36,000			72,000
	Output 1.2:	1.2.1:	Planting of forest trees in the catchment areas to protect water harvesting dams	6,900	6,780	4,050	2,330	20,060
		1.2.2	Establish water user groups		12,700	12,700		25,400
		1.2.3	Conduct training workshops on safety and sustainable use of harvested water		6,700	7,200	7,200	21,100
			Component Sub-Total	**186,220**	**188,700**	**23,950**	**9,530**	**408,400**
		2.1.1:	Establishment of community Nurseries	12,600.00	12,600.00	6,600.00		31,800
Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees utilization	**Output 2.1**	2.1.2:	Selection and collection of of the best adapted tree species for semi arid areas	5,000.00	5,000.00			10,000
		2.1.3:	Optimization of propagation methods for each of the selected species	6,900.00	4,600.00			11,500
		2.1.4	Farmers Groups training on nursery techniques, establishment and management	6,900.00	6,900.00	6,900.00		20,700
	Output 2.2	2.2.1:	Planting of forest trees and fruits in the farm land and degraded land for conservation		4,420.00	3,500.00		7,920
		2.2.2:	Management, monitoring and evaluation of performance of planted trees			4,200.00	6800	11,000
	Output 2.3	2.3.1:	Capacity building to communities on appropriate skills and knowledge on tree planting and management		9,800.00	10,800.00	6600	27,200
		2.3.2	Dissemination for wider capacity building and knowledge dissemination			8,800.00	8300	17,100

		2.3.3	Mainstreaming training and training in various platforms. Establishment of farmer schools			9,000.00	8800	17,800
			Component Subtotal	**31,400**	**43,320**	**49,800**	**30,500**	**155,020**
Component 3: Develop integrated climate resilient livelihoods diversification for climate change	**Output 3.1**	3.1.1:	Excavations and establishment of model fish ponds	12,000.00	12,000.00			24,000
		3.1.2:	Stocking of fingerlings and management of fish ponds	8,460.00	8,460.00	4,000.00		20,920
		3.1.3:	Construction of water and nutrient recycling systems from fish to vegetable	4,600.00	4,600.00			9,200
		3.1.4:	Training of farmers in the target communities on fish farming practices		8,400.00	8,600.00	6600	23,600
		3.1.5:	Development of manuals and fliers on aquaculture and value addition and marketing			2,000.00	2800	4,800
	Output 3.2	3.2.1:	Eestablishment and management of horticultural crops		6,860.00	6,860.00	6860	20,580
		3.2.2:	Design and establish irrigation systems for horticulture crops		6,800.00	7,860.00	6000	20,660
		3.2.3:	Training of farmers on horticultural value chain of different adapted commercially marketable crops		6,800.00	6,800.00	6800	20,400
		3.2.4	Training on postharvest handling and packaging of horticultural crops		4,200.00	4,200.00	8200	16,600
		3.2.5:	Develop tree nurseries and vegetable gardens		4,600.00	5,460.00	5460	15,520
	Output 3.3	3.3.1:	Training on modern livestock management for climate change adapatation		6,600.00	6,600.00	4800	18,000
		3.3.2:	Construction of water drinking points and water delivery trenches		9,000.00	9,000.00		18,000
		3.3.3:	Establish model pasture paddocks for rotational grazing		9,000.00	9,000.00		18,000
				25,060	87,320	70,380	47,520	230,280
Component 4: Formulate and	**Output 4.1**	4.1.1:	Site selection, excavation of pits and building dip tanks		15,600.00	15,600.00		31,200

implement interventions for integrated management of emerging pests and diseases		4.1.2:	Formation of village committee for dip tank management		3,600.00	3,600.00		7,200
		4.1.3:	Registration of livestock keepers and training of dip attendants		3,600.00	3,600.00	3,600.00	10,800
		4.1.4:	Establishing plant health clinics and surveillance systems in field crop production			9,900.00	9,900.00	19,800
	Output 4.2	4.2.1:	Participatory surveillance and scouting for identification of major insect pests and vectors			6,000.00	6,000.00	12,000
		4.2.2:	To establish insect traps based on abundant species in the location for early warning				6,600.00	6,600
		4.2.3	Participatory diagnostic of pest and disease and implementation of management options				9,570.00	9,570
				0	22,800	38,700	35,670	97,170
Project Execution costs,			Project team Leader (part time)	4,800.00	4,800.00	4,800.00	4,800.00	19,200
			Office staff researchers and technical support	15,000.00	15,000.00	15,000.00	15,000.00	60,000
			Office Facilities and Utilities	2,055.00	2,100.00	2,100.00	2,100.00	8,355
			Project Evaluation	3,000.00	3,000.00	3,071.00	3,000.00	12,071
			Project vehicles and maintenance	76,000.00	2,000.00	2,000.00	2,250.00	82,250
			Audit costs	3,000.00	3,000.00	3,000.00	3,000.00	12,000
			Subtotal	103,855	29,900	29,971	30,150	193,876
Total Project costs				346,535.00	372,040.00	212,801.00	153,370.00	**1,084,746.00**
Administrative cost of NIE (8.5%)				29,455.48	31,623.40	18,088.09	13,036.45	92,203.40
Institution Execution costs (9.5%)				32,920.83	35,343.80	20,216.10	14,570.15	103,050.60
Total Fund request				**408,911.30**	**439,007.20**	**251,105.18**	**180,976.60**	**1,280,000.00**

Shaded columns indicate timelines for project activities

Personnel: Per diem during travels, Coordination allowance, Special task honoraria, secretary and attendance, financial and admin assistance, Supporting staff, dissemination, Staff time, farmer and local GOVT facilitation and Research assistants time

Consumables: Fuel and lubricants, Stationery, Printing and publication, animal feeds, tree seeds, scions and rootstocks, fertilizers, approved natural pesticides
Equipment: irrigation fishponds, livestock infrastructure, shade screen nets, nursery equipment
Transport and Vehicle: Vehicle procurement and fuel for field trips
Consultancy: Dam designing construction, nursery establishment, surveys,
Contractors and service providers: construction and commissioning of water dams, nursery and screen houses and irrigation infrastructures
Maintenance Costs: Materials, labour, irrigation facilities and replacement of defaulted facilities
Monitoring & Evaluation: Field visits per diems, facilitation for local government and farmers and VEO special task allowance, **Training:**
Technical staff, local government, farmers and VEO facilitation allowance,

H. Include a disbursement schedule with time-bound milestones00.

Project Objective/Component	Time –bound milestones disbursement Schedule per objective - Costs in USD				
	Year 1	Year 2	Year 3	Year 4	Total
Installation, rehabilitation and establishment of community water harvesting dams	181,700	193,220	23,950	9,530	408,400
Develop and implement participatory afforestation program for locally adapted fruit and forest trees	31,400	43,320	49,800	30,500	155,020
Develop integrated climate resilient livelihoods diversification for climate change	25,060	87,320	70,380	47,520	230,280
Formulate and implement interventions for integrated management of emerging pests and diseases	0	22,800	38,700	35,700	97,200
Project Execution Costs	**346,535.00**	**372,040.00**	**212,801.00**	**153,370.00**	**1,084,746.00**
Administrative cost of NIE (8.5%)	29,455.48	31,623.40	18,088.09	13,036.45	92,203.40
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Total Fund request	**408,911.30**	**439,007.20**	**251,105.18**	**180,976.60**	**1,280,000.00**

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[64] *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*

Ambassador Joseph E. Sokoine, Deputy Permanent Secretary, Vice President's Office	Date*: January, 20, 2020*

B. Implementing Entity certification

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (National Development Plans, Poverty Reduction Strategies, National Climate Change Strategy, National Adaptation Programme of Action) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

 ***Fredrick F. Mulinda*** Implementing Entity Coordinator	
Date: January 17, 2020	Tel. and email: **+255 753 240 517**, nieaf@nemc.or.tz / kasigazi.koku@gmail.com
Project Contact Person: **Prof. Paul M. Kusolwa**	
Tel. and Email: +255 785 116 669 kusolwap@gmail.com / kusolwa@sua.ac.tz	

[41.] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Government Endorsement Letter

UNITED REPUBLIC OF TANZANIA

Telegraphic address: "MAKAMU",
Telephone: +255 -26-2329006
Fax. No.: +255 -26-2329007
E-mail: ps@vpo.go.tz

In reply please quote:

Government City,
Mtumba Area,
Vice President's Office
Building,
Ihumwa,
P. O. Box 2502,
DODOMA

Our Ref: BA. 90/201/01

14th January, 2020

The Adaptation Fund Board,
c/o Adaptation Fund Board Secretariat,
Email: Secretariat@Adaptation-Fund.org,
Fax: 202 522 3240/5

Re: Endorsement for Strategic Water Harvesting Technologies for Enhancing Resilience to Climate Change in Rural Communities in Semi-Arid Areas of Tanzania (SWAHAT) in Singida, Tabora and Dodoma Regions

In my capacity as designated authority for the Adaptation Fund in the United Republic of Tanzania, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the National Environment Management Council and executed by the Sokoine University of Agriculture in collaboration with Bahi, Manyoni and Nzega District Councils in the Regions of Dodoma, Singida and Tabora respectively.

Sincerely,

Ambassador Joseph E. Sokoine
For Permanent Secretary

THE UNITED REPUBLIC OF TANZANIA
VICE PRESIDENT'S OFFICE

Telegrams: "MAKAMU"
Telephone: +255 026 2329006
Fax: +255 026 2329007/2963150
Email: ps@vpo.go.tz
In reply please quote:

Makole Street,
LAPF Building, 7th floor,
P.O. 2502,
40406 **DODOMA.**
TANZANIA.

Our Ref: AB.90/201/01/203

28th December, 2018

The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for **Strategic Water Harvesting Technologies for Enhancing Resilience to Climate Change in Rural Communities in Semi-Arid Areas of Tanzania**

In my capacity as designated authority for the Adaptation Fund in the United Republic of Tanzania, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by National Environment Management Council and executed by Sokoine University of Agriculture.

Sincerely,

Eng. Joseph K. Malongo,
PERMANENT SECRETARY

Annex 1 Community Consultations and Vulnerability Assessment as Baseline of the Selected Target SWAHAT Project Areas.

1. 1 Alternative livelihoods resilience activities						
Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Awareness of economic value of beekeeping	yes	yes	yes	yes	yes	yes
% Contribution of beekeeping to household income	low	low	low	low	low	low
# of villagers participating in beekeeping activities	5	15	26	30	7	15
Amount of honey produced	no data	no data	no data	600 litres	200 litres	no data
%Households demanding seedlings (fruit and forest trees)	100%	100%	100%	100%	65%	60%
% of households with shortage of forest products	Low	High	High	High	High	High
% of women involved in fuel-wood collection	100%	100%	100%	100%	70%	60%
% of households using stumps for fuel-wood	0%	80%	100%	0%	20%	0%
# of households planting trees	0	0	0	0	0	n/a
# of existing nurseries	0	0	0	0	n/a	n/a
# of seedlings produced per year	0	0	0	0	n/a	n/a
Awareness of economic value of aquaculture	yes	Yes	Yes	yes	yes	Yes
# of fish catch per village per year	Low	low	low	low	low	low
# of households with access to fishing activities	0	0	0	0	10	n/a
Level of contribution of fishing to household income	n/a	n/a	Low	Low	Low	Low
Level of awareness of economic value of aquaculture	High	High	High	High	High	High

Forest species preference	1.Azadirachta 2. Senna 3. Mti maji 4. Mkungugu 5.Migombwe 6. Mtunduru 7. Mtamba 8. Mkuyu 9. Miyombo 10. Mkola 11. Milumba	1.Azadirachta 2. Senna 3. Mti maji 4. Mkungugu 5.Leucaena 6. Mtunduru 7. Mtamba 8. Mfuku 9. Mkambala 10. Mkole 11. Mjiha	1. Mtunduru 2. Mbukwe 3. kambala 4. Mhozolo 5. Mkola 6. Mnguji 7. Mninga	1. Pterocarpus 2 Mkola 3. Mtundu 4. Mponda 5. Acacia	1.Mgunga, 2.Msuha, 3.Mkola, 4.Mninga, 5.Mponda, 6.Mpogolo	1.Cypre pines 2.muaro ini 3.mning 4.mkola 5.mlong 6.mdodo ma, 7.Cashe
Distance travelled to collect fuelwood	6km	20 kms	15km	10 km	6 km	10 km

,

1. 1 Alternative livelihoods resilience activities						
Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Income sale of seedlings	0	0	0	0	0	0
Level of awareness of economic value of fruit and forest trees	high	high	high	high	high	high
Level of awareness of economic value of beekeeping	low	low	low	high	medium	medium
Income from fruit and forest trees products	from sales of papaya, mango, sour sop, guava, orange, avocado, mandarin, banana	none	none	up to 200,000 per mango tree owned by clan. Up to 10 trees per clan	150,000 per mango tree owned by clan. Up to 10 trees per clan	from sal of few fruits
Types of fruit tree species preferred (Exotic/indigenous)	papaya, mango,sour sop, guava, orange, avocado, mandarine, banana, Cashew	papaya, mango,sour sop, guava, orange, avocado, mandarine, banana, cashew	papaya, mango,sour sop, guava, orange	Papai, guava, mango, banana, Zambarau, Sungwi, Fulu, Ntobho, Nhongo, mamilwa cashew	Papai, guava, mango, banana, Zambarau, Sungwi, Fulu, Ntobho, Nhongo mamilwa, cashew	Cashew Mango, Chungw Papaya Guava, lemon

Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
1. 2: Water resources and infrastructure						
% of households using tap water	0	0	10	0	0	0

% of households using river water	0	0	0	0	0	0
% of households using community dams	100	100	100	100	100	100
% of women involved in fetching water	100	100	90	75	75	100
% of households using shallow wells	100	0	10	100	100	100
% of households using boreholes	15	75	100	80	80	0
Number of dams having water all year round	0	0	0	0	0	0
Number of dams having water for at least 3 months of dry season	1	1	0	0	1	0
% of households involved in irrigation farming	85	15	20	0	20	0
Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
% of men involved in fetching water	1	10	10	25	25	5
% of households sharing dam water with livestock	60	90	10	60	60	80
% of households using charcoal dams	60	80	30	30	30	30
Use of water for irrigation	yes	yes	yes	no	yes	no
Use of water for livestock	yes	yes	yes	yes	yes	yes
Use of water for fish farming	No	No	No	Yes	No	No
Use of water for domestic use	yes	yes	yes	yes	yes	yes
Main water source for domestic use	shallow wells	bore hole	Borehole	Shallow wells	bore hole	shallow wells
Diatance travelled in fetching water	25kms	10 kms	2km	8-25 kms return distance	2km	12km
Time spent in fetching water per day	<1hr	6 hours	4hrs	2-6 hours	2hrs	4hrs

Village_Site	Mkwese	Ibugule	Mtitaa	Ntoba	Utwigu	Nguriti
1.3: Uses of Dam/Water Harvesting Facilities						
Number of Villages getting services from the dam	12	3	6	5	5	9
Number of households	1285	812	1292	3531	3385	1406
Number of hamlets	10	9	6	30	29	25
Number of beneficiaries	6341	4765	6241	17657	2683	11043
Number of women	3236	2828	3324	9732	162	n/a
Number of men	3105	1946	2917	7925	126	n/a
Total number of resident population	6341	4774	6241	17657	22081	11043
Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Name of villages using the dam	Mpamaa, Stendi, Majengo, Miningaa, Tambukareli, Miomboni, Mbuyuni, Mjiti, Kinyika, Kinangali, Kamenyanga, Njiri.	Nchimila, Ibugule, Mtitaa	Mtitaa, Mwitikilwa, Chibelela, Nyhinila, Nkhome.	Uhemeli, Kamoala, Ntoba, Wita and Mabisilo	Utwigu, Mwanhala, Iyombo, Isalalo, Ishike.	Nguriti, Sungwizi, Ncheli, Mangugu, Mwamala, Mgunga, Bukoko, Chama, Nkinga.
Area suitable for irrigation	100 Acres	270 acres	250 Acres	500 Acres	400 Acres	10 acres
Area covered by the dam	10 Acres	5 Acres	100 Acres	10 Acres	70 Acres	50 Acres

1.4: Contribution of crops to adaptation and resilience to climate change effects

Village_Site	Mkwese	Ibugule	Mtitaa	Ntoba	Utwigu	Nguriti
Main crops grown	Maize Pearl millet Cotton Chick peas Sunflower Sorghum	Pearl millet, Sorghum, Maize,	Groundnuts, Maize, Sorghum, Pearl Millet	Rice, Maize, Sweet potatoes, Cassava,	Rice, Groundnuts, Maize, Cassava, Sweet potatoes, Cotton, Sunflower.	Maize, Red Sorghum, Cassava, Sweet Potatoes, Rice.
Vegetable crops grown	Tomatoes, Onions, Cabbages, Eggplant, Chinese, Okra, Amaranthus, African eggplant, Sweet pepper	Tomatoes, Onions, Cabbages, Eggplants, African eggplants, Amaranthus	Tomatoes, Onions, Cabbages, Eggplants, African eggplants, Amaranthus	Tomatoes, Onions, Amaranthus, Chinese, Pumpkins, Sweet potato	Tomatoes, Onions, Amaranthus, Chinese, Pumpkins, Cabbages, Sweet potatoes	Tomatoes, Onions, Amaranthus, Chinese, Pumpkins, Cabbages, Sweet potatoes
Awareness of people on the economic value of horticulture	High	High	High	Medium	High	Medium
% Households engaged in field crop production	100%	100%	100%	100%	100%	100%
% of households engaged in horticultural crop production	>60%	10%	30%	5%	10%	10%
% Households with food insecurity for all year round	> 65%	85%	85%	35%	35%	40%
% Households with food security for six months	25%	< 20%	< 20%	60%	60%	40%
% of households with food security for all year round	3%	2%	2%	5%	5%	20%
% of crop harvests sold for income generation	30%	80%	80%	50%	50%	10%
%Contribution of field crops to household income	40%	60%	60%	70%	70%	65%
% contribution of fruit trees to household income	5%	5%	5%	10%	10%	5%
% Contribution of vegetable crops to household income	50%	10%	15%	5%	5%	5%
% Contrbution of livestock to household income	5%	20%	15%	10%	10%	20%
% contibution of beekeeping to household income	0%	5%	5%	5%	5%	5%
% Contribution of tree nursery products to household income	0%	0%	0%	0%	0%	0%

1.5. Climate change related impacts and barriers for adaptation and possible interventions

	Mkwese	**Ibugule**	**Mtitaa**	**Ntoba**	**Utugwi**	**Nguriti**
Most problematic climate change	Drought, Imergence of new pests and diseases, rise in temperature, Unpredictable and unreliable rainfalls emerging Noxious weeds, Invassive rodents and birds (vermins),					
Effects	Loss of forest cover, Forest and land degradation, food insecurity, water scarcity and crop failure, Loss of crops and livestock death due to drought, pests and diseases, deterioration of water reservoir for fish habitats, damaged infrastructure due to floods, High costs of dealing with climate change hazards e.g. vet services and pesticides, reduced access to food diversity. Increased vulnerability and drugerry of women and children to impacts of climate change in search of water and fuel woods for domestic use.					
Factors stopping community from copping with impacts of CC	Lack of infrastructure for water harvesting and storage, emerging resistance tocrop pesticided and drugs for livestocks, limited irrigation due to siltation, poverty, poor management of natural vegetation, limited education and skills for adaptation and resislince to climate change, Innefective and expensive pesticides, hight costs of intervention, seedlings growth failure due to long dry periods, Resistance to adapt to new varieties of foods, Lack of strong by-laws to protect dams from livestock trampling when drinking directly, Erosion caused by farming and pastoralism on the catchment					
Prioritized activities for enhancing adaptive capacity	1. Water harvesting through restoration and construction of dams, 2. Dip-Tank installation for control of tick –borne diseases 3. Capacity building on tree nursery afforestation, soil conservation, and improved farming system 4. Model farms for vegetable crop production and new varieties 5. Introduce and or Improve fish farming and beekeeping technologies 6. Establish early warning systems and IPM for crop pests					

1.6 Emerging pests and diseases that affects crops and livestock

Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Types of pests and diseases affecting crops	1. Fall army worms 2. White flies 3. Tuta absoluta, Maggots (tomato, onions) and Fruit fly					
Types of pests and diseases affecting livestock	1. Newcastle, 2. Fowl pox 3. Coryza 4. ECF 5. Lumpy skin disease 6. BQ 7. CBPP 8. FMD					
Intensity of pests and diseases	High	High	High	High	High	High
Awareness of people to emerging pests and diseases due to climate change	100%	100%	100%	100%	100%	100%
% loss caused by pests and diseases to crops	50%	50%	50%	>80%	>80%	100%
% loss caused by pests and diseases to livestock	50%	20%	30%	20%	20%	20%
% loss of poultry due to diseases	100%	100%	100%	100%	100%	100%

1.7: Contributionof Livestock production to adapatation and resislience to climate change effects

Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Types of livestock	Cattle, Goat, Sheep, Pig, Donkey, Poultry	Cattle, Goat, Sheep, Pig, Donkey, Poultry	Cattle, Goat, Sheep, Pig, Donkey, Poultry	Cattle, Goat, Sheep, Poultry	Cattle, Goat, Sheep, Poultry	Cattle, Goat, Sheep, Pig, Donkey, Poultry

% of households engaged in livestock production	Cattle (28%), Goat (37%), Sheep (19), Poultry (78%)	Cattle (20%), Goat (22%), Sheep (19%), Poultry (82%)	Cattle (20%), Goat (27%), Sheep (15%), Poultry (80%)	Cattle (38%), Goat (40%), Sheep (22), Poultry (85%)	Cattle (38%), Goat (40%), Sheep (22), Poultry (85%)	Cattle (43%), Goat (38%), Sheep (22), Poultry (80%), Donkey (4%), Pig (2%)
% of households consuming livestock	Medium	medium	medium	medium	medium	medium
products						
% of livestock products sold for income generation	cattle hides, Goat skin, Sheep skin, diary milk and eggs	cattle hides, Goat skin, Sheep skin, diary milk and eggs	cattle hides, Goat skin, Sheep skin, diary milk and eggs	cattle hides, Goat skin, Sheep skin, diary milk and eggs	cattle hides, Goat skin, Sheep skin, diary milk and eggs	cattle hides, Goat skin, Sheep skin, diary milk and eggs
% Conttribution of livestock products to household income	40%	50%	50%	50%	50%	30%
Livestock access to drinking points (high, Moderate acceess, Limited access)	Limited access (210km)	Limited access (2-10km)	Limited access (2-10km)	Limited access (2-10km)	Limited access (2-10km)	Limited access (2-10km)

1.8. Infrastructure for irrigation farming						
Village_Site	**Mkwese**	**Ibugule**	**Mtitaa**	**Ntoba**	**Utwigu**	**Nguriti**
Existence of flood/furrow irrigation	Yes	None	None	None	None	None
% of households applying flood/furrow irrigation system	40	25	40	2	10	5
% of households demanding irrigation systems	80%	60%	100%	80%	80%	80%
% of households experiencing crop loss due to drought	100	100	100	100	100	100

Annex 2:

Report from participatory and consultative discussions at district level

Annex 2.1

Igunga District counsultation Report Objectives

- **Presentation of the project to gather views, and recommendations to ensure sustainable implementation of the project**
- **Re-confirm focal point support**
- **Establish preferred target areas**
- **Gain understanding on integrating climate change adaptation into commune and district level plans**
- **Collection of important secondary data on socio economic profile of the districts**

Main Discussion points

Importance of the project:

This project provides major adaptation and resilience options for drought and floods through water harvesting technologies. Existing old dams found in various villages were pointed out as entry points for this project; Nguriti, Uswaya, Igumbi, Itumba, Mwamashimba, Mwamapalala and Simbo have existing old dams, which need rehabilitation. Simbo is a designed and proposed dam that is estimated to cost over 4.5M USD. Following the discussion with DED and his heads of departments, it was concluded that the team visit the dams at Nguriti and Mwamashimba. In collaboration with the team from the district, the dams were visited and assessed for SWAHAT intervention strategy. Following this, one dam at Nguriti village was selected for SWAHAT intervention strategies. The dam at Nguriti was selected because it is positioned to save more than 5 villages, has good water catchment contrary to Mwamashimba dam where there is brick making along the catchment, has high water holding capacity and existing small-scale vegetable gardening. The dam is also used for livestock watering and water fetching for household use.

Local Village Communities Visits at Nguriti, and Mwamashimba Igunga district OBJECTIVES:

- Agree target sites
- Document on village profiles (gender desegregated resident population, livestock numbers)
- Understand the main climate change issues and impacts of vulnerable groups and climate actions
- Understand climate change vulnerability and possible concrete adaptation intervention
- Understand the local climate change impacts/ effects in each village
- Highlight on community coping and specific resilience mechanisms

DISCUSSIONS

The **selected site** in Nguriti is potential in implementation of SWAHAT Project components because it has an existing water harvesting dam but with broken dykes and siltation. There organized farmers groups in crop production, good land use planning, and Livestock keeping and environmental conservation bylaws (such as Protection of water catchments by not allowing animals to directly drink from the dam, and prevention of agricultural activities upstream the catchment area.

The old dam at Nguriti require reinstallation and repairs embankments and restoration of spillway in order to allow for increase in volume of water. Currently the dam is not capable of retaining much water for more than two months during dry season (Annex Figure 2:Brocken dyke and spillway of the dam at Nguriti, hence low water storage capacity of the dam. Siltation has also filled the dam leading into low water storage capacity.Annex Figure 2). These dams will give water access to animals and domestic use to 5 villages:
Nguriti, Sunguwizi, Mangungu, Mwamapalala and Ncheri.

Climate change vulnerability assessment:

Residents were highly vulnerable to impacts of climate change especially drought and water scarcity**.** in these villages, there is severe drought resulting to crop failure (Annex Figure 1) with maximum yield ranging from 100kg of millet and sorghum. This has resulted into food insecurity. In addition, floods resulting into loss of rainwater by runoff contribute to water scarcity and crop failure. Villagers also reported of emergence of new pests and diseases. Other threats included forest and land degradation from charcoal making from forest woods and bush clearing for agriculture resulting into deforestation**.**

Annex Figure 1: High incidence of crop failure as a result of drought in villages nearby Mtitaa

Small-scale vegetable farming is in practice around the dam at Nguriti in Igunga through irrigation using water from dug pits. However, the quantity, diversity and duration of vegetable production is limited by water availability along the year especially during dry season. In the presence of sustainable and reliable water harvesting, this activity is suggested as an optional climate smart approach for ensuring year -long household food and nutrition security. It aligns well with the SWAHAT project activities on improving household food and nutrition security through vegetable gardening, fruit tree planting and crop production. It allows for the application of methods to protect crops, vegetables as well as fruits against drought and emerging pests and diseases thereby climate proofing food and nutrition security.

The project should ensure the following: sensitization, capacity building and training for community members, establishment of integrated alternative generation of income for community members, support for communities to produce indigenous vegetables and fruits is encouraged as these are adapted to local conditions, and have higher nutritive as well as market value, diversification of crops, fruit trees, aquaculture and small stocks such as chickens.

Key interventions: Drought, deteriorated water harvesting infrastructures, land degradation, emerging pests and diseases for crops and livestock, poor quality soils in potential farms are a major challenge in the targeted project sites. So integration of water harvesting technologies for domestic and agricultural, crop, vegetable, fruit and fodder species to improve soil quality and sustain livestock production is pivotal towards beneficiaries' resilience enhancement against climate change impacts. This includes, introduction of improved production technologies for crops like sorghum and bulrush millet, and other high value drought tolerant crops are of importance in the targeted project areas.

Key challenges to adaptation:

Although dams for water harvesting exist in many villages in all districts, still there are challenges on their respective management, including governance and technical skills for maintenance, prevention of siltation and construction of spillways and dykes noted inadequate. Integration of water harvesting and other knowledge and skills for agriculture and livestock climate change adaptation technologies are inadequate or lacking. Crop failure and low livestock productivity are the major challenges to food and nutrition security.

Annex Figure 2:Brocken dyke and spillway of the dam at Nguriti, hence low water storage capacity of the dam. Siltation has also filled the dam leading into low water storage capacity.

Local communities' copping strategies

Local communities were digging of small water pits within dried seasonal river beds for collection of domestic water use and serve as drinking points for livestock (Annex Figure 3). Migration to nearest water points for animals and domestic use water collection. Also walking long distances especially women in search of water for domestic use and herdsmen in search of water and pasture for livestock.

Annex Figure 3: Dug water pits for water collection (left) for domestic and livestock drinking points (right) as drought copping strategy at Nguriti village, Igunga District, Tabora.

Proposed interventions for Adaptation and resilience

Consultative team identified the need for supporting and promoting the efficient use of water for crop production, household water use, community socio-economic developments and diversification of livelihood sources such as fish farming.

The following interventions were identified/proposed for strengthening community adaptive capacity, building resilience and ensuring sustainable food security: Introduction of fruits and indigenous forest tree species; land reclamation; water harvesting, improved technologies in aquaculture/fish farming, bee keeping, poultry, piggery, gardens, promoting trees planting, protected agriculture, wetlands rehabilitation. Pledged to support the project and establish partnerships as deemed necessary.

The baseline survey identified community awareness and mobilization as catalyst to generate the relevant mentality and behavioral change. Project will ensure holistic management of natural resources by community members in line with integrated approach and be complimented by laws; local institutions be strengthened to sustain project assets beyond the project life; need for synergies, complementarities and coordination.

Annex 2.2:

Manyoni District consultation report Objectives

- Presentation of the project to gather views, and recommendations to ensure sustainable implementation of the project
- Re-confirm focal point support
- Establish preferred target areas
- Gain understanding on integrating climate change adaptation into commune and district level plans
- Collection of important secondary data on socio economic profile of the districts

Main Discussion points

Importance of the project: this project provides major adaptation and resilience options for drought and floods through water harvesting.

Existing old dams found in various villages were pointed out as entry points for this project; **Importance of the project:** This project provides major adaptation and resilience options for drought and floods through water harvesting technologies. Existing old dams found in various villages were pointed out as entry points for this project; Mkwese, Mbwasa, Kinangali, Sasajila, Majili, Mpandagani and Ikasi have existing old dams, which need rehabilitation. The district has proposed to construct a dam at Mbwasa since 2014, but failed due Lack of funding. The dam was intended for rice farming. It is estimated to cost USD 1.2b. Following the discussions with DED and heads of departments, it was concluded that the team should visit the dams in Mkwese and Majili. In collaboration with the team from the district, the dams were visited and assessed for SWAHAT intervention strategy. Following this, one dam at Mkwese village was selected for SWAHAT intervention strategies. The dam in Mkwese was finally selected because is well positioned to serve more than 5 villages, has good water catchment, very high community uptake of the technologies (currently, community members are participating in small scale vegetable gardening). The dam is also used for livestock drinking watering and serving water for domestic use.

Local Village Communities Visits at Mkwese and Majili OBJECTIVES:

- Agree target sites
- Document on village profiles (gender desegregated resident population, livestock numbers)
- Understand the main climate change issues and impacts of vulnerable groups and climate actions
- Understand climate change vulnerability and possible concrete adaptation intervention
- Understand the local climate change impacts/ effects in each village
- Highlight on community coping and specific resilience mechanisms

DISCUSSIONS

The **selected sites:** Mkwese was potential in implementation of SWAHAT Project components because they have organized farmers groups in crop production, good land use planning, Livestock keeping and environmental conservation bylaws (such as Protection of water catchments by not allowing animals to directly drink from the dam, and prevention of agricultural activities upstream the catchment area.

Mkwese has an old dam that requires reinstallation and repairs embankments and restoration spillway in order to allow for increase in volume of water storage. Currently the dam is not capable of keeping that much water for more than two months of dry season (Annex Figure 4). These dams will give water access to animals and domestic use to 3 villages: Mkwese, Mitoo and Kinyika. A population of more than 8,000 livestock animals and over 13,000 villagers.

Climate change vulnerability assessment: residents were highly vulnerable to impacts of climate change especially drought and water scarcity in these villages, there is severe drought resulting to crop failure (Annex Figure 1) with maximum yield ranging from 100kg of millet and sorghum. This has resulted into food insecurity. In addition, floods resulting to loss of rain water by runoff contributes to water scarcity and crop failure. Villagers also reported of new emerging pests and diseases. Other threats included charcoal making from forest woods resulting into deforestation**.**

Annex Figure 4. SWAHAT and Manyoni district team (above) observing the dam and major associated activities at Mkwese village. Small scale vegetable gardening (left) and livestock drinking points (right) at Mkwese dam in Manyoni District

Local communities' copping strategies

Digging of small water pits in the dried seasonal river beds for collection of domestic water and drinking points for livestock (Annex Figure 5)

- Migration to nearest water points for animals and domestic use
- Walking long distances of women in search of water for domestic use and herdsmen in search of water and pasture for livestock.

Annex Figure 5: Digging of shallow sand wells/pits within dried seasonal river beds as a coping strategy for water sources during dry spell in Manyoni District.

Annex 2.3

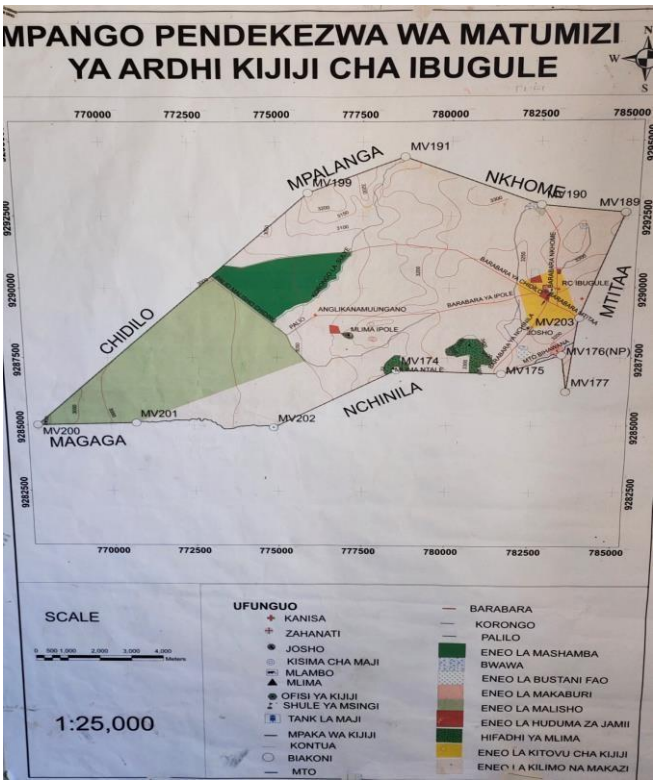
Bahi District

Importance of the project: This project provides major adaptation and resilience options for drought and floods through water harvesting.

Existing old dams found in various villages were pointed out as entry points for this project; Chikopelo a designed and proposed dam that is estimated to cost over 3M USD, Chipanga, Chali, Nholi, Igubule and Mtitaa. In collaboration with the team from the district, the dams were visited and assessed for SWAHAT intervention strategy. Following this, two dams were selected: i.e. Mtitaa and Ibugule dams.

Local Village Communities Visits at Nholi, Ibugule and Mtitaa OBJECTIVES:

- Agree target sites
- Document on village profiles (gender desegregated resident population, livestock numbers)
- Understand the main climate change issues and impacts of vulnerable groups and climate actions
- Understand climate change vulnerability and possible concrete adaptation intervention
- Understand the local climate change impacts/ effects in each village
- Highlight on community coping and specific resilience mechanisms



Annex Figure 6: Land use plan of Ibugule village

DISCUSSIONS

The **selected sites** in Mtitaa and Ibugule were potential in implementation of SWAHAT Project components because they have organized farmers groups in crop production, good land use planning, Livestock keeping and environmental conservation bylaws (such as Protection of water catchments by not allowing animals to directly drink from the dam, and prevention of agricultural activities upstream the catchment area.

Ibugule and Mtitaa has two old dams that require reinstallation and repairs embankments and restoration spillway in order to allow for increase in volume of water storage potentially it can hold 300,000m^3 and is capable of irrigating 103ha of crops. Currently the dams are not capable of keeping that much water for more than two months of dry season (Annex Fig 6). These dams will give water access to animals and domestic use to 6 villages: Mtitaa, Nkhome, Ibugule, Magaga, Nchinila, and Chidilo (Annex Figure 6). A Population of more than 10,000 livestock animals and over 17,000 villagers depending on such water sources. Mtitaa village in particular, has a total of 356 old aged people of whom 138 and 258 being men and women, respectively as among vulnerable social groups largely hit by water shortages.

Climate change vulnerability assessment: residents were highly vulnerable to impacts of climate change especially drought and water scarcity**.** in these villages, there is severe drought resulting to crop failure (Annex Figure 7) with maximum yield ranging from 100kg of millet and sorghum. This has resulted into food insecurity. In addition, floods resulting to loss of rain water by runoff contribute to water scarcity and crop failure. Emergence of new pests and diseases were reported by the villagers within their respective vilages. Other threats included charcoal making from forest woods resulting into deforestation**.**

Annex Figure 7 Broken embankment and spillway of the dam at Mtitaa causing low water storage capacity of the dam.

Local communities' copping strategies

Digging of small water pits in the dried seasonal river beds for collection of domestic water and drinking points for livestock (Annex Figure 8, Annex Figure 9).

- Migration to nearest water points for animals and domestic use
- Walking long distances of women in search of water for domestic use and herdsmen in search of water and pasture for livestock.

Annex Figure 8: Water pits for water collection

Annex Figure 9: Privately owned water drinking points for livestock on dried seasonal rivers

Annex 2.3

Nzega District Consultation Report Objectives

- Presentation of the project to gather views, and recommendations to ensure sustainable implementation of the project
- Re-confirm focal point support
- Establish preferred target areas
- Gain understanding on integrating climate change adaptation into commune and district level plans
- Collection of important secondary data on socio economic profile of the districts

Main Discussion points

Importance of the project: this project provides major adaptation and resilience options for drought and floods through water harvesting.

Existing old dams found in various villages were pointed out as entry points for this project;

Local Village Communities Visits at Mwanhala, Ndala Ntoba and Budushi OBJECTIVES:

- Agree target sites
- Document on village profiles (gender desegregated resident population, livestock numbers)
- Understand the main climate change issues and impacts of vulnerable groups and climate actions
- Understand climate change vulnerability and possible concrete adaptation intervention
- Understand the local climate change impacts/ effects in each village
- Highlight on community coping and specific resilience mechanisms

DISCUSSIONS

The **selected sites:**

Based on the socio-economic profile, Nzega district is not well endowed with large potential area for irrigation, yet a number of efforts have been invested in establishing small sized dams, which were found facing different challenges. In response, through the consultative meetings/ Focus Group Discussions, which were accompanied by transect walks in different villages in Nzenga District, the SWAHAT team in collaboration with villagers selected the following working sites. Among the visited sites included Utwigu village, which is found in Utwigu ward consisting of a total of 3,385 households. The visiting team in collaboration with beneficiaries selected Ibako dam (Annex Figure 10), which was constructed during the colonial rule (covering 28 ha) but has undergone deterioration due to siltation and collapsing of the spillway. The dam was reported by to serve approximately 22,081 people from a total of 2,633 households (i.e. 162 and 128 households being headed by females and old aged people, respectively) as beneficiaries and 31,155 livestock both from villages of Utwigu, Mwanhala, Iyombo and Isalalo. Livelihood activities supported by the dam were paddy and vegetable production, includes fish farming activities. Potential irrigable land size surrounding the Ibako dam is estimated at 252 ha which could similarly serve for improving production of paddy, maize, onions, water melon, tomatoes, cabbages and vegetable crops commonly grown in Utwigu.

Similarly, Kabudyo dam (Annex Figure 11) found in Ntoba village particularly in Ndala ward was also identified and selected by the team that could serve the purpose of enhancing resilience and adaptations to climate change impacts to members of surrounding communities. Selection of this dam was based on the fact that is the potential old site used to serve crop and livestock farmers from five villages i.e. Ntoba, Uhemeli, Kampala, Wita (Ndala Ward which is consists of a total of 15,674 households out of which 108 were female headed) and Budushi (Budushi Ward). However, the dam has lost its capacity of holding water due to collapsing of the dyke and encroachment of trees in the dam and farming activities in the catchment area. Above all, both selected dam sites were well positioned to serve for majority of surrounding communities, since have enough land for expansion of crop farming activities. Challenges of the existing dams were related to mismanagement of the resources whereas livestock keepers were reported/found driving their cattle into dams for drinking water directly inside.

Annex Figure 10: A herd of cattle found drinking water inside the Ibako dam (Utwigu village), which is among causatives of siltation

Climate change vulnerability assessment:

Consulted stakeholders, i.e. from the district to village level reported over emerging climate change associated calamities, include shortages of food, water and pasture due to rain shortages. Beneficiaries acknowledged that climate is changing, which is also associated by human activities. In addition to negative impacts of climate change, farmers reported to experience pest and disease infestations to their crops and livestock. Among others, crop farmers reported of pests like thrips infesting their vegetable crops particularly onions, include stalk borers and termites to paddy crop particularly in rain shortages. Also aphids and bollworms in maize crops accompanied by rain shortages. Similarly, vector borne diseases to livestock were raised as issues of concern, which, include foot and mouth diseases, Tick borne diseases, etc. infesting cattle, while mites, lice and Newcastle disease were a challenge to chicken keeping.

Annex Figure 11. Kabudyo dam in Ntoba village had brocken embankenment with extreme siltation such that has lost water holding capacity.

Local communities' copping strategies

Similarly, digging of shallow wells and small water pits along dried seasonal river beds was reported being commonly done for collection of domestic water and serve as livestock water points. Reportedly, livestock keepers were also forced to migrate into other neighbouring villages searching for pastures and drinking water for cattle (Annex Figure 12). Yet women were shouldering high responsibilities of fetching water by walking long distances for domestic use.

Annex Figure 12: Drought has pushed even children into driving herds of cattle searching for drinking water and pastures.

Annex 3:

Summary of District Socio-Economic Profiles

Annex 3.1:

Igunga District Consultation Report

Background of Igunga District Council

Location

Igunga District is located between latitudes 3"51' and 4"48' South of Equator and longitudes 33"22' and 34"8' East of Greenwich. The District covers an area of square kilometers 6,912 and it is bordered by Kishapu District to the North, Iramba District to the East, Uyui District to the South and Nzega District to the West.

Administrative Set-up

Igunga District Council is one of the eight administrative districts Council that make up the Tabora Region. The district inaugurated on 20th July 1975. Formerly, this district was part of Nzega district. The district council has four divisions, which are Igunga, Simbo, Manonga and Igurubi, 35 wards, 119 villages and 755 hamlets as shown in Table 1.

Table: Administrative divisions, Wards and Village of the Council:

S/No	Division	Km2	Number of Wards	Number of Villages	Number of hamlets	% of area
1.	Igunga	2,484	9	30	183	36
2.	Igurubi	1,410	7	26	145	20
3.	Manonga	1,439	11	38	295	21
4.	Simbo	1,579	8	25	123	23
TOTAL		**6,912**	**35**	**119**	**755**	**100**

Population

According to the 2012 National Population and Housing Census General Report from the National Bureau of Statistics, the district had 399,727 inhabitants (195,607 being males and 204,120 being females) and 62,317 households. The average size of the household was 6.4 people. The annual growth rate was 2.1% the District population is projected at 425,442 inhabitants by 2015. The inhabitants of this District originate from different tribes and ethnic groups. The majority are Wasukuma, Wanyamwezi, Wanyiramba, Wataturu, Wanyaturu and a mixture of other tribes who originate from different parts of Tanzania. **Economic status and land use**

Above 75% of the income of district's is generated from agriculture (Crop and animal husbandry) and the remaining part is contributed by other formal and informal sectors. About 95% of the rural population is mainly engaged in crop forming and livestock keeping. Due to low agricultural production and the prevailing unfavorable economic conditions, the council's income per capital is currently estimated at TZS 600,000 equivalent to 275 US$ the exchange rate of TZS 2,180 per one US dollar in 2012.

Land use

The District has an area of 6912 square km. Out of this land, 4838 km^2 (70%) is suitable for agriculture and livestock keeping. 1659 km^2 (24%) is forest reserves and 415 km^2 (6%) is for domestic commercial and other uses.

Topography, drainage, soils and vegetation

The physical features of the district are characterised by a plain land with black cotton soil at the northern and central parts of the district. There are small hills and sandy soils at the southern parts and there are seasonal

rivers, which are Manonga, Kagong'ho, Mbutu and Mapilinga. The district has a mixed type of vegetation cover that includes grasslands, woodlands and scrublands.

Climate and Agro-ecological zones:

The district has a semi-arid land with temperatures ranging from 20°C to 33°C. During cool and hot seasons respectively. It is one of the driest districts in Tanzania with rainfall ranging from 500mm to 700mm per annum. The rain period is usually from November to April. The south and south-western parts get more rain than the north and north eastern parts of the district. Igunga district has two agro-ecological zones namely the northern and Southern zone.

The Northern Zone

The northern zone includes Igurubi, part of Igunga and Manonga division. The soils are black clay cotton soils with an altitude ranging from 1000m to 1060m above sea level. The average mean annual rainfall is 579.1mm. This area is occupied by a very low scrubland with extensive grasslands.

The southern Zone:

The southern zone includes Simbo, southern parts of Manonga and Igunga divisions. The dominant soils are moderately fertile sandy loams. Most of the land is occupied by mixed vegetation of grasslands and woodlands. An altitude of this zone ranges from 1060m to 1100m above sea level. The average mean annual rainfall is 913.52mm.

Climate

Temperatures range from 20ºC to 30 ºC. Igunga is one of the driest districts in Tanzania with rainfall ranging from 500mm-700mm per annum. The rain period is usually from November to April every year. The South and South Western parts receive more rainfall than the North and North Eastern parts of the district.

Water sector

Most of water facilities are dams, charcoal dams boreholes shallow wells, piped schemes, Domestic points, Cattle troughs and Rain water harvesting schemes. The total number of people served with safe and clean water in rural areas is 191,065. This is equivalent to 30.9%; of actual requirement. There is a big demand for water harvesting and dams in order to facilitate water supply for domestic, agriculture and livestock use. Capacity building for community and district personnel is required to ensure sustainable governance of the water resources.

Agriculture, Irrigation and Cooperative sector

Table Implementation of agricultural food crop targets 2010/2011 to 2014/15

Crop	2010/2011		2011/2012		2012/2013		2013/14		2014/15	
	Ha	**Ton**	**Ha**	**Ton**	**Ha**	**Ton**	**Ha**	**Ton**	**Ha**	**Ton**
Maize	40,108	33,635	40,544	26,958	17,918	26,877	19,918	20,877	16,099	21,056
Sorghum	24,293	21,378	25,220	18,818	14,659	21,988.5	17,659	18,489	7,708	9,816
Rice	3,016	5,730	6,970	5,215	6,361.6	25,446.4	9,936	29,774	10,996	30,244
S/potatoes	11,582	19,853	13,303	42,073	1,657.2	1,657.2	14,155	18,465	11,000	14,933
Cassava	3,457	2,392	2,920	1,872	8,493	15,479	2,762	2,762	1511	1801
Legumes	9,431	1,603	9,227	3,613	3,853	2298.9	3,521	7,506	11,560	15,500
Total	**91,887**	**84591**	**98184**	**98549**	**52,941.8**	**93,757**	**77,740**	**97,873**	**58,874**	**93,350**

Table: Implementation of agricultural cash crop targets 2010/2011 to 2014/15

Crop	2010/2011		2011/2012		2012/2013		2013/14		2014/15	
	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton
Cotton	21,130	21,130	23,319	23,319	17,350	17,350	20425	18382	14942	19273
Groudnuts	11,020	11,020	11,973	11,973	6,569	14,452	8622	8622	3565	5933
Sunflower	9,613	21,188	9,660	21,252	6,567	6,567	3915	3915	1634	2548
Simsim	2,410	1,687	2,782	2,226	1,943	1,554	1578	1262	1308	2024
Pigeon peas	103	103	517	517	178	178	531	537	284	162
Greengram	2,490	1,494	3,295	1,977	126	126	1231	1236	557	898
Total	**46,766**	**56,622**	**51,546**	**61,264**	**32,607**	**39,923**	**36302**	**33,954**	**22,290**	**30,838**

Table: Potential area for agriculture from 2010 - 2015

Season	Potential area for cultivation (ha)	Potential area for irrigation (ha)	Cultivated area under irrigation scheme (ha)	%of irrigated area vs potential area
2010/2011	314,500	40,790	3,407.5	8.4
2011/2012	314,500	40,790	3,407.5	8.4
2012/2013	314,500	40,790	3,407.5	8.4
2013/2014	314,500	40,790	3,407.5	8.4
2014/2015	314,500	40,790	3,807.5	9.3

Table: Agro ecological Zones

S/no	Name of Zone	Type of soil	Crops grown
1	Northern	Clay, loam soil	Cotton, sorghum, sweet potatoes, maize, greengram and simsim
2	Southern	Sandy clay soil	Sweet potatoes, maize, ground nuts, sunflower horticultural and fruits

Table: Farmers Field School

FFS	Financial Years					Total
	2010/11	2011/12	2012/13	2013/14	2014/15	
Number of Farmers Field School	32	33	48	169	58	-
Number of farmers participated	763	1915	2004	4886	2432	12,000

Livestock and fisheries development sector

Livestock and fisheries development is among the fundamental sectors to in the District economy. The most constraints impeding this sector include: poor animal husbandry and disease control, inadequate and deteriorating infrastructure, poor genetic potential, inadequate fund for capacity building and monitoring to stakeholders and personnel as well as unorganized markets for livestock and their products. This situation is shown on the tables below: - **Table : Livestock population 2014**

Type of animals	Actual	
	Indigenous	Exotic
Cattle	466,464	1,550

Goats	233,999	178
Type of animals	**Actual**	
	Indigenous	**Exotic**
Sheep	101,570	-
Chicken	560,864	4081
Ducks	5,181	-
Pigs	9,200	17
Donkeys	11,055	0
Dogs	9,182	21
Cats	3,642	0

Table: Animal Disease Control

Type of Animal	**Number of animals**	**Vaccinated**	**Type of Diseases**
Cattle	102,511	71038	Lumpy Skin Disease
	213,576	205,491	Contagious Bovine Preuro Pneumonia (CBPP)
	42,940	38,940	Worms infestation
	35,274	632	East Cost Fever
Goats and Sheep	17,289	12102	Foot Rot Caprae Contagious Pleo Pneumonia Worms infestation
Chicken	34,196	4710	New Castle Disease
	10,210	6294	Fowl Pox
	12,739	503	Infectious Bursal Disease (Gumboro)
Pigs	1240	1027	Worm Infestation
Dogs	3444	0	Rabies

Table : Infrastructure

Type of infrastructure	**Infrastructure**			**State of infrastructure**	
	Required	**Available**	**Shortage**	**Working**	**Not working**
Dip tanks	35	20	15	15	5
Veterinary Centres	12	7	5	2	5
Secondary market	1	1	1	1	0
Primary markets	14	7	7	3	4
Abattoir	1	1	0	1	0
Slaughter slabs	119	6	113	6	0
Hides banda	119	4	115	4	0
Charcol dam	119	55	64	55	0
Dams	7	3	4	3	0
Water Troughs	88	23	23	23	0

Staff house	35	11	25	11	0

Natural resources

There are two natural forest reserves in Igunga District as shown in the Table below

S/N	Natural reserve	Area (Ha)	GN. Number	Owner
1	Unyambiu South	16,640	443 dated 12/9/1958	Central Government
2	Unyambiu North	9,728	(LAFR) G.N. 442 l of 1958.	Igunga District Council

Igunga District Council experiences a challenging situation regarding natural resources especially forests due to inadequate rains. There is a lot to be done by the district, individuals, the Governmental and NonGovernmental institutions and other development partners in promoting effective natural resources and environmental management in order to mitigate negative effects caused by Climate Change and Human activities and actions. Tree planting is required in form of enrichment planting in the reserves and afforestation on the deforested and degraded non-reserve landscapes.

Gender equality and equity

The district aims to ensure there is equal gender enrolment for school age children at pre-primary, primary and secondary schools. It also strives to ensure provision of special seats for women in the councilors assembly. Another aim is to avoid any kind of gender discrimination in the entire community.

Community participation

- To engage community in planning, implementing, monitoring and evaluating of its own development activities.
- To ensure that the community is involved in the contribution cash and kind of (funds and labour in order to boost their own development for its current and future generations).

Annex 3.2

Manyoni District Consultation Report

Land, climate, agro-ecological zones and people

Geographical Location

Manyoni District Council is located below the equator between latitudes -5^0 3' and -7^0 due South. Longitudinally the Council is situated between 34^0 9' and 35^0 3' East of Greenwich.

Land Area and Land Use Pattern

Manyoni District is one of Six Councils in Singida Region. It is located in the Southern East part of the Region. It covers an area of 14,118 km^2which is equivalent to about 28.6% of the region area which is 49,341km^2. About 5. 4% (7,650km^2) of the District is occupied by Game Reserves (Rungwa, Muhesi and Kizigo), the area suitable for Agricultural activities is about 847 km^2, 1,835 km^2 is the area suitable for grazing, 3,645 km^2 is the area covered with forest and 141.18 km^2 is the area suitable for residence.

1.1 Administrative Units

The Council has 1 parliamentary constituent namely Manyoni East, 4 Divisions namely Nkonko, Kintinku, Kilimatinde and Manyoni, 19 Wards, 58 Villages, 278 Hamlets (Sub Villages) and 1 Township Authority namely Manyoni Township Authority with 3 Wards and 30 Hamlets.

Climate and Physical Features (Soil, Topography and natural vegetation)

Climate Rainfall

The District Council forms part of the semi- arid central zone of Tanzania which experiences low rainfall and short rainy seasons which are often erratic with fairly wide spread drought in one year out of four. Total rainfall ranges from 500mm to 700mm per annum with high geographical, seasonal and annual variation. There are two rather well defined seasons, the short rainy season during the months of December to March or sometimes goes to April and the long dry season from April to November.

Temperature

The temperatures in the District Council vary according to altitude but generally range from about 20ºC in July to 30ºC during the month of October. Moreover, temperature differences are observed between day and night and may be very high with hot afternoons going up to 32ºC and chilly nights going down to 15ºC.

Relative humidity

The annual mean, maximum and minimum monthly mean daily relative humidity are 80.6%, 86.0% (February) and 73.4% (July) respectively.

Pan evaporation

The maximum and minimum monthly mean daily pan evaporation are 6.6 mm/day (November) and 5.2 mm/day (January) with standard deviations of 1.2 mm/day and 0.8 mm/day respectively.

Sunshine hours

The average annual daily sunshine hours are 7.9 hr/day. The maximum and minimum monthly mean daily sunshine hours are 9.2 hr/day (September) and 6.5 hr/day (January) respectively.

Wind-run

The wind run records shows 95 km/day (1.1 m/sec) as the average annual daily wind run; 140 km/day (September) and 53 km/day (February) as the maximum and minimum monthly daily wind run respectively. Wind season that exceeds 100 km/day (1.2 m/sec) extends only from August to December.

Physical Features, Soil, Topography and natural

Agro – Ecological Zones (AEZ)

Rift Valley Zone

This zone is an area of low population but with high propotion of household owning livestock, mainly cattle. The zone has low rainfall averaging between 500mm to 650mm per annum. The soils vary from reddishbrown loamy sands to dark grey and black cracking clays in the valleys and depressions. The major crops grown here are maize, sorghum, millet, paddy, groundnuts, cassava and beans. Oxenization is also meagerly practiced in the zone. The zone covers the north eastern parts of Manyoni, Bahi area, Kintiku and Saranda; south-eastern Manyoni, the zone also boarders with Dodoma Region in the east.

Miombo woodland Zone

This is an undulating area with occasional inselbergs. It covers most of Nkonko division. The soils are reddish loamy sands with dark grey to black clays in valleys and depressions. The zone, however experiences medium rainfall of 500mm to 700mm per year. Major crops grown here are maize, millet, sorghum, cassava, sweet potatoes and groundnuts. Beekeeping and hunting are also major economic activities of the people in the zone.

Slightly high terrains zone

The zone has low, variable and unreliable rainfall, which ranges from 550mm to 600mm per year. Areas within this zone are the northern Parts of Manyoni. Soils are extremely acidic, grayish-brown sands and black cracking clays in valleys and depressions. Crops production in the zone is generally poor due to poor soil and low rainfall. Crops generally planted are maize, millet, cassava, beans, yellow gram, groundnuts and cotton.

Drainage System

There is one basic drainage systems in the Bubu River flow eastwards into the Bahi swamp which extends across the floor of the Rift Valley into Dodoma region. Other rivers feed the Njombe which ultimately joins with the Ruaha discharging into the Indian Ocean.

Population Size and Growth

Like most other Districts Council on Tanzania mainland, the population of Manyoni District Council has experienced a significant growth. According to 2012 Population and Housing Census Manyoni District Council had a population of 296,763 people of whom 146,030 males (49%) and 150,733 females (51%) with the annual Population growth rate is 3.7. According to 2016 population projections the Council is estimated to have 213,010 people of whom males are 104,375 and females are 108,635. The decline in of population size for the year 2016 compared to 2012 is due to establishment of New Itigi Council in 2016 which was split from Manyoni.

Population Sex Ratio and Age Groups

The 2002 population census results showed that females were more than males in the Council. For every 100 females there were 90 males. The situation changed in the 2012 Census whereby the number of males increased from 90 in 2002 to 97 for every 100 females in the population. **Population and Sex Ratio of Manyoni District Council; 2002 and 2012**

2002			2012		
Males	**Females**	**Sex ratio**	**Males**	**Females**	**Sex ratio**
64,791	71,887	90	146,030	150,733	97

Source: Calculations based on data from the 2002 and 2012 censuses Reports

Population by Broad Age Groups and by Sex; Manyoni District Council, 2012

Age Group	Male		Female		Total	Percent of Total
	Number	Percent	Number	Percent		
0 – 17	79,184	54.2	77,176	51.2	156,360	52.7
18 – 29	26,205	17.9	29,800	19.8	56,005	18.9
30 – 44	20,479	14.0	22,636	15.0	43,115	14.5
45 – 60	12,221	8.4	13,006	8.6	25,227	8.5
61+	7,941	5.4	8,115	5.4	16,056	5.4
Total	**146,030**	**100**	**150,733**	**100**	**296,763**	**100**

Source: 2012 Population and Housing Census Report

Households and Average Households Size; 2002 and 2012

2002 Census			2012 Census		
Total Population	**Number of Households**	**Average Household size**	**Total Population**	**Number of Households**	**Average Household old size**
136,678	28,475	4.8	296,763	58,464	5

Source: Computed Data from 2002 and 2012 Population Censuses Reports.

The district economy

District Gross Domestic Product

In absolute terms, the Estimated Annual Gross Domestic Product of Manyoni District Council for the year 2015 was **Tshs. 292,881,436,740/=**. The Annual GDP was estimated from the data collected in the field and Secondary Data from various District Council Departments and Other Government Agencies and Authorities.

Manyoni District Council continues to be dominated by Agriculture Sector which contributes about 75% of the whole Council 2015 Annual Gross Domestic Product followed by the Industry Sector with 4% and Service sector with 8%

Manyoni District Council Gross Domestic Product (GDP) by Sector; 2015

Economic Sector	**Year**	
	2015	
	GDP	**%**
Agriculture	219,661,077,555	75
Services	23,430,514,939	8
Indrturies	49,789,844,246	17
Total	**292,881,436,740**	**100**

Manyoni District Council Gross Domestic Product (GDP) by Sector; 2012-2015

Economic Sector	**Years**							
	2012		**2013**		**2014**		**2015**	
	GDP	**%**	**GDP**	**%**	**GDP**	**%**	**GDP**	**%**
Agriculture	153,435,406,534	69	195,699,459,783	74	205,008,665,304	73	219,661,077,555	75
Services	20,013,313,896	9	26,445,872,944	10	25,275,040,928	9	23430514939	8
Industries	48,921,433,967	22	42,313,396,710	16	50,550,081,856	18	49789844246	17
Total	**222,370,154,397**	**100**	**264,458,729,436**	**100**	**280,833,788,088**	**100**	**292,881,436,740**	**100**

Source: Computed data from NBS, National Accounts of Tanzania Mainland 2007-2014

District per Capita GDP

The per capita income of the residents of Manyoni District Council was approximated to Tshs. 573,200 in 2010. This amount is less than that of Tanzania Mainland which was estimated at Tshs. 1,045,848 in the same year. The average annual per capita income of the residents of Manyoni District improved to Tshs. 612,080.00 in 2011, Tshs. 749,319.00 in 2012, Tshs. 863,691.00, Tshs. 896,136.00 and to Tshs 932,140.00 in 2015. This Per Capital income shows that poverty level in the Council is still very high since the Per Capital income is belew 1.25 US$ per day which is considered as the Poverty line According to new Sustainable Development Goals 2030.

Manyoni District Council per Capita Income; 2010-2015

Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Par Capita GDP	573,200	612,080	749,319	863,691	896,136	932,140

Source: Computed data from NBS, National Accounts of Tanzania Mainland 2007-2014

Food Security and Food Consumption Patterns

Food security and level of food consumption is also an indicator of poverty level of the household. Number of meals consumed in a day and frequencies of protein intake per week particularly meat and fish are most superior in measuring poverty levels of the households in the country. The percentage of households that reported to have never experience food satisfaction was 32%, followed by those who reported to seldom experience food satisfaction (31%), and those who always experience the problem of satisfying food (20%). The percentage of those who often or sometimes have the problem of food satisfaction was 9 and 8 respectively

Access to Clean Drinking Water

The main source of drinking water in Manyoni District Council is unprotected well (47.1 Percent), followed by surface water 13.5 percent, Public tap/standpipe 13.3 Percent, Protected Dug Well 8.6 Percent, Tube Well/Borehole 5.6 Percent, Unprotected spring 3.7 Percent, Piped water into dwelling 2.9 Percent and other sources as shown in the table below.

Households	Improved Drinking Water Sources							Non-Improved Drinking Water Sources							
	Piped Water into dwelling	Piped Water to yard/plot	Public tap/ standpipe	Tube well/ borehole	Protected dug well	Protected Spring	Total Improved	Unprotected dug well	Unprotected Spring	Rain water collection	Bottled water	Cart with small	Tanker truck	Surface water	Total Non-Improved
58,464	2.9	2.7	13.3	5.8	8.6	0.7	34	47.1	3.7	0.1	0.1	1.4	0.2	13.5	66.1

Percentage of Households by Type of Water Source 2012
Source: Population and Housing Census Results, 2012

Sources of Energy for Cooking

Data shows that 99.4% of people in Manyoni use wood based energy (firewood and charcoal) for cooking i.e. firewood (83.5 percent) followed by charcoal with 15.5 percent, Kerosene/Paraffin (0.3 percent), Electricity (0.2 percent), and Other Sources with 0.1 percent each as shown in the table below. From this, It is evident that deforestation in is increasing very fast since firewood and charcoals are the main source of energy for cooking and lighting. These results indicate that more efforts have to be done to plant trees and improve alternative energies other than charcoal and firewood for protection of forests as well as reversing land degradation.

Agriculture

Agriculture is the back born of the economy and about 80 percent of its residents depend on it as their main source of livelihood. According to UN classifications, agriculture comprises of crop production, livestock, forestry and hunting sub sectors. Others are fishing, beekeeping and tourism.

Distribution of Arable Land

The 2016 land use planning shows that Manyoni District Council has a total land area of 14,118 km2, of which 847 km2 (6 percent) were classified as arable land and therefore suitable for crop farming. The remaining 13,271 km2 (94 percent) were considered to be used for other productive activities such as grazing and game reserves. However, only 55.5 percent of arable land is being utilized for crop production.

Distribution of Arable Land in the Council; 2016

Total Land Area (km^2)	Total Arable Land (km^2)	Percent of Council Arable Land	Arable Land Under Crop Production	Percent of Arable Land Under Crop Production (Ha)
14,118	**847**	**6**	**469.49**	**55.4**

Source: Compiled Data from the District Executive Director's Offices, 2016

Area under Foods Production

The major food crops grown include sorghum, bulrush millet, maize, sweet potatoes, beans, paddy, and cassava. The Table below shows that sorghum is the main food crop grown covering 31 percent of the cumulative annual average area under food crop cultivation, followed by maize (26 percent), Bulrush millet (20 percent) and sweet potatoes (11 percent). Other food crops with their percentage area under cultivation were beans (6 percent), cassava (3 percent) and paddy (3 percent).

Estimated Area (Ha) Under Major Food Crops (Maize and Sorghum); 2010/11 – 2014/15

Crop	2010/2011		2011/2012		2012/2013		2013/2014		2014/15		Annual Average Area	Average %
Food Crops	Area	%	Area	%	Area	%	Area	%	Area	%		
Sorghum	20,944	32	20,314	29	31,745	35	18,420	26	22,222	31	31	22,729
Bulrush Millet	10,967	17	15,687	23	17,820	20	11,781	16	16,038	22	20	14,459
Maize	16,771	25	16,286	23	17,426	19	27,359	38	18,534	26	26	19,275
Paddy	1,952	3	2,024	3	2,900	3	3,341	5	2,231	3	3	2,490
Cassava	1,485	2	2,164	3	4,264	5	2,174	3	2,558	4	3	2,529
Sweet Potato	9,102	14	8,585	12	11,042	12	4,692	7	5,926	8	11	7,869
Beans	5,229	8	4,402	6	4322	5	4,290	6	4,290	6	6	4,507
Total	**66,450**	**100**	**69,462**	**100**	**90,099**	**100**	**72,057**	**100**	**71,799**	**100**	**100**	**73,973**

Source: Data from Manyoni District Council Agricultural Department, 2016

Estimated Production of Major Food Crops (Tonnes) by Type; 2010/11 – 2014/15

Crop	2010/2011		2011/2012		2012/2013		2013/2014		2014/15		Annual Average Production	Average %
Food Crops	MT	%	MT	%	MT	%	MT	%	MT	%		
Sorghum	10,540	26	16,251	17	18,100	21	15,003	17	5,430	25	13,065	21
Bulrush Millet	10,527	26	17,256	18	14,434	17	10,603	12	6,928	31	11,950	21

Maize	3,321	8	13,029	14	20,758	24	30,642	35	4,359	20	14,422	20
Paddy	1,372	3	4,857	5	5,105	6	7,016	8	1,072	5	3,884	5
Cassava	1,342	3	9,737	10	7,418	9	6,304	7	1,113	5	5,183	7
Sweet Potato	11,832	29	30,047	32	17,185	20	13,606	16	2,921	13	15,118	22
Beans	2,153	5	2,201	2	3,432	4	3,432	4	274	1	2,298	3
Total	**41,087**	**100**	**93,378**	**100**	**86,432**	**100**	**86,607**	**100**	**22,097**	**100**	**65,920**	**100**

Source: Data from Manyoni District Council Agricultural Department, 2016

Estimated Area (Ha) Under Major Cash Crops; 2010/11-2014/15

Crop	**2010/2011**		**2011/2012**		**2012/2013**		**2013/2014**		**2014/15**		**Annual Average Area**	**Average %**
Cash Crops	**Area**	**%**	**Area**	**%**	**Area**	**%**	**Area**	**%**	**Area**	**%**		
Sunflower	14,987	38	19,055	36	21,872	36	19,147	29	19,147	31	18,842	34
Sesame	6,970	18	11,221	21	12,510	21	10,755	16	10,755	18	10,442	19
Crop	**2010/2011**		**2011/2012**		**2012/2013**		**2013/2014**		**2014/15**		**Annual Average Area**	**Average %**
Cash Crops	**Area**	**%**	**Area**	**%**	**Area**	**%**	**Area**	**%**	**Area**	**%**		
Groundnuts	11,558	29	14,573	27	15,591	26	11,564	17	11,564	19	12,970	24
Cotton	1,009	3	3,756	7	4,254	7	1,358	2	1,358	2	2,347	4
Yellow gram	2,119	5	2,648	5	3,520	6	2,710	4	2,710	4	2,741	5
Tobacco	2,988	8	2,189	4	2,889	5	1,069	2	1,415	2	2,110	4
Cowpeas	-	-	-	-	-	-	18,767	28	13,899	23	6,533	10
Cashewnuts	-	-	-	-	-	-	885	1	0	0	443	1
Total	**39,631**	**100**	**53,442**	**100**	**60,636**	**100**	**66,255**	**100**	**60,848**	**100**	**56,428**	**100**

Source: Data from Manyoni District Council Agricultural Department, 2016

Estimated Production (Tonnes) of Major Cash Crops by Type; 2010/11-2014/15

Crop	2010/2011		2011/2012		2012/2013		2013/2014		2014/15		Annual Average Production	Average %
Cash Crops	MT	%	MT	%	MT	%	MT	%	MT	%		
Sunflower	4,464	28	10,922	31	15,318	41	15,318	31	5,514	42	10,307	34
Sesame	2,285	14	7,155	20	7,506	20	7,506	15	1,054	8	5,101	16
Groundnuts	4,161	26	10,201	29	9,355	25	9,355	19	187	1	6,652	20
Cotton	424	3	2,493	7	263	1	265	1	61	0	701	2
Yellow gram	1,102	7	1,994	6	2,816	8	0	0	0	0	1,182	4
Tobacco	3,507	22	2,818	8	1,707	5	1,233	2	1,280	10	2,109	9
Cowpeas	-	0	-	0	-	0	16,352	33	5,142	39	4,299	14
Cashewnuts	-	0	-	0	-	0	0	0	0	0	-	0
Total	**15,943**	**100**	**35,583**	**100**	**36,965**	**100**	**50,029**	**100**	**13,238**	**100**	**30,352**	**100**

Source: Data from Manyoni District Council Agricultural Department, 2016 **Amount and Value of Cash Crops Purchased by Manyoni District Council; 2014/15**

Crop	Amount Purchased (Kgs)	Average Price per Kg (Tshs.)	Revenue Earned in Tshs	Percent Earnings	Rank
Sunflower	5,514,000	600	3,308,400,000	10	5
Cotton	61,000	850	51,850,000	0	8
Groundnuts	18,7000	2,000	374,000,000	1	7
Onions	5,000	1,000	5,000,000	0	9
Simsim / Sesame	1,054,000	1,800	1,897,200,000	6	6
Tobacco	1,280,000	2,800	3,584,000,000	11	4
Gram	5,142,000	1,500	7,713,000,000	24	2
Paddy	4,359,000	1,500	6,538,500,000	20	3
Lentils	5,142,000	1,800	9,255,600,000	28	1
TOTAL	**22,744,000**		**32,727,550,000**	100	

Source: Data from Manyoni District Council Agricultural Department, 2016

Irrigation Development Programme

Manyoni has potential areas that can be utilized for irrigation purposes in order to improve crop production. The District has a total of 9,250 potential area for irrigation but only 1,318 hectors are utilized so far although irrigation water is not available throughout the year, .which implies that the District in collaboration with various stakeholders need to take more initiatives to speed up irrigation developments.

Traditional Irrigation

Traditional Irrigation is a local way system of irrigating commonly applied in small scale farming practiced along the rivers, lakes and dams. Traditional Irrigation is not practiced in Manyoni due to lack of water resources calling for efforts to establish water harvesting dams.

Improved Irrigation

Most of agriculture households in Manyoni District Council are small scale farmers who have inadequate resources to invest in improved irrigation which essentially needs both financial and material resources. The table below indicates that, the area potential for irrigation is 9,250 Hectares and only 1,318 Hectares equivalent to 14.2 percent is utilized so far in 8 irrigation Schemes available. These schemes have been designed for rice production only and used by only a meager 1% of the district population. This is another factor which justify introduction of water harvesting technologies in the Districts.

Prospects for Improved Irrigation in the Council; 2012/03 – 2014/15

Estimated Potential Area (Ha.)	2012/13		2013/14		2014/15	
	Area Under Irrigation (Ha.)	Major Crops	Area Under Irrigation (Ha.)	Major Crops	Area Under Irrigation (Ha.)	Major Crops
9,250	1,318	Paddy	1,318	Paddy	1,318	Paddy

Source: Data from Manyoni District Council Agricultural Department, 2016

Livestock

The types of livestock kept at large in Manyoni include cattle (353,852), goats (184,453), sheep (51,893), pigs (2,640), donkey (3,902) and Poultry (275,489). Data indicate that cattle, sheep, Poultry and goats contribute a large percentage in the earning of livestock keepers.

Estimated Livestock Population in Manyoni District Council, 2012

Cattle	Goats	Sheep	Donkeys	Pigs	Poultry
353,852	184,453	51,893	3,902	2,640	275,489

Source: 2012 Population and Housing Census Report

Grazing Area

Estimated Areas under Grazing in the District; Manyoni District Council, 2016

Land Suitable for Grazing (Ha)	Land Used for Grazing (Ha)	Percent of Grazing Area	Tsetse fly Infected Area (Ha)	Percent of Tse tse fly Infected Area
236,100	236,100	100	N.A	N.A

Source: Compiled Data from the District Executive Directors' Office, 2016

Animal Health and Infrastructure

Table below indicates various infrastructures which support control and prevention of Diseases as well as improving quality of livestock Marketing. The table depicts that out of 29 dips available in the Council, 24 dips (82.3%) are working.

Type of Livestock	Disease/Vaccine	Number	%
Chicken	Mdondo	103,189	52
Chicken	Ndui	21,829	11
Chicken	Gumboro	25,798	13
Cattle	FMD	345	0.2
Cattle	CBPP	89	0.2
Goats	CCPP	986	1

Types of Service	Amount	Working	Not working
Cattle Dips	29	24	5
Skin/Hide Shades	10	6	4
Abattoir (Slaughter Slabs)	5	5	0
Meat Shops	21	21	0
Livestock Health Centers	6	1	5
Holding Grounds	1	1	0
Stock Routes	5	5	0
Cattle Markets	10	10	0

Source: Data from Manyoni District Council Livestock Department, 2016

Marketing of Livestock and Their Products

Marketed Livestock by Type (Official Markets) and Revenue Earned; 2015

Livestock	Number of Livestock	Percent Number	Total Revenue (Tshs.)	Percent Revenue	Average Price
Cattle	38,555	21	17,735,300,000	82.4	460,000
Livestock	**Number of Livestock**	**Percent Number**	**Total Revenue (Tshs.)**	**Percent Revenue**	**Average Price**
Goats	46,827	26	2,341,350,000	10.9	50,000
Sheep	9,328	5	326,480,000	1.5	35,000
Pigs	438	0	78,840,000	0.4	180,000
Poultry	86,347	48	1,036,164,000	4.8	12,000
Total	**181,495**	**100**	**21,518,134,000**	**100**	

Source: Data from Manyoni District Council Livestock Department, 2016

Item	2015		
	Number	Revenue (TShs.)	Average Price

Cattle Hides	154,220	1,542,200,000	10,000
Goat Skins	46,827	561,924,000	12000
Sheep Skins	9,328	93,280,000	10000
Total	**210,375**	**2,197,404,000**	**10,667**

Source: Data from Manyoni District Council Livestock Department, 2016

Milk and Eggs Production

Number of Litres of Milk Marketed by Type; 2014 and 2015

Livestock	**2014**			**2015**		
	Number of Litres	**Revenue (TShs.)**	**Percent of litres Marketed**	**Number**	**Revenue (TShs.)**	**Percent of litres Marketed**
Indigenous Cattle	1,194,800	836,360,000	48.5	1,240,996	1,240,996,000	47.8
Diary Cattle	1,208,600	846,020,000	49.0	1,269,900	1,269,900,000	48.9
Diary Goats	61,100	42,770,000	2.5	84,794	84,794,000	3.3
Total	**2,464,500**	**1,725,150,000**	**100.0**	**2,595,690**	**2,595,690,000**	**100.0**

Source: Manyoni District Council Livestock Development Department, 2016

Eggs Production

Year	**2013**	**2014**	**2015**
Number of Eggs	2,637,312	4,917,847	7,107,075
Value of Eggs (Tshs.)	527,462,400	1,229,461,750	2,132,122,500

Source: Manyoni District Council Livestock Development Department, 2016

Natural resources

Forestry

Village Forest area covers **49,920.59** Hectors. The District has a sustainable plan to demarcate and conserve forest resource in all 58 villages and this will promote the ongoing beekeeping projects. Currently the total of 46 villages has demarcated forest reserves. The figures below shows number of seedlings raise in the District. The number is very low compared to the size of the district and the potential demand, which is supposed to be not less than 10 million per year. Also data on species type and planted seedlings and those which survive and develop into trees is not available.

Number of Tree Seedlings Raised by Wards: 2013-2015

Ward Name	**2013**	**2014**	**2015**
Manyoni	14,500	20,900	14,180
Makuru	50,000	50,000	69,000
Kintinku	1,200	800	360
Chikola	500	1,200	300
Total (all)	71,200	72,900	83,840

Production of charcoal [bag] and value by wards; 2013-2015

Ward Name	2013		2014		2015	
	Number of bags	Value (Tsh)	Number of Bags	Value (Tsh)	Number of Bags	Value (Tsh)
Manyoni	910	910,000	26	26,000	1040	1,040,000
Mkwese	1079	1,079,000	317	317,000	1223	1,223,000
Makuru	-	-	-	-	490	490,000
Solya	601	601,000	230	230,000	1460	1,460,000
Muhalala	5011	511,000	381	381,000	2866	2,866,000
Saranda	319	319,000	260	264,000	1977	1,977,000
Makutupora	-	-	-	-	78	78,000
Maweni	-	-	80	86,000	319	319,000/=
Nkonko	-	-	-	-	440	440,000
Isseke	-	-	-	-	129	129,000
Sanza	-	-	-	-	103	103,000
Total (all)	3,420	3,420,000	1,300	1,300,000	10,125	10,125,000

Source: Data from the District Executive Directors' Office, Forest Section, 2015

Fishery

Fishing activities in Manyoni is very marginal and it is mainly carried for domestic consumption due to lack of water bodies like rivers, lakes and dams associated with unreliable rainfall.

Beekeeping

The data presented in the table below indicates that from 2010 to 2015, Manyoni had a total of 11,850 beehives of which 10,100 (85%) were traditional and 1,750 (15%) modern.

Number of Traditional and Modern Beehives; Manyoni, 2010 – 2015

Year	2010	2011	2012	2013	2014	2015
Traditional	8,500	9,250	9,400	9,720	9,800	10,100
Modern	1,104	1,270	1,477	1,890	2,010	1,750

Source: Data from the District Executive Directors' Offices, Beekeeping Office, 2015

On the other hand, the number of bee's keepers has been increasing each year from 1,300 in 2010 to 2,500 in 2015 as it has been shown in the table below.

Year	2010	2011	2012	2013	2014	2015
Number of bee's keepers	1,300	2,349	2,355	2,390	2,410	2,500
Number of bee's keeping groups	20	22	28	30	23	35

Source: Data from the District Executive Directors' Offices, Beekeeping Office, 2015

Beekeeping using traditional inneficient beehives in Manyoni

Beekeeping Products

Beekeeping in Manyoni District Council is mainly carried out traditionally. The data in the table below indicates that the highest quantity of honey of 190,525 litres valued was harvested in 2014 while the lowest, 140,010 litres was observed in 2010. Production of beewax was at the pick in 2014 by harvesting 17,046 kgs while the lowest production was observed in 2011 in which 12,527 kgs of beewax was harvested.

Beekeeping Products Harvested in the District; 2010-2015

Year	Quantity of honey produced (Lts).	Quantity of Beeswax produced (Kgs).
2010	140,010	12,527
2011	160,300	14,342
2012	170,192	15,227
2013	190,025	17,002
2014	190,525	17,046
2015	146,000	13,064

Source: Data from the District Executive Directors' Offices, Beekeeping Office, 2015

Source of Energy for Cooking

The 2012 population and housing census results show that for the most of the private households, the main source of energy for cooking was firewood (83.5 percent) followed by charcoal with 15.5 percents, Kerosene/Paraffin (0.3 percent), Electricity (0.2 percent), and Other Sources with 0.1 percent each as shown in the table below.

Percentage Distribution of Households by location and main source of energy for Cooking; Manyoni District Council 2012

Households	Electricity	Kerosine/ Paraffin	Gas	Firewood	Charcoal	Wood/Farm Residual	Coal	Animal Residual	Not Applicable	Total
58,464	0.2	0.3	0.1	83.5	15.5	0.1	0.1	0.1	0.1	100

Source: The United Republic of Tanzania, 2012 Population and Housing Census Report

Percentage Distribution of Households by location and main source of energy for Cooking; Manyoni District Council 2002

	Electricity	Kerosene/ Paraffin	Gas	Firewood	Charcoal	Other	Not Applicable	Total
Total	0.10	0.28	0.04	87.52	11.87	0.14	0.05	100
Rural	-	0.17	0.04	95.27	4.46	-	0.04	100
Urban	0.50	0.71	0.06	57.06	40.90	0.67	0.10	100

Source: The United Republic of Tanzania, 2002 Population and Housing Census Report

Gender empowerment

Gender empowerment aims at ensuring that the disadvantaged group particularly women, are fully participate in the policy and decision-making process and in all aspects of economic, social-cultural and politics. Various measures have been put in place to minimize time spent by women and girls in attending home activities and allow them more time to participate in above-mentioned activities. These measures include the use of family planning, opening and operating day care centres; establishment of women's economic through provision microloans.

Women participation in decision making

Among the goals and targets of Tanzania Development Vision 2025 and 2030 Sustainable Development Goals (SDGs 2030 goal Five) are to empower women by involving them in various levels of decision making. Table below illustrates the steps that are being taken to involve women in various positions to emancipate themselves from their present position to a much higher position in society by participating in all spheres in the society. The table depicts the number of women participated in managerial, technician as well as politics in Manyoni District Council.

Year	Managerial		Professionals/ Technicians		Politics (MPs, Councilors)		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
2016	14	5	1,250	884	19	9	**1,283**	**898**

Source: Compiled Data from District Human Resources Office, 2016

Youth development

Youth is another group that organises and form groups for the purpose of social economic development. It is from these groups that credits facilities become easier in such a way that the formed groups loaned money for the purpose of economic development. By 2016 there are 158 active youth economic groups in the Council with 1,590 members. On the other hand Youth SACCOS established with a deposit of Tshs. 8,000,000.00 from the members contribution and Tshs. 32,810,000.00 from Minister of Information, Culture, Artists and Sports. The Council through its Owns Sources collections managed to provide micro loans of Tshs. 24,500,000.00 to 49 Youth and Women Economic Groups.

Number of Youth Groups by Wards: 2016

S/N	WARD	Youth Economic Groups
1	MANYONI	54
2	MUHALALA	4
3	MKWESE	19
4	MAKURU	10
5	SARANDA	10
6	SOLYA	8
7	MAKUTUPORA	7
8	CHIKUYU	3
9	MAJIRI	9
10	SASAJILA	3
11	MAWENI	5
12	KINTINKU	10
13	MAKANDA	5
14	SANZA	2
15	ISSEKE	1
16	NKONKO	2
17	HEKA	2
18	SASILO	2
19	CHIKOLA	2
	TOTAL	**158**

Annex 3.3
Bahi District Consultation Report

Area, Size and Location:

Bahi District Council is one of the seven local government authorities of Dodoma region. The District Council borders Manyoni District (Singida Region) on the western part, Chemba District on the North, Dodoma Municipal on the East and Chamwino District on the Southwest part. It lies on the central plateau of Tanzania in the western direction of Dar es Salaam. The district has a total area of 5,948 square kms, of which arable land is only 542,844 hectares.

Administrative Units:

Bahi district is divided into 4 divisions, 22 wards 59 villages and 553 hamlets. There is also one parliamentary electoral constituency namely Bahi.

Table - Administrative Units in the District

Wards	Villages
6	**18**
6	**18**
6	**14**
4	**9**
22	59

Source: **Bahi District Council, 2018 Demography:**

The 2012 National Population and Housing Census showed that the District has the total population of **221,645** out of which **105,975** were males, and **115,670** females. Annual Average growth rate is **2.3** percent and the average household size is **4.5.** Based on annual projection, it is estimated that 2017 total population has been increased to **245,958** out of which **117,600** are males and **128,358** are females.

Table 1. 2**: Population of Bahi District Council by Sex, Average Household Size and Sex Ratio**

Serial No.	Ward	Population (Number)			Average Household Size	Sex Ratio
		Total	Male	Female		
	Total	**221,645**	**105,975**	**115,670**	**4.5**	**92**
1	Makanda	7,896	3,808	4,088	4.4	93
2	Lamaiti	12,268	5,971	6,297	4.3	95
3	Babayu	10,126	4,942	5,184	4.6	95
4	Zanka	9,886	4,866	5,020	4.5	97
5	Msisi	11,847	5,736	6,111	4.5	94
6	Mundemu	8,149	3,917	4,232	4.2	93
7	Bahi	18,293	8,876	9,417	4.5	94
8	Mpamantwa	12,984	6,249	6,735	4.8	93
9	Ibihwa	11,060	5,223	5,837	4.3	89
10	Ilindi	9,440	4,515	4,925	4.5	92
11	Kigwe	15,559	7,315	8,244	4.3	89
12	Chikola	13,668	6,479	7,189	4.4	90
13	Chipanga	9,654	4,594	5,060	4.5	91
14	Chali	11,300	5,282	6,018	4.3	88
15	Chifutuka	15,369	7,344	8,025	4.8	92
16	Mpalanga	10,228	4,831	5,397	4.5	90
17	Ibugule	8,046	3,770	4,276	4.6	88
18	Chibelela	10,033	4,739	5,294	4.4	90
19	Mwitikira	7,235	3,424	3,811	4.4	90
20	Mtitaa	8,604	4,094	4,510	4.5	91

Source: NBS, 2012

Physical Features:

Bahi District is predominated by a number of depressions, which are generally Water-Lodged during rainy season and have a tendency of salinity because of the limited outflow. The District has a dry Savannah type of Climate, which is characterized by a long dry season. The average rainfall is **500-800 mm** annually, and about **85%** of this falls in the four months between December & March.

Hydrogeology

The main source of water in the District is boreholes pumped with diesel engines.

Land area

The district is estimated to have land area of **544,842** hectares. Overall computation shows that Bahi district land area is about **13%** percent of Dodoma Regional. Out of the **544,842** hectares, **378,207** hectares **(70%)** are arable land. The area for arable land which is currently under use is **164,637(44%)** indicating that large portion of land suitable for agriculture remains unutilized.

Table : Land Area in the District by Ward, 2012

No.	Ward Name	Land Area (Ha)	% of Total District Area
1	Babayu	32,357	5.9
2	Bahi	10,960	2.0
3	Chali	19,330	3.6
4	Chibelela	13,561	2.5
5	Chikola	40,474	7.4
6	Chipanga	28,386	5.2
7	Ibihwa	14,346	2.6
8	Ibugule	16,709	3.0
9	Ilindi	19,725	3.6
10	Kigwe	21,655	4.0
11	Mpinga		
12	Lamaiti	30,659	5.6
13	Makanda	26,531	4.9
14	Mpalanga	20,824	3.8
15	Mpamantwa	27,762	5.1
16	Msisi	31,684	5.8
17	Mtitaa	15,763	2.9
18	Mundemu	16,272	3.0
19	Mwitikira	15,652	2.9
20	Nondwa	99,928	18.3
21	Chifutuka		
22	Zanka	42,264	7.8

Source: Bahi District Council Office, Dodoma 2015

Climate

Rainfall

Most part of Bahi district is semi arid characterized by low and erratic rainfall. Bahi district experiences one rain season between November and April. The rainfall duration is usually very short and sometimes characterized with short period of heavy storms leading to floods. Due to short rainfall duration, heavy water runoff and hence poor water infiltration is common in the area leading to less moisture reserve in soils. Rainfall ranges from **500 mm to 650mm** per annum. The rain season is then followed by the long dry spell between the mid April to the beginning of November, characterized by dry winds and low humid that leads to higher evapotranspiration.

Temperature

Bahi district experiences both high and low temperature. The highest temperature is **31ºC** while the lowest temperature is **18º C.** The cool dry season begins in June and always ends up in early September. Absence of cloud cover lowers the temperature in the night but also raise the day light temperature.

Winds

Winds blow across the district from East/south to northwest of the district; the wind is usually dry contributing to the semi-arid condition of the area. The wind speed increase in July with the strongest winds occurring in October. During the driest season the wind speed is higher as compared to the wet season.

Geographical features

Topography

Most part of Bahi district is flatlands with gentle slope hills and lowlands in some places. The district is raised to an altitude ranging between **560 -1200m** above sea level. In the eastern part of the district there is Bahi lowland area. This area has a swampy characteristic, which makes it suitable for paddy farming. As a result, Bahi is one of the popular districts for paddy production in Dodoma region. In the northwest part there is *Nondwa* and *Mchito* dam, while in the central part (Ilindi) there is a wetland endowed with salt. Relatively high altitude areas are located in the northern part of the district wherein there is Chenene mountain ranges covered with dense forests. Other part of the district is more or less flatland with undulating hills. The main river (seasonal) in the district is known as river Bubu, which flows from north to south-east and drain its water to Bahi Swamps. During rain season, many people around this river, catches fish as one of their livelihood strategy. Like most rivers in the area, many natural dams, wetlands and swamps in the district are seasonal. Some of these natural dams (non-salt natural dams) provide fishing ground to the Bahi population surrounding them.

Soil

Generally, the soil of Bahi district has shallow depth, moderate fertility, moderate organic matter content, and moderate to poor permeability leading to higher surface runoff. Soil salinity is a serious problem that negatively affects crop growth in areas of Ilindi, Kigwe, Chikola and Bahi wards. The soil textural classes found in the district are as follows; Near to Iringa region (south west) and central part of the district the soil is dark grey and brown sand, and sandy loams. The other part of the district is characterized by brown loamy soil to dark grey clay sands and sand loams.

Vegetation

The vegetation of Bahi district is characterized by bush and thickets and scattered trees in some areas. The vegetation cover has been reduced by human activities such as agriculture, lumbering, bush fire, fuel wood and charcoal extraction, and grazing. Most hills and mountain ranges, steep slopes and protected forest reserve have large wood plants. which forms good water shed protective cover.

Water

The drainage is characterized by seasonal rivers and swamps/wetlands. There are very few permanent rivers and swamps/wetlands in the district. Both seasonal and permanent water resources in the district are very useful to the community as they provide water for domestic uses, livestock, irrigation, and act as fishing grounds. Water resources located in different areas of the district are summarized in the Table below.

Table Distribution of rivers and Swamps in the District by Division

Division	Rivers
Bahi	Kigwe, Msangambuye, Msolwa, Chisugala, Majuveni, Nkonkorale, Chimpindu, Chinzanchi, Chiwela, Bubu, Nghogwa,Kimavi, Mkwakwa, Nchikole and Masake.
Chipanga	Manyagwa, Mhola, Nholi, Mzanje, Chisati, Lunyemba and Chipanga.
Mwitikira	Makomasenga, Rusimu, Ihugule, Lugombe, Igugu, Mfangwe, Makola, Mtonga, Chilala, Makulu, and Mpunguzi

Mundemu	Fwadi, Kinyasungwi, Kibudibudi, Lulunde, Wanyagase, Kan damiza, Kasela and Bubu

Distribution of swamps in the District

Division	Swamps/Wetland
Bahi	Nchenje, Chiswila, Surungai, Ilindi, Mkalama, Mkakatika kwa ng'ombala, Udundamisi, and Nyambisi.
Chipanga	Tope, Kalama, Nondwa, Ilundi, Mpululu, Mkalawe, Magobwe, Myambwe, Chisinzisa and Masaulwa.
Mwitikira	Funamia, Mfuko, Itumo, Ndulumaa, Msachile, Salabwe, Lebawa, Muhanga, Kisingisi, Mtonga, Lugalala,Nyungu and Fao
Mundemu	Mkalama, Choleo, Solowi, Magombwe, Mtinaye, Halo, Mase, Solo, Matitu,Kwamsute, Mundemu, Nala and Sulungai.

Economy

About **80** percent of Bahi district economy comes from farming. The sector is managed by smallholderfarmers and most of them do not use improved farming practices and mostly depend on rain fed farming. As a result, yield per acre is relatively low. The district mainly cultivates maize, sorghum, bulrush millet, groundnuts, sunflower, paddy, Bambara nuts, cassava, sweet potatoes, tomatoes and to a lesser extent finger millet and grapes.

Apart from farming, livestock also have great potential of contributing significantly to the district economy. The common livestock are traditional cattle breed, sheep and goats. However, improved dairy cattle also form a source of income, especially in ward with urban characteristics. Besides livestock, forestry products are also prominent sources of the district economy. The potential products include timber; honey and wax; charcoal and fuel wood from Chinene forest. Fishing industry is also performed in the district as one of the sources of district economy. In addition, wildlife sector have potential to contribute a substantial amount of income to the district. Salt mining at Mpamantwa, Lamaiti, Chali, Kigwe and Ilindi wards; and gold at Mafurungu hills may largely contribute to the district economy.

District GDP and average income

According to 2002 progress reports, the then Dodoma Rural District which included Bahi and Chamwino District was estimated to have annual GDP of Tshs. **20,468,850,378/=.** Based on the 2008 survey, majority of households in Bahi District are still poor with average income per household being estimated at Tshs. **427,489/-** per year

Agriculture

Arable farming

As noted before in this section, the district economy mainly depends on farming. Information obtained from District Agricultural Officer reveals that the sector employs more than 80% of the district population.

Farming by most of the household is on subsistence basis. Information from district natural resource office (2012) indicates that 378,207ha, which is 70% of the total district area are suitable for agricultural activities (Arable land). The report further indicates that out of the total arable land only 164,637ha were under crop production. This area constitute to about 30% of total district area and 44% of total arable land.

Production of major crops in the district

The major crops grown in the district include Maize, Sorghum, Bulrush millet, groundnuts, sunflower, paddy, Bambara nuts, cassava, sweet potatoes and to a lesser extent finger millet and grapes. Cereals like Maize, Sorghum, Bulrush millet, Finger millet, cassava and sweet potatoes are mainly grown for food while Paddy is

for both cash and food. Other crops mainly grown for both cash and food are Groundnuts and Bambara nuts. Sunflower, Grapes and simsim are mainly grown for cash.

Area for irrigation in the district

The district statistics shows that around 6,286.6ha in the district are suitable for irrigation. Area endowed with irrigation potentials is Bahi, Mpamantwa, Chali, Mtitaa and Babayu wards. Nevertheless, only 1,816ha is being irrigated. The area being irrigated is mainly located in Bahi, Mpamantwa, Chali and Mtitaa wards.

Problems facing farming activities in the district

Farming in the district is that of smallholders who cannot afford to buy and use fertilizers, agrochemicals and improved seeds. Unavailability and high price of agricultural inputs have tremendously impacted agricultural production in the district. Most farmers use traditional farm implements, such as the hand hoe, bush knife and axes. This practice has resulted into under utilization of the arable land available in the district.

Livestock As with crops production, livestock keeping is also playing a significant role in supporting the households' economy and of the district at large. Based on the survey carried out in June 2008, the district was estimated to have **28%** of its population keeping cattle, **37%** keeping goats, **19%** keeping sheep, and **78%** keeping chickens. In addition, the survey revealed that donkey, turkey and guinea pigs are kept by less than **10%** of total households.

Livestock population in the district

Total population of cattle, goats and sheep in the district was indicated by 2012 livestock census to be **203,319**, **105,256** and **56,498,** respectively.

Grazing area in the district

Livestock statistics show that more than **95** percent of district livestock are indigenous breed. The indigenous breed depends mainly on availability of grazing area. Available data shows that the district is estimated to have **133,156ha** of suitable land for grazing. Based on livestock carrying capacity of 2 hectares per livestock unit per year, the area is not enough to fully support the existing number of livestock population in the area. The situation is thought to be worsened by inflow of pastoralists with their livestock from other districts/regions in seek for grazing land. ***Livestock infrastructures in Bahi district***

Information obtained from Ward Executive Officers of all wards in the district (2012) revealed that there is significant shortage of livestock infrastructure in the district. Such information shows that the district has **17** charco dam, **17** dips, **2** livestock health centres, **8** slaughtering slabs and **8** skin shed.

Markets for Livestock in the district

As indicated before in the preceding sub-sections, livestock are among the key sources of income to smallholder farmers and the district as a whole. As a result, tracing the places where livestock are being traded has been one of the issues in this subsection. Livestock market in the district is of two kinds; the internal and the external markets. The internal markets explain the traditional weekly trade gatherings commonly known in Kiswahili as "*Minada".* Where as in each ward there is at least one "*Mnada" per* month. These trade traditional gatherings provide opportunities for smallholder farmers to sale among other things, their livestock, and hence increase their disposable income. The major immediately external livestock market available to the livestock keepers' of Bahi district is Dodoma Municipal.

Problems facing livestock sector in the district Low production

Because most of the livestock in the district is of indigenous breed, there has been low production of both meat and milk. Cattle for instance, are estimated to produce 2-3lts of milk per day during the rain season, an amount which decline to 0.5-1lt during the dry season. The average age at which a bull is being slaughter in the district range from 6 to 8 years; whilst, the average weight at slaughter varies from 200 to 300kg during rain season and 150-200kg during the dry seasons.

The mortality among calves and adults is estimated at 20- 25% and 10% respectively. Goats and sheep in the district are generally not milked; and they seem to thrive well. This is so because their weight during their life time range from 15 to 18kg and their motility rate is estimated to be below 5%. Nevertheless, considering the overall livestock situation the district is in general having poor livestock production coefficient.

Overgrazing and lack of pasture management

Pasture and water in the district are very scarce particularly during dry season, which to the large extent contributes to poor livestock condition. During dry season, livestock keepers are forced by circumstance to walk for approximately 2 to 7 km with their livestock seeking for grazing land. The situation is further being aggravated by poor range management; uncontrolled burning of rangeland and pastures; and absence of land tenure which could grant farmers control over their lands as a result users have no incentives to invest in pasture improvement.

Table: Diseases facing livestock by type

	LIVESTOCK	**DISEASES**
1	Cattle	East coast fever, black quarter, Red water (babesiosis), Foot and Mouth disease, Brucellosis,Contagious Bovine Pleuropneumonia (CBPP).
2	Goats	Foot rot, Anthrax and pneumonia and Contagious Caprine Pleurophenmonia (CCPP)
3	Sheep	Pneumonia and diarrhoea
4	Chicken	Newcastle, Coryza, fowl pox and fowl typhoid
5	Pigs	Mange, pneumonia and worms

Source; District livestock office, 2015

Inadequate funds

This is another serious problem facing the livestock sector despite of its contribution to district economy. Due to budget constraints the district council fails to fund the sector requirement of essential veterinary drugs and equipment. **Natural resources**

Bahi district is endowed with vast natural resources that include seasonal rivers and dams which provides great opportunity for fishing, irrigation, water for domestic uses as well as for livestock keeping and for being consumed by wild animals. Other natural resources in the district include forests, bee products, minerals and wildlife.

Fisheries

Fishing in Bahi district is mainly done seasonally; yet the sector has notable contribution to the individual income and that of the district as a whole. The main river for fishing in the area is river *Bubu*. Other rivers include *Lukali, Kasela and Mkambala*. In few cases fishing is being done throughout the year in areas with permanent swamps located in *Surunghai with an area of 290km2, Nondwa (243m2) and Mchito.* Fish species found in the area are Clarias (*Kambale*), Tilapia (*Perege*), *Ningu* and Sardines (*Dagaa*) whereas, the main tools used in fishing are fishnets, fish traps and hook lines.

Fish Processing

Although the district has high potential for fishing industry, there is no fish-processing factory in the area. Most of the fishing products are processed by fishermen and/or petty traders through sun drying and fire drying. Fishermen sell their fish to petty traders or directly to consumers mainly in Singida, Morogoro, 1 and Dar es Salaam this implies that deliberate efforts are needed to invest in fish processing especially.

Problems facing fishing sub sector in the district

Despite of the fact that fishing has great potential to contribute to the district economy, there are however, a number of problems facing this sub sector. These include; lack of capital, inadequate expertise in fisheries management, unreliable annual rainfalls and disvaluing of fisheries activities by the indigenous, something which makes these activities to be done by the people from outside the district; mainly from Ruvuma, Mbeya, Rukwa and Mara. Other problems are poor and sometime the absence of infrastructure like reliable roads net work and electricity; and little budget to promote this sub sector.

Forestry

The district is also endowed with forestry resources. A good number of people in the district depend on trading forestry products as one of their important livelihood strategies.

Forest reserves

The district is estimated to have about 2819.4ha covered with natural forests and 175ha covered with exotic forests, about 2644.4ha are forest reserves. *Mipululu* and *Miyombo* trees constitute the largest proportion of forest in the district. Other types of trees include *Mikungugu*, *Mitundulu, Mikola, Misami, Midoho, Mifulu, Mikoma and Migunga*.

Bylaws to curb deforestation in the district

In an effort to combat environmental problems several by laws exists in the area. These include restrictions on setting fire on bushes/forests; restrictions on burning charcoal unless one has permission from Village Executive Officer's; imposition of fines to deviants; and requiring each household should plant at least **10** trees each year.

Tree planting efforts in the district

Most of the tree planting efforts in the district has been initiated by Non Governmental Organizations. These include Dodoma Environmental Network DONET and DCT . In line with their tree planting campaign they also advocate for the use of improved cooking stoves. Although data are not available to indicate how many trees have survived, information shows that about **259,098**, **326,457**, and **427,000** tree seedlings were planted in the district in the year **2013**, **2014** and **2015,** respectively. ***Environmental problems resulting from deforestation in the district***

Like other part of central Tanzania environmental degradation due to deforestation and overgrazing is one of the major problems in Bahi district. This has resulted into declining soil fertility, reduction in the number of natural tree species and wild animals. Results from the survey done (2012) in the district indicates that more than 80% of the surveyed households complained that land fertility has decline substantially in recent years compared to the past ten years ago. Similarly, number of tree species and area under natural forest, number and species of wild animals has declined. Deforestation has been caused by clearing of land for farming and cutting of trees for firewood and charcoal. Overgrazing in some of the places specifically in the Bahi lowland (valley) has been caused by presence of pastoralist immigrants mainly form *Sukuma* land.

Bee-keeping

Bee-keeping, though is carried in a small scale is another source of district and individual income. Beekeeping in the district is to the large extent (more than 99%) being carried out traditionally. Bee species found in Bahi district include stinging bees (*Apis mellifera steculata*) and stingless bees (*Mellipona spp. and Trigona spp*.). Number of both traditional and modern beehives in the district has been increasing over years in the district.

Wildlife

There is no identified game reserve in the District, but animals are found in some traditional forest reserves such as Dangiyo, Goima, Lamaiti and Chenene. Animals species found in the area are Elephant, Lion, Hyena, Hippopotamus, Antelope, Leopard and Hare. Since there are no identified game reserves, this sub-sector does not contribute to the district economy.

Mining

Mining sector in the district is still in the infant stage, currently what exist in the district is small scale salt, phosphate and gold mining carried out by local people using traditional methods. Gold is mined at Mpinga ward, Chipanga ward and Nholi village in Mpalanga ward, phosphate in Chiwela, Iron ore deposits is found in Asanje Village and salt in Mpamantwa, Lamaiti, Chali, Kigwe and Ilindi wards. The largest deposit of salt is found in Ilindi ward. Several local people are engaged in salt mining for local use and export to other regions/districts in the country. Uranium is still in exploration in Bahi and Mpamantwa wards.

Water supply and sanitation

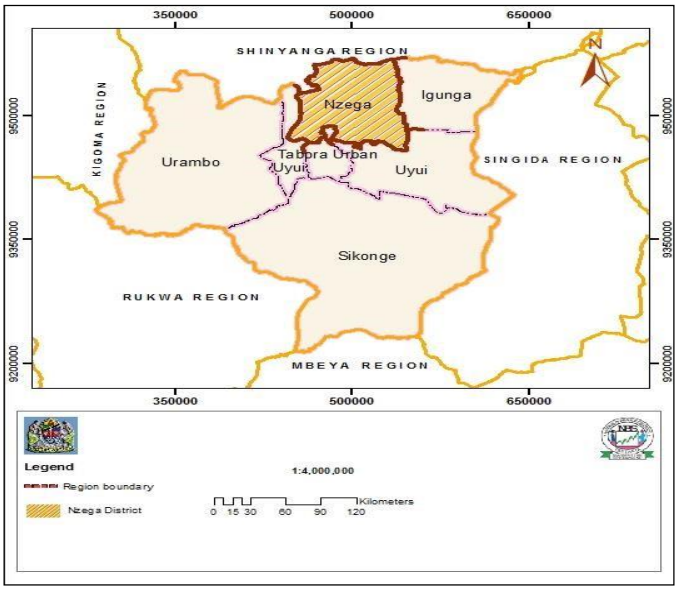
Nearly all places in the district are rural. Rural water supply in the district for domestic use is still a development challenge. By 2015, the district has a total number of **164** water sources. These are **57** bore holes, **79** shallow wells, **2** Spring water, **24** rain water harvesting and **2** dams. To make water supply schemes sustainable **78 %** of all villages have water committees and water funds. Challenges are many and they are caused by lack of maintenance and rehabilitation of the water infrastructure, drought, floods and sharing of similar water points with livestock..

Gender Aspects

The Tanzania society, like others is faced with the problem of gender inequalities and mainstreaming. There is a remarkable national and international concern on the need to actively address gender-based inequalities and its mainstreaming. There is no doubt that gender aspects in the country involve complex socio-cultural factors and hence quite challenging as require long-term interventions at various levels. Bahi District Council shall embark on contributing towards alleviating inequalities based on gender and thus promote sensitization of gender aspects.

Annex 3.4:

Nzega District

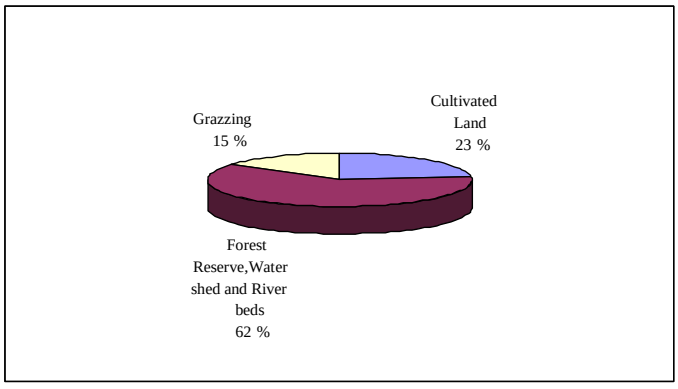


Map of Tabora Region Showing District Boundaries and location of Nzega District[66] Source: National Bureau of Statistics – 2009

Location Nzega district is among six districts of Tabora region. Most parts of the district are located in the northern part of Tabora region. For universal location identification, the district lies between latitudes $3^0$45' and $5^0$00' South of the Equator and between longitudes $32^0$30' and $33^0$30' east of Greenwich.

Area

Nzega district has a total land area of 6,961 sq. kms most of which is a rolling plain with very few small hills and escarpments. Figure 1 below shows land use pattern in Nzega.



Land Use Pattern in Nzega District, 2009 Source: Nzega District Executive Director's Office – 2015

Soils

[66] NBS, 2009. National Bureau of Statistics, Dar es Salaam, Tanzania

The soils vary from red lateritic earth grey sand to silt hardpan and iron crust *mbuga*. Although the majority of these soils have good nutrient content and are considered suitable for a wide range of food and cash crops and therefore have the potential for profitable cultivation, Nzega district soils can at best be described as moderately fertile.

Climate

The district receives rainfall of between 650mm and 1,200mm annually, falling between the months of October or November and December and a dry period from January to February/March and a second lower peak occurring soon after the dry spell is over in February or March and the rains then tail off in April/May. Temperatures range from 28ºC to 30ºC. The highest temperatures are experienced in October just before the onset of rainfall. Temperatures fall gradually to December and thereafter remain relatively constant up to May. From May to August the district experiences low temperatures. Nzega district is covered by *miombo* woodland, acacia woodland and grassland. The *miombo* woodland is natural forest for the district which is found in Bukene division and some parts of Mwakalundi division. *Miombo* woodlands are associated with well drained soils on high ground while *acacia* woodlands and grasslands thrive in low lying areas of some impeded drainage.

Topography

Nzega district forms part of the vast central plateau of Tabora region, an area of flat and gently undulating plains broken in places by prominent hills. Most parts of the district lie between 1,100 meters and 1,300 meters above sea level and form the main watershed separating rivers flowing north eastward into the Manonga River and the Wembere Swamps. The district harbours the second largest basin in the region, that of the Manonga river and Wembere Swamp, draining ultimately into Lake Eyasi.

Agroecological zones

Basically the district has two distinctive agro - ecological zones, namely, the High Rainfall Zone and the Low Rainfall Zone.

The High Rainfall Zone: This zone covers the western part of the district in parts of Bukene division and to the north parts of Puge division. The terrain of the zone is low lying used successfully for paddy cultivation and has been the paddy producing area of the district. A small part of this zone has good tobacco growing potential, while on the north of the zone is suitable for cotton growing. Soils are sandy loam and alluvial. This zone being about 100 percent tsetse fly – free area is good rangeland and hence cattle's rearing in this area is popular. The main food crops grown in this zone are maize, paddy, groundnuts and cassava. Cotton and paddy are grown as cash crops.

The low rainfall zone: This zone lies in the central, northeast and southeast part of Nzega district and is covered with alluvial soils. It covers Mwakalundi and Nyasa division and part of Bukene and Puge division. The zone has low rainfall of between 450mm and 850mm and hence limits maize yields leaving groundnuts and paddy as the major cash crops. Cattle rearing are practised in this zone, as it is a 100 percent tsetse-free area.

Population

Over the years the population of Nzega District has grown significantly. According to the 2002 Population and Housing Census the district had 415,203 people compared to 296,082 inhabitants counted in 1988 Population Census. The population size found during the 2012 census was 502, 252 people out of which females were 257,249 and males were 245,003 with an average household size of 5.8 and sex ratio of 96 and a population density of 64 people per square kilometer.

Economic status of Nzega District
GDP

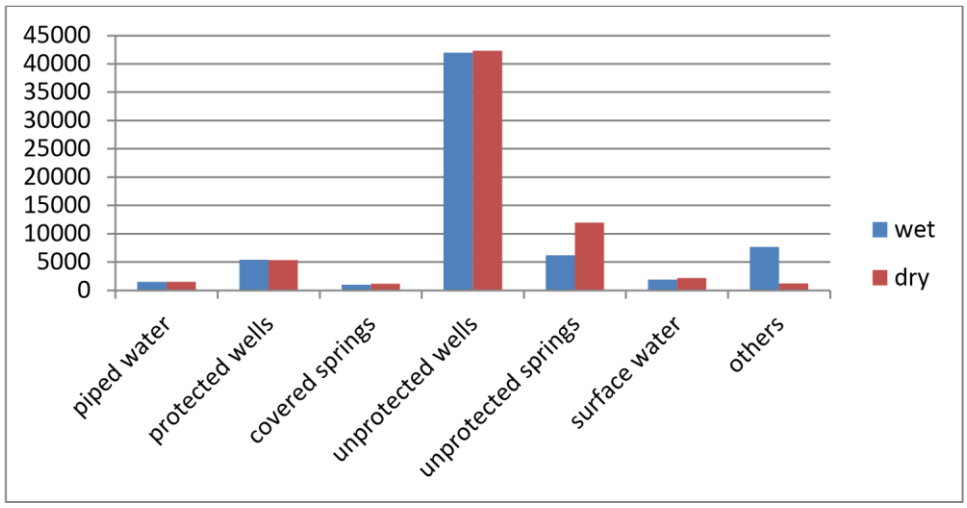
Tabora region's share of the national GDP is 14.0 percent equivalent to TShs. 900 million based on 2012 data while the per capita income of regional residents was estimated at TShs. 280,299, (equivalent to US $ 269) which was less by 24 percent, than the average for Tanzania Mainland. Similar observations were made for the years 2000, 2001 and 2002 when the respective Regional GDPs were TShs. 280,409 million, 292,623 million and 332,051 million respectively.

Economic Activities

For Nzega 35 percent of people live below the poverty line with 55% of the household experiencing food insecurity. The agriculture sector ranks first with the selling food crops being the main source of income in the district. Selling of forest products, livestock keeping, off farm income, other casual cash earnings and business income, follows this.

Water

Water scarcity if a serious socio-economic burden to the Nzega District. The flat topography of the district and hence to non-existence of a significant permanent drainage system is the main reason for unreliable surface water sources in the district. There is insignificant variation in the sources of water during wet and dry seasons. For example, the National Sample Census of Agriculture of 2002/03 revealed that the proportion of households that used unprotected well in the wet season was 67.5 percent compared to 68.2 percent in the dry season. According to the results, unprotected well was the main source of drinking water in the district followed by the protected well with 8 percent for both wet season and dry season.



Number of Households by Type of Water Source during Wet and Dry Seasons

Energy sources

Firewood remains to be the most prevalent source of energy for cooking. This also applies to Nzega as 92 percent of the households in the district use it, followed by paraffin or kerosene with 3.9 percent and charcoal with 2.5 percent. An insignificant number of the households reported using modern and/or environmental friendly source of energy for cooking such as electricity, solar energy and bottled gas. If the current practice continues deforestation and depletion of natural vegetation through using firewood and charcoal will destroy the nature and ecology of the district

The productive sectors

Agriculture employs about 74.9 percent of the total labour force of the district although poverty is still the problem. Approximately 90 percent of the population depends on poor smallholder agricultural production, characterised by the use of hand tools and reliance rain-fed agriculture and pastoralism. The sector is firther challenged with low soil fertility, environmental degradation, crop failure, and poor transport infrastructure. Cereals are the main food crops in the district with maize as the dominant food crop. Paddy, cotton and tobacco are the favourite cash crops in that order.

Poor transport network for haulage of agricultural produce, 2015

Table Estimated Area (Ha) Under Major Food Crops by Division, Nzega District, 2002/03 – 2008/09

Crop/Division	/ 2002 2003	/ 2003 2004	/ 2004 2005	/ 2005 2006	/ 2006 2007	/ 2007 2008	/ 2008 2009	Total Area (Ha)	Percentage share
Maize									
Bukene	6620	11180	6110	5958	13546	11046	6092	60552	17.6
Puge	25566	18015	30523	24782	11333	16985	30871	158075	45.8
Nyasa	6710	6890	8190	6448	13230	10169	10676	62313	18.1
Mwakalundi	6330	7400	8220	8000	10513	12077	11532	64072	18.6
Sub-Total	**45226**	**43485**	**53043**	**45188**	**48622**	**50277**	**59171**	**345,012**	**100.0**
Paddy Bukene									
	9290	13390	5290	8180	5678	57635	6349	105812	43.3
Puge	9517	4672	9309	5043	3712	2387	3982	38622	15.8
Nyasa	4040	7760	7240	5945	10720	4199	9573	49477	20.2
Mwakalundi	6200	7930	7930	7960	6644	3656	10139	50459	20.6
Sub-Total	**29047**	**33752**	**29769**	**27128**	**26754**	**67877**	**30043**	**244,370**	**100.0**
Sorghum									
Bukene	1030	3340	1220	906	236	592	6666	13990	24.1
Puge	3931	2690	5308	3373	1473	1788	2506	21069	36.3
Nyasa	6710	2870	2790	1873	1730	1235	2216	19424	33.5
Mwakalundi	0	510	950	51	714	842	418.5	3485.5	6.0
Sub-Total	**11671**	**9410**	**10268**	**6203**	**4153**	**4457**	**11807**	**57,968.50**	**100.0**
Grand Total	**85,944**	**86,647**	**93,080**	**78,519**	**79,529**	**122,611**	**101,021**	**647,350.50**	

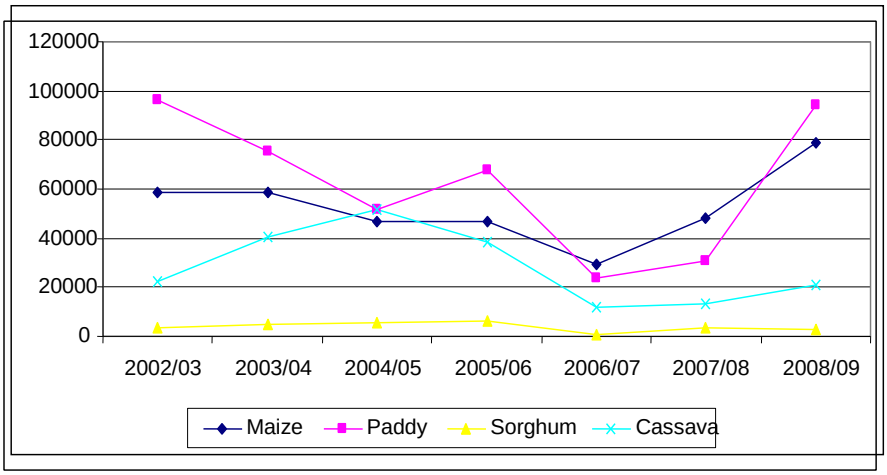
Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009

Table Estimated Production of Major Food Crops (Tons) by Division, Nzega District, 2002/032008/09

Crops/Division	2003 / [illegible]	2004 / [illegible]	2005 / [illegible]	2006 / [illegible]	2007 / 2006	2008 / 2007	2009 / 2008	Total
Maize								
Mwakalundi	10,970	13316	12335	11700	3777	11977	24649	88724
Puge	9,040	13720	9831	15938	9102	8797	23105	89533
Nyasa	18,300	14610	15625	10070	8524	12106	23747	102982
Bukene	20,540	16770	9295	8832	7928	15383	7472	86220
Sub-Total	**58,850**	**58416**	**47086**	**46540**	**29331**	**48263**	**78973**	**367459**
Paddy Mwakalundi								
	25,300	19665	16215	24400	4968	9907	53496	153951
Puge	4,810	1960	3730	5964	3777	2243	9009	31493
Nyasa	51,640	19410	18270	14872	11200	4807	18264	138463
Bukene	14,800	34570	13225	22095	4090	14037	13175	115992
Sub-Total	**96,550**	**75605**	**51440**	**67331**	**24035**	**30994**	**93944**	**439899**
Sorghum Mwakalundi								
	390	418	495	26	0	293	321	1943

Puge	950	208	480	1080	350	1356	1297	5721
Nyasa	2,020	2780	4023	4108	160	1633	858	15582
Bukene	30	1685	806	1115	235	260	558	4689
Crops/Division	**2003 / 2002**	**2004 / 2003**	**2005 / 2004**	**2006 / 2005**	**2007 / 2006**	**2008 / 2007**	**2009 / 2008**	**Total**
Sub-Total	**3,390**	**5091**	**5804**	**6329**	**745**	**3542**	**3034**	**27935**
Cassava								
Mwakalundi	3,850	5225	14220	8975	420	1421	2689	36800
Puge	5,100	9250	9060	11990	1872	2510	6225	46007
Nyasa	9,680	15525	16445	12713	6260	7626	5891	74140
Bukene	3,480	10545	11760	4540	2976	2028	6426	41755
Sub-Total	**22,110**	**40545**	**51485**	**38218**	**11528**	**13585**	**21231**	**198702**
District Total	**180,900**	**179657**	**155815**	**158418**	**65639**	**96384**	**197,182.50**	**1033996**
Percent	**17.5**	**17.4**	**15.1**	**15.3**	**6.3**	**9.3**	**19.1**	**100.0**

Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009



Production Trend of Major Food Crops by Division; Nzega District, 2008/0
Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009

Table: Estimated Area (Ha) under Major Cash Crops by Division, Nzega District, 2002/03 – 2008/09

Division/Crop	**2002 / 2003**	**2003 / 2004**	**2004 / 2005**	**2005 / 2006**	**2006 / 2007**	**2007 / 2008**	**2008 / 2009**	**Total**	**Yearly Average**	**% of the Total Area**
Cotton										
Mwakalundi	318	12.5	18.5	19	0	5	4.5	377.5	53.9	18.3
Puge	..	..	..	..	..	..	..	..	..	..
Nyasa	120	160	206	271	171	308.1	380	1616	230.9	78.4
Bukene	50	10.5	2.5	3.5	1.6	0	0	68.1	9.7	3.3

Sub-Total	**488**	**183**	**227**	**293.5**	**172.6**	**313.1**	**384.5**	**2062**	**294.5**	**100.0**
Sunflowers										
Mwakalundi	..	..	..	..	..	..	..	..	..	..
Puge	284	167	414	573	1057	1157	1592	5244	749.1	53.9
Nyasa	340.5	388	482.5	501	577	914	1277	4480	639.9	46.1
Bukene	..	..	..	..	..	..	..	..	..	..
Division/Crop	**/ 2002 2003**	**/ 2003 2004**	**/ 2004 2005**	**/ 2005 2006**	**/ 2006 2007**	**/ 2007 2008**	**/ 2008 2009**	**Total**	**Yearly Average**	**% of the Total Area**
Sub-Total	**624.5**	**555**	**896.5**	**1074**	**1634**	**2071**	**2869**	**9724**	**1389.1**	**100.0**
Groundnuts										
Mwakalundi	..	..	..	..	..	..	..	..	..	..
Puge	2648	2501	3017	2995	2641	4254	3241	21297	3042.4	68.1
Nyasa	984	1271	1349	1388.2	1507.8	1842	1648	9990	1427.1	31.9
Bukene	..	..	..	..	..	..	..	..	..	..
Sub-Total	**3632**	**3772**	**4366**	**4383.2**	**4148.8**	**6096**	**4889**	**31287**	**4469.6**	**100.0**
Tobacco										
Mwakalundi	..	..	..	..	..	..	..	..	..	..
Puge	103	368	296	392	358	321	467	2305	329.3	100
Nyasa	..	..	..	..	..	..	..	..	..	..
Bukene	..	..	..	..	..	..	..	..	..	..
Sub-Total	**103**	**368**	**296**	**392**	**358**	**321**	**467**	**2305**	329.3	**100.0**
Grand Total	**4847.5**	**4,878**	**5,785.50**	**6,147.70**	**6,313.40**	**8,801**	**8,609**	**45,377**	**6,482.40**	**100.0**

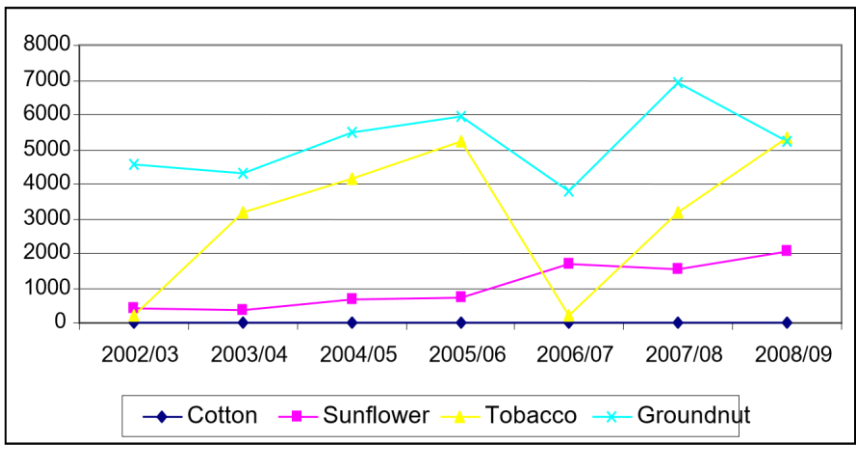
Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009 Data was not available

Table Estimated Production of Major Cash Crops (Tons) by Division, Nzega District, 2002/03-2008/09

Division/Crop	**/ 2002 2003**	**/ 2003 2004**	**/ 2004 2005**	**/ 2005 2006**	**/ 2006 2007**	**/ 2007 2008**	**/ 2008 2009**	**Total**	**Yearly Avera % of Distri ct**	
Cotton										
Mwakalun	..	5.6	7.4	3.5	1.2	2.75	1.4	21.85	3.1	
Puge	..	..	..	..	..	..	..	..	..	
Nyasa	..	..	..	3.4	..	1.5	0.4	5.33	0.8	
Bukene	25	10.5	2.5	3.1	1.8	..	..	42.9	6.1	
Sub-Total	**25**	**16.1**	**9.9**	**10**	**3**	**4.3**	**1.8**	**70.1**	**10**	**0.1**
Sunflowers										
Mwakalun	2.8	8.3	13.7	2.9	9.5	5.9		**43.1**	**6.2**	

Puge	338.4	279	503.4	480	921	982.2	1498.2	5002.2	**714.6**	
Nyasa	80.9	94	160.7	203.2	771	530	569.2	2409	**344.1**	
Bukene	..	..	..	7	8.5	7.8	6	29.3	**4.2**	
Sub-Total	**422.1**	**381.3**	**677.8**	**693.1**	**1710**	**1525.9**	**2073.4**	**7483.6**	**1069.1**	**11.4**
Tobacco										
Mwakalun	..	..	..	..	..	..	..	..	..	
Puge	216	3177.5	4150.2	5191	180	3146	5314	21374.7	3053.5	
Nyasa	..	..	..	..	..	..	..	..	..	
Bukene	..	..	..	46.8	22	17	41	126.8	18.1	
Sub-Total	**216**	**3177.5**	**4150.2**	**5237.8**	**202**	**3163**	**5355**	**21501.5**	**3071.6**	**32.9**
Groundnuts										
Mwakalun	..	97.5	68.4	10.46	48.8	58.8	104.8	388.8	55.5	
Puge	1,982.6	1,308.6	1,652.40	1,579.80	1,398.6	3,134.00	1,795.80	12,851.8	1836	
Nyasa	2534.2	2858	3714.3	4327.3	2356.3	3738.2	3271.4	22799.7	3257.1	
Bukene	68	48.6	38	52	16.5	8.2	37.5	268.8	38.4	
Sub-Total	**4,584.8**	**4,312.7**	**5,473.10**	**5,969.60**	**3,820.2**	**6,939.20**	**5,209.50**	**36,309.1**	**5187**	**55.5**
District	**5,247.9**	**7,887.6**	**10,311.0**	**11,910.5**	**5,735.2**	**11,632.4**	**12,639.7**	**65,364.3**	**9,337.8**	**100.**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009



Production (tonnes) Trend of Major Cash Crops by Division; Nzega District, 2008/09

Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009

Irrigation

Lack of good number of sizeable permanent water bodies accompanied with low rainfall has affected irrigation development. The district needs dams to support agriculture since the few existing dams are severely damaged

and holds insufficient water for a short span of time. Only about 19 out of 151 villages (about 10% of the population) benefit from the dams which normally dries out a few months after the rains due to siltation and livestock trampling and are mainly intended for rice farming. Potential horticultural crops which can be cultivated for a short time and generate superior income and benefits cannot be cultivated in the rice schemes. Hence strategic water harvesting schemes are still needed

Table: List of Dams by Division and their Main Use, Nzega District, 2015

Division/Dam	Status	Capacity (M^3)	Estimated Number of Beneficiaries (Villages)	Activity/Use
Puge				
Budushi	Few months	628,779	2	Paddy irrigation
Nkiniziwa	Few Months	750,000	2	
Nyasa				
Kilimi	Few Months	3,500,000	5	Domestic and fishing activities
Uchama	Few Months	1,328,700	2	
Bukene				
Kamanhalan	Under construction	2,400,000	3	Paddy irrigation
Ikindwa	Few Months		1	
Malolo	Few Months	930,000	2	
Mwakalundi				
Itobo	Few Months		3	Domestic and fishing
Total		**9,537,479**	**19**	

Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009

Table Availability of Improved Seeds (Tonnes), Nzega District, 2006/07-2008/09

Type of Improved seeds	2006/07			2007/08			2008/09		
	Demand	Supplied	Distributed	Demand	Supplied	Distributed	Demand	Supplied	Distributed
Maize	50	40	40	50	22.8	22.8	50	38	38
Sorghum	10	1.8	1.8	10	68	68	10	4	4
Sunflower	40	0	0	40	16	16	40	0.5	0.5
Tobacco	4	3.5	3.5	4	4	4	4	3.5	3.5
Cotton	50	50	50	60	60	60	80	57	57
Total	**154**	**95.3**	**95.3**	**164**	**170.8**	**170.8**	**184**	**103**	**103**

Source: District Executive Director's Office (Agriculture Department), Nzega District, 2009

Livestock

Livestock keeping is the second most important economic activity after agriculture in Nzega district. The main type of livestock kept in Nzega are cattle, goat, sheep, pigs and poultry.. The table that follow below shows the district's livestock population data for the year 2009. Over the years, CBPP and Newcastle diseases have affected Cattle and Poultry.

Table Estimated Livestock Population by Division; Nzega District, 2009

Division	Cattle	Goats	Sheep	Pigs	Poultry
Nyasa	169,172	73,352	16,237	1213	43446
Bukene	104,532	41236	9069	58	39,758
Mwakalundi	91,141	32001	9131	161	49,164
Puge	97176	50,304	12,620	456	63,089
Grand Total	**462,021**	**196,893**	**47,057**	**1,888**	**195,457**

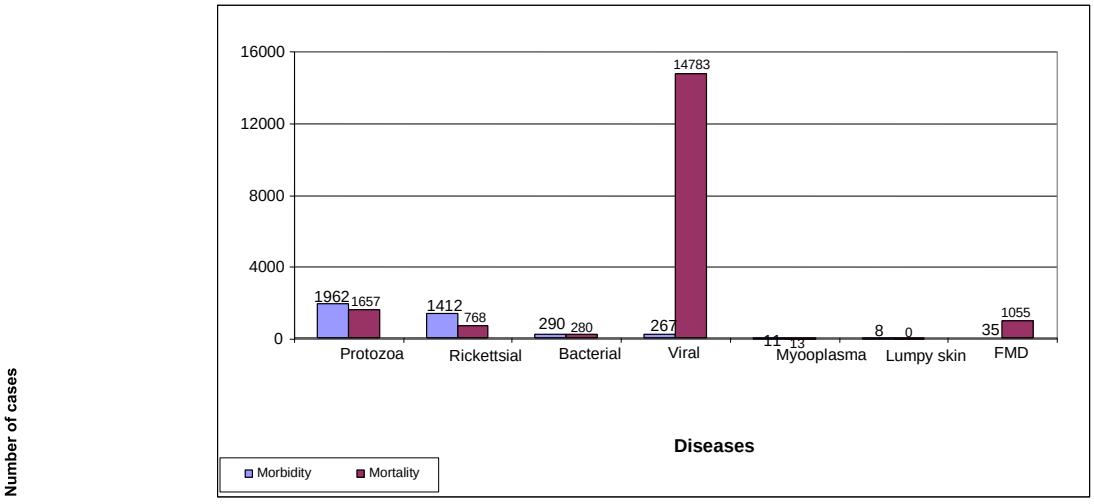
Source: District Executive Director's Office (Agriculture and Livestock Department), Nzega District, 2009

Table Morbidity and Mortality of Major Disease Reported, Nzega District, 2009

Type of Diseases	Morbidity Cases		Mortality Cases reported	
	2009	Percentage of the District Total	2009	Percentage of the District Total
Protozoa Diseases				
Theileriosis	1,230	49.2	1,153	8.9
Red water (Babesiosis)	663		384	
Coccidiosis	69		120	
Sub-Total	**1,962**		**1,657**	
Rickettsial Disease				
Anaplasmosis	1,017	35.4	520	4.1
Heart water	395		248	
Sub-Total	**1,412**		**768**	
Bacterial Diseases				
Bklackquarter	86	7.3	121	1.5
Pneumonia	19		42	
Footrot	10		-	
Type of Diseases	**Morbidity Cases**		**Mortality Cases reported**	
	2009	**Percentage of the District Total**	**2009**	**Percentage of the District Total**
Fowl Typhoid	69		36	
Fowl Pox	92		39	
White Bacillary Diarrhoea	8		36	
Fowl Cholera	6		6	
Sub-Total	**290**		**280**	

Viral Diseases				
Newcastle	245	6.7	14,761	79.7
Rabies	22		22	
Sub-Total	**267**		**14,783**	
Myooplasma Diseases				
Contagious	**11**	0.3	**13**	0.1
Sub-Total	**11**		**13**	
Lumpy skin Diseases	**8**	0.2	**-**	-
FMD (Foot and Mouth	**35**	**0.9**	**1,055**	**5.7**
District Total Cases	**3,985**	**100**	**18,556**	**100.0**

Source: District Executive Director's –2009



Morbidity and Mortality of Major Disease Reported, Nzega District, 2009
Source: District Executive Director's Office Nzega District, 2009

Though the district has ample land for grazing livestock, none of it has been surveyed. If the size of the grazing land is quantified or surveyed, environmental management programs could easily be introduced to balance grazing land with the number of livestock. According to the available information from agricultural extension officers in the district, Puge has the best and largest grazing land followed by Bukene and Mwakalundi divisions. Nyasa division has the smallest area of grazing land because of being within Nzega Mjini.

Grazing land is under threat due to critical shortage of rainfall

Table : Marketed Livestock by Type and Market Value (Official Markets), Nzega district, 2009

Livestock	Livestock sold	Percent	Amount earned (000)	Percent Earned	Average Price (Tshs.)
Cattle					
Mwakalundi	8,071	27.8	1,667,665	26.4	206,624.3
Puge	13,109	45.1	3,050,003	48.3	232,664.8
Nyasa	3,992	13.7	821,519	13	205,791.3
Bukene	3,895	13.4	781,241	12.4	200,575.4
Sub-Total	**29,067**	**100.0**	**6,320,428**	**100.0**	**217,443.4**
Goats					
Mwakalundi	2,456	24.0	63,017	23.8	25,658.4
Puge	4,509	44.0	118,368	44.8	26,251.5
Nyasa	2,720	26.5	69,355	26.2	25,498.2
Bukene	563	5.5	13,512	5.1	24,000.0
Sub-Total	**10,248**	**100.0**	**264,252**	**100.0**	**25,785.7**
Sheep					
Mwakalundi	726	24.8	15,514	24.5	21,369.1
Puge	1,134	38.7	24,846	39.3	21,910.1
Nyasa	772	26.3	16,374	25.9	21,209.8
Bukene	298	10.2	6,556	10.4	22,000.0
Sub-Total	**2,930**	**100.0**	**63,290**	**100.0**	**21,600.7**
Grand Total	**42,245**		**6,647,970**		

Source: District Executive Director's Office – 2009

Table The Number of Livestock Hides and Skins Marketed in Puge division, 2005, 2007 and 2009

Division	Total Number of Units	Total Value in Tshs.

	2005	2007	2009	Total	2005	2007	2009	Total	Average Price
Puge									
Cattle	14,87	6,026	5,498	26,400	32,088,20	157,224,3	4,445,35	193,757,8	7339.3
Goat	23,51	5,421	5,442	34,379	10,856,83	3,096,830	1,088,86	15,042,52	437.5
Sheep	5,520	2,232	2,494	10,246	1,975,550	958,700	459,700	3,393,950	331.2
Total	**43,91**	**13,67**	**13,43**	**71,025**	**44,920,59**	**161,279,8**	**5,993,91**	**212,194,3**	

Source: District Executive Director's Office – 2009

Table Production of Milk by Division, Nzega District, 2004, 2005 and 2006

Livestock	Number of Litres				Total Value (Tshs)			
	2004	2005	2006	Total	2004	2005	2006	Total
Nyasa								
Indigenous	58331	91942	211190	8,069,200	16,104,400	42,238,000	58,331	91942
CattleDairy Cattle	-	-	-	-	-	-	-	-
Dairy Goats	-	-	-	-	-	-	-	-
Sub-Total	**58331**	**91942**	**211190**	**8,069,200**	**16,104,400**	**42,238,000**	**58,331**	**91942**
Puge								
Indigenous	50,125	61138	24,305	6,479,500	10,181,200	4,861,000	50,125	61138
CattleDairy Cattle	-	-	-	-	-	-	-	-
Dairy Goats	-	-	-	-	-	-	-	-
Sub-Total	**50,125**	**61138**	**24,305**	**6,479,500**	**10,181,200**	**4,861,000**	**50,125**	**61138**
Mwakalundi								
Indigenous	52,240	61706	51,000	7,074,000	12621200	10,200,000	52,240	61706
CattleDairy Cattle	-	-	-	-	-	-	-	-
Dairy Goats	-	-	-	-	-	-	-	-
Sub-Total	52,240	61706	51,000	7,074,000	12621200	10,200,000	52,240	61706
Bukene								
Indigenous	56,889	80,991	48,614	7,202,500	13,523,400	9,722,800	56,889	80,991
CattleDairy Cattle	-	-	-	-	-	-	-	-
Dairy Goats	-	-	-	-	-	-	-	-
Sub-Total	56,889	80,991	48,614	7,202,500	13,523,400	9,722,800	56,889	80,991
Grand Total	**217,585**	**295,777**	**335,109**	**28,825,200**	**52,430,200**	**67,021,800**	**217,585**	**295,777**

Source: District Executive Director's Office (Agriculture and Livestock Department), Nzega District, 2009

Natural resources

The natural resources sector is comprised of various sub-sectors including forestry, fisheries, bee - keeping and wildlife. This sector is very important in the contribution to social and economic development of the district. According to the 2002 Population and Housing Census and this Nzega District Profile, the sector provides employment to about 16.7 percent of the total labour force in the district. Apart from economic gains, the sector also plays an important role in the maintenance of climate stability, conservation of water sources, soil fertility, controlling land erosion, and providing sources of wood fuel, industrial materials and non - wood products such as honey and bees - wax.

Forestry

Land and forest resources are the main natural endowments of Tanzania. However, it has been noticed that the country's forest area has been declining. Nzega district being part of Tanzania also experiences this problem. Causes of this decline are mainly heavy pressure from agricultural expansion, livestock grazing, wildfires, over exploitation of wood resources for various purposes and other human activities. Examples of valuable forest species found in the district are Mmenga, Eucalyptus, Albizia and Acacia.

Table: Forest Reserves by Division, Nzega District, 2009

Division	Name of Forest Reserves	Total Area Occupied (Ha)	Percentage of the District Total
Nyasa	Mwanhala	2,81	
	Mwakulu	12	
	Kagon'ho	3,956	
Sub-Total		**6,784**	**1.6**
Puge	Puge North	3027	
	Puge South	2560	
	Igombe river*	18,800	
Sub-Total		**24,387**	**5.7**
Bukene	Karitu	37,120	
	Ilomero Hills*	348,162	
Sub-Total		**385,282**	**89.7**
Mwakalundi	Itobo dam	75	
	Mwakalundi	13,056	
Sub-Total		**13,131**	**3.1**
District Total		**429,584**	**100.0**

Source: District Executive Director's - 2009

* Reserves are in both Puge and Bukene divisions

Table Estimated Value of Timber/Poles Harvested (Tshs. '000') by Division, Nzega District, 2004/05 – 2008/09

Division	2004/05	2005/06	2006/07	2007/08	2008/09	Total	Annual average	Percentage share
Nyasa	6,000	3,600	3,000	2,400	4,048	19,048	3809.6	18.8
Puge	7,200	6,600	6,000	4,800	4,000	28,600	5720	28.3
Bukene	335	200	1,500	30,000	6,250	38,285	7657	37.9
Mwakalundi	5,400	4,800	1,900	1,100	2,000	15,200	3040	15.0
Total	**18,935**	**15,200**	**12,400**	**38,300**	**16,298**	**101,133**	**20,226.60**	**100.0**

Source: District Executive Director's Office – 2009

Table Estimated Value of Charcoal (Tshs) by Division, Nzega District, 2004/05 – 2008/09

Division	2004/05	2005/06	2006/07	2007/08	2008/09	Total	Annual Average	Percentage Share
Nyasa	2,955,402	1,382,573	6,217,846	4,031,077	8,056,000	22,642,898	4528580	30.1
Bukene	3,201,685	1497788	5,052,000	4,367,000	2,800,000	16,918,473	3383695	22.5
Puge	2,845,942	1331367	4,490,667	5,822,667	3,100,000	17,590,643	3518129	23.4
Mwakalundi	3,940,535	1,843,431	4,663,385	2,687,385	5,000,200	18,134,936	3626987	24.1
Total	**12,943,564**	**6,055,159**	**20,423,898**	**16,908,129**	**18,956,200**	**75,286,950**	**15057390**	**100.0**

Source: District Executive Director's - 2009

Fisheries

Table Fishery Resource Facilities and Production by Ward, Nzega District, 2006/07

Ward	No. of Fishing licenses	No. of Fishermen	No. of Registered Fishing Vessels	Fish Production		
				Weight (Kgs)	Value (Tshs '000')	Average Price (Tshs)
Nkiniziwa	20	26	12	5,318	10,636	2,000
Nzega Ndogo	33	38	18	6,120	12,240	2,000
Miguwa	19	25	13	2,503	5,006	2,000
Ikindwa	8	9	-	257	514	2,000
Itobo	4	7	-	89	178	2,000
Isanzu	16	23	15	864	1,728	2,000
Total	**100**	**128**	**58**	**15,151**	**30,302**	**2,000**

Source: District Executive Director's - 2009

Table Revenue Collection from Fishermen (TShs) by Ward, Nzega District, 2004/05 – 2008/09

Ward	2004/5	2005/6	2006/7	2007/8	2008/9	Total	Annual average	Percentage share

Nkiniziwa	120,000	160,000	200,000	210,000	230,000	920,000	184,000	20.6
Nzega Ndogo	200,000	240,000	330,000	340,000	300,000	1,410,000	282,000	31.6
Miguwa	150,000	140,000	190,000	150,000	200,000	830,000	166,000	18.6
Ikindwa	60,000	70,000	80,000	70,000	80,000	360,000	72,000	8.1
Itobo	20,000	30,000	40,000	50,000	40,000	180,000	36,000	4
Isanzu	140,000	120,000	160,000	180,000	160,000	760,000	152,000	17
Total	**690,000**	**760,000**	**1,000,000**	**1,000,000**	**1,010,000**	**4,460,000**	**892,000**	**100**

Source: District Executive Director's - 2009

Beekeeping

Table : Number of Traditional and Modern Beehives by Division, Nzega District, 2005 – 2009

Division	**2005**	**2006**	**2007**	**2008**	**2009**	**Total**
Traditional						
Bukene	9,200	11,000	13,427	16,560	21,000	71,187
Nyasa	6,750	7,600	462	5,640	7,000	27,452
Puge	2,000	1,100	7,485	2,000	4,150	16,735
Mwakalundi	414	500	1,489	242	2,325	4970
Sub-Total	**18,364**	**20,200**	**22,863**	**24,442**	**34,475**	**120,344**
Modern						
Bukene	0	0	0	0	0	0
Nyasa	0	0	0	32	308	340
Puge	0	0	0	0	0	0
Mwakalundi	0	0	0	0	5	5
Sub-Total	**0**	**0**	**0**	**32**	**313**	**345**
Grand Total	**18,364**	**20,200**	**22,863**	**24,474**	**34,788**	**120,689**

Source: District Executive Director's - 2009

Apiculture is still dominated by traditional beehives in Nzega district, 2015

Table: Production Levels of Bee - Products by Division, Nzega District, 2005 – 2009

Division	Total from 2005 - 2009			
	Honey (Kg)	Percentage	Bees wax (Kg)	Percentage
Bukene	10,120	40.0	4,240	40.0
Puge	7,590	30.0	3,180	30.0
Nyasa	5,060	20.0	2,120	20.0
Mwakalundi	2,530	10.0	1,060	10.0
Total	**25,300**	**100.0**	**10,600**	**100.0**

Source: District Executive Director's - 2015

Table: Levels of Amount Earned from Bee-Products by Division, Nzega District

Division	Amount Earned from 2005 - 2009 by			
	Honey		Bee - wax	
	Tshs	Percentage	Tshs	Percentage
Bukene	10,120,000	40.0	7,800,000	40.0
Puge	7,590,000	30.0	5,850,000	30.0
Nyasa	5,060,000	20.0	3,900,000	20.0
Mwakalundi	2,530,000	10.0	1,950,000	10.0
Total	**25,300,000**	**100.0**	**19,500,000**	**100.0**

Source: District Executive Director's - 2009

Water Supply and Sanitation

In rural areas unprotected wells account for about 79 per cent of water supplies followed by protected wells with 15 percent. In urban areas 54 per cent of households used unprotected wells as the main source of drinking water. The figure below shows the proportion of water sources indicating a significant percentage of availability of bore holes. During the consultations however the situation observed was not the case and this could be because this figure is based on data before 2009 where some of the boreholes can be malfunctioning by now. In 2005, only 10.5 percent of the 412,709 people had access to clean and safe water in Nzega district. The percentage of people getting clean water increased to 12.4 percent in 2007 and reached to 20.1 percent in 2009.

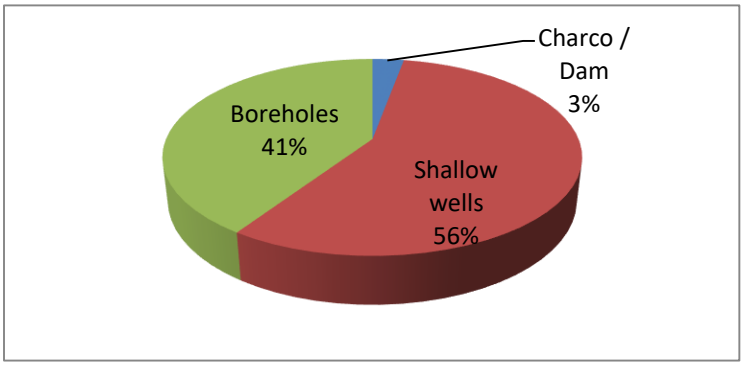


Figure: Proportion of Sources of rural water sources, Nzega District 2009

Table: Number and Type of Rural Water Supply Sources by Ward; Nzega District, 2009

Ward	Number of Villages	Source of Water				Water Sources Village Ratio
		Charcoal/ Dam	Shallow wells	Boreholes	Total	
Puge Division					2	
Puge	**3**	0	10		12	4
Nkiniziwa	4	2	2	1	5	1.3
Budushi	2	1	0	1	2	1
Mwakanshahala	5	0	0	26	26	5.2
Tongi	5	0	7	1	8	1.6
Mizibaziba	4	0	3	1	4	1
Milambo Itobo	4	0	0	0	0	0
Magengati	5	0	6	0	6	1.2
Ndala	4	0	0	3	3	0.8
Sub-Total	**36**	**3**	**28**	**35**	**66**	**1.8**
Nyasa Division	2		3		9	
Nzega Mjini		0			12	6
Wela	4	0	0	4	4	1
Mbogwe	2	1	12	4	17	8.5
Miguwa	6	1	14	4	19	3.2
Itilo	3	0	0	0	-	0
Muhugi	3	0	7	0	7	2.3
Utwigu	7	1	11	2	14	2
Ijanija	5	2	0	2	4	0.8
Nzega ndogo	2	1	5	10	16	8
Lusu	6	0	1	18	19	3.2
Nata	5	1	1	13	15	3
Isanzu	6	0	0	2	2	0.3
Sub-Total	51	**7**	**54**	**68**	**96**	**1.9**
Mwakalundi Division						
Itobo	3	1	0	0	1	0.3
Mwangoye	6	0	10	4	14	2.3

Sigili	4	0	0	1	1	0.3
Mwamala	6	0	16	0	16	2.7
Igusule	4	0	1	17	18	4.5
Shigamba	2	0	0	0	-	0
Kasela	4	0	18	0	18	4.5
Ward	**Number of**	**Source of Water**			**Water Sources**	
Karitu	4	0	5	0	5	1.3
Sub-Total	**33**	0	50	22	**72**	2.2
Bukene Division						
Bukene	1	**0**	**6**	**3**	9	**9**
Mogwa	4	0	15	0	15	3.8
Mambali	8	0	5	41	46	5.8
Kahamanhalaga	4	1	21	0	22	5.5
Uduka	3	0	25	0	25	8.3
Semembela	4	0	0	0	-	0
Isagenhe	4	0	5	0	5	1.3
Ikindwa	3	1	26	0	27	9
Sub-Total	**31**	**2**	**103**	**44**	**149**	**4.8**
Grand Total	**151**	**12**	**235**	**169**	**383**	**2.5**

Source: District Executive Director's Office (Water Supply and Sanitation n Department), Nzega District, 2015

Table: Water Supply Coverage of the Population by Ward and by year, Nzega District, 2005, 2007 and 2009

Ward	2005			2007			2009		
	Estimated Population	Estimated Population Covered	Percent Covered	Estimated Population	Estimated Population Covered	Percent Covered	Estimated Population	Estimated Population Covered	Percent Covered
Nyasa Division									
Nata	13,899	3,500	25.2	14,834	3,500	23.6	15,833	3,500	22.1
Utwigu	19,654	1,250	6.4	21,058	1,500	7.1	22,542	2,750	12.2
Muhugi	11,629	500	4.3	12,480	500	4	13,381	1,750	13.1
Wela	6,285	500	8	6,742	500	7.4	7,229	1,000	13.8
Ijanija	7,896	500	6.3	8,432	500	5.9	9,013	500	5.5
Mbogwe	6,034	1,250	20.7	6,450	1,250	19.4	6,910	2,500	36.2
Miguwa	13,134	2,500	19	14,008	2,500	17.8	14,998	4,000	26.7
Lusu	18,059	6,250	34.6	19,347	6,250	32.3	20,695	6,250	30.2
Isanzu	12,007	500	4.2	12,802	500	3.9	14,122	500	3.5
Nzega Ndogo	7,532	2,000	26.6	8,040	2,000	24.9	8,582	3,500	40.8
Itilo	11,553	250	2.2	12,326	250	2	13,161	250	1.9
Sub-Total	**127,682**	**19,000**	**14.9**	**136,519**	**19,250**	**14.1**	**130,633**	**26,500**	**20.3**

Bukene Division									
Ikindwa	10,116	1,250	12.4	10,809	2,750	25.4	11,549	6,500	56.3
Isagenhe	8,795	0	0	8,425	0	0	10,086	1,250	12.4
Kahamanhalaga	12,286	250	2	13,160	2,000	15.2	14,103	5,250	37.2
Semembela	14,877	1,250	8.4	15,953	0	0	17,084	0	0.0
Uduka	4,938	0	0	5,286	1,500	28.4	5,632	5,000	88.8
Mambali	27,669	250	0.9	29,647	3,000	10.1	31,780	11,500	36.2
Mogwa	12,093	0	0	12,952	0	0	13,866	3,750	27.0
Sub-Total	**90,774**	**3,000**	**3.3**	**96,232**	**9,250**	**9.6**	**104,100**	**33,250**	**31.9**
Mwakalundi Division									
	2005			**2007**			**2009**		
Ward	**Estimated Population**	**Estimated Population Covered**	**Percent Covered**	**Estimated Population**	**Estimated Population Covered**	**Percent covered**	**Estimated Population**	**Estimated Population Covered**	**Percent covered**
Mwamala	15,205	1,000	6.6	16,250	4,000	24.6	17,383	4,000	23.0
Kasela	9,068	500	5.5	9,684	500	5.2	10,341	4,500	43.5
Mwangoye	13,462	3,750	27.9	14,349	3,750	26.1	15,280	3,250	21.3
Shigamba	4,771	2,250	47.2	5,073	2,250	44.4	5,413	0	0.0
Karitu	7,952	1,500	18.9	8,485	1,500	17.7	9,053	1,250	13.8
Itobo	10,196	2,750	27	9,537	2,750	28.8	10,189	2,750	27.0
Sigili	10,339	250	2.4	11,046	250	2.3	11,804	250	2.1
Igusule	15,854	5,250	33.1	16,971	5,250	30.9	18,157	5,250	28.9
Sub-Total	**86,847**	**17,250**	**19.9**	**91,395**	**20,250**	**22.2**	**97,620**	**21,250**	**21.8**
Puge Division									
Mizibaziba	10,894	1,000	9.2	11,687	1,000	8.6	12,518	1,000	8.0
Tongi	14,469	250	1.7	15,503	250	1.6	16,600	1,500	9.0
Miramboitobo	10,196	0	0	10,925	0	0	11,721	0	0.0
M/shanhala	25,435	500	2	27,305	2,250	8.2	29,321	6,500	22.2
Budushi	4,943	250	5.1	5,308	250	4.7	5,686	250	4.4
Puge	12,474	1,250	10	13,349	1,250	9.4	14,286	2,750	19.2
Magengati	11,432	0	0	12,235	0	0	13,093	1,250	9.5
Nkiniziwa	17,563	750	4.3	18,829	750	4	20,159	750	3.7
Sub-Total	**107,406**	**4,000**	**3.7**	**115,141**	**5,750**	**5**	**123,384**	**14,000**	**11.3**
Grand Total	**412,709**	**43,250**	**10.5**	**439,287**	**54,500**	**12.4**	**471,570**	**95,000**	**20.1**

Source: District Executive Director's Office (Water Supply and Sanitation n Department), Nzega District, 2015

Table : Number of Village Water Committees and Village Water Funds by Ward, Nzega District, 2009

Ward	Number of Village	Village Water Committees	Village Water Funds	Total Funds (TShs.) as at 31/12/2007
Nyasa Division				
Nata	4	4	4	1,783,000
Utwigu	6	6	6	475,000
Muhugi	3	3	3	150,000
Wela	3	3	3	190,000
Ijanija	3	3	3	465,000
Mbogwe	2	2	2	280,500
Miguwa	6	6	6	400,000
Lusu	5	5	5	2,696,671.65
Isanzu	5	5	5	110,000
Nzega Ndogo	2	2	2	150,000
Itilo	3	3	3	472,000
Sub-Total	**42**	**44**	**42**	**7,172,172**
Bukene Division				
Ikindwa	3	3	3	50,000
Isagenhe	3	3	3	60,000
Kahamanhalaga	4	4	4	0.0.
Ward	**Number of Village**	**Village Water Committees**	**Village Water Funds**	**Total Funds (TShs.) as at 31/12/2007**
Semembela	4	4	4	100,000
Uduka	3	3	3	63,000
Mambali	5	5	5	3,511,000
Mogwa	3	3	3	0.0.
Sub-Total	**25**	**25**	**25**	**3,784,000**
Mwakalundi				
Kasela	4	4	4	220,000
Mwangoye	6	6	6	380,000
Shigamba	2	2	2	0.0.
Karitu	3	3	3	306,000
Itobo	3	3	3	55,000
Sigili	4	4	4	425,000
Igusule	4	4	4	882,500
Sub-Total	**32**	**32**	**32**	**3,078,500**
Puge Division				
Mizibaziba	3	3	3	198,000
Tongi	5	5	5	370,000
Miramboitobo	3	3	3	50,000
M/shanhala	3	3	3	100,000
Budushi	2	2	2	50,000
Puge	3	3	3	310,000
Magengati	5	5	5	300,000
Nkiniziwa	4	4	4	1,265,100

Sub-Total	**32**	**32**	**32**	**3,467,100**
Grand Total	**133**	**133**		**17,501,772**

Source: District Executive Director's Office (Water Supply and Sanitation Department), Nzega District, 2015

Women Protection and Development

Women suffer from custom influenced inferiority and their low status in the family circle. The absence of a significant number of women in leadership positions at various levels demonstrates this observation. The practice of high bride prices reduces women to economic objects for ownership by the highest bidder. Thus the majority of women are restricted to their traditional roles of child care takers, family cooks and housekeepers, firewood and water collectors and farm labourers.

Gender empowerment aims at ensuring that disadvantaged women fully participate in the policy and decisionmaking process and in all aspects of economic, socio-cultural and political life. Various measures have already been put in place to minimise time spent by women and girls in attending to home activities and thus allow them more time to participate in the above mentioned activities. These measures include the use of family planning, opening and operating day care centres, establishment of women economic groups, participation in SACCOS, CBOs and other cooperative activities. Economic empowerment of women through agriculture and making water and fuelwood available in proximity to their homes will further relieve them from the current hardships.

Annex 4 Project Designs for Project Components Annex 4.1:

Component 1- Project Design and Implementation for water harvesting infrastructures through rehabilitation of broken dams

Location	**Bahi, Manyoni, Igunga and Nzega districts**
Problem	Drought, runoff due to flooding, with no effective water harvesting interventions, water scarcity for agriculture, livestock and domestic use.
Deliverables for Adaptation and resilience to Climate change	Excavation of the silted dam to increase water storage capacity Restoration of broken embankment of the dam and Construction of spillway Installation of borehole for clean water
Beneficiaries	A total of 39 villages will benefit from this intervention with a total number of 126,503 people in the village and surrounding villages accessing this and animals accessing this water.
Budget	**$ 341,840**

Problem and vulnerability to Climate Change

During consultative process the team visited villages in four districts in the semiarid regions namely Bahi, Manyoni, Igunga and Nzega where the most climate change vulnerable villages were selected. These villages have common challenges requiring more or less the same approach to enhance adaptation to impacts of climate change.

In **Igunga District**, most of water facilities are dams, charcoal dams boreholes shallow wells, piped schemes, Domestic points, Cattle troughs and Rainwater harvesting schemes. The total number of people served with safe and clean water in rural areas is 191,065. This is equivalent to 30.9%; of actual requirement. There is a big demand for water harvesting and dams in order to facilitate water supply for domestic, agriculture and livestock use. Capacity building for community and district personnel is required to ensure sustainable governance of the water resources.

In **Nzega District**, Water scarcity if a serious socio-economic burden. The flat topography of the district has led to non-existence of a significant permanent drainage system is the main reason for unreliable surface water sources in the district. There is insignificant variation in the sources of water during wet and dry seasons and the proportion of households that used unprotected well in the wet season was 67.5 percent compared to 68.2 percent in the dry season. Unprotected well was the main source of drinking water in the district followed by the protected well with 8 percent for both wet season and dry season. In addition, lack of good number of sizeable permanent water bodies accompanied with low rainfall has affected irrigation development. The district needs dams to support agriculture since the few existing dams are severely damaged and holds insufficient water for a short span of time. Only about 19 out of 151 villages (about 10% of the population) benefit from the dams that normally dry out a few months after the rains due to siltation and livestock trampling and are mainly intended for rice farming. Potential horticultural crops which can be cultivated for a short time and generate superior income and benefits cannot be cultivated in the rice schemes. Hence strategic water harvesting schemes are still needed.

In **Bahi District**, There are very few permanent rivers and swamps/wetlands in the district. Both seasonal and permanent water resources in the district are very useful to the community as they provide water for domestic uses, livestock, irrigation, and act as fishing grounds. Rural water supply in the district for domestic use is still a development challenge. By 2015, the district has a total number of **164** water sources. There are **57** bore holes, **79** shallow wells, **2** Spring water, **24** rain water harvesting and **2** dams. To make water supply schemes sustainable **78 %** of all villages have water committees and water funds. Challenges are many and they are caused by lack of maintenance and rehabilitation of the water infrastructure, drought, floods and sharing of similar water points with livestock.

In **Manyoni District**, The main source of water domestic use in Manyoni is unprotected wells accounting for 47.1 Percent, followed by surface water 13.5 percent, Public tap/standpipe 13.3 Percent, Protected Dug Well 8.6 Percent, Tube Well/Borehole 5.6 Percent, Unprotected spring 3.7 Percent. While some villages in Manyoni have potential of 9,250ha potential area that can be utilized for irrigation purposes but only 1,318ha are utilized for irrigation equivalent to 14.2 percent and water is not available throughout the year. Traditional Irrigation is a local way system of irrigating commonly applied in small scale farming practiced along the rivers, lakes and dams. Traditional Irrigation is not practiced in most farming communities in Manyoni due to lack of water resources calling for efforts to establish water harvesting dams

Most of agriculture households are small scale farmers who have inadequate resources to invest in improved irrigation with only 8 irrigation Schemes available of which only a meager 1% of the district population. This is another factor which justify introduction of water harvesting technologies in the Districts

All selected districts therefore demonstrated a big demand for water harvesting and rehabilitation of dams in order to facilitate water supply for domestic, agriculture and livestock use. Capacity building for community and district personnel is required to ensure sustainable governance of the water resources. Inhabitants of these villages including neighboring communities depend on these dams as sole source of water during dry season for agriculture, livestock and domestic use. However, these dams are old with high siltation and broken dykes and spillways requiring major rehabilitations and repairs in order to allow increase in volume of water harvested

and stored. Because of these problems, the dams are not capable of retaining water for more than two months post rain season. This leaves the communities and surrounding villages more vulnerable to impacts of climate change. Restoration of the water-harvesting dams will give community access to water for livestock and agriculture. In addition, most of the water catchment for the dam comes as runoff from distant locations depending on topographic features on the landscape. This catchment collects muddy water contaminated with microbes thus not safe and clean enough for domestic use. Sanitatization and treatment of harvested water from the dams is technically and financially difficult and hence not sustainable under village conditions. In order to supply safe and clean water for domestic use, boreholes will be installed in selected needful villages in the same districts.

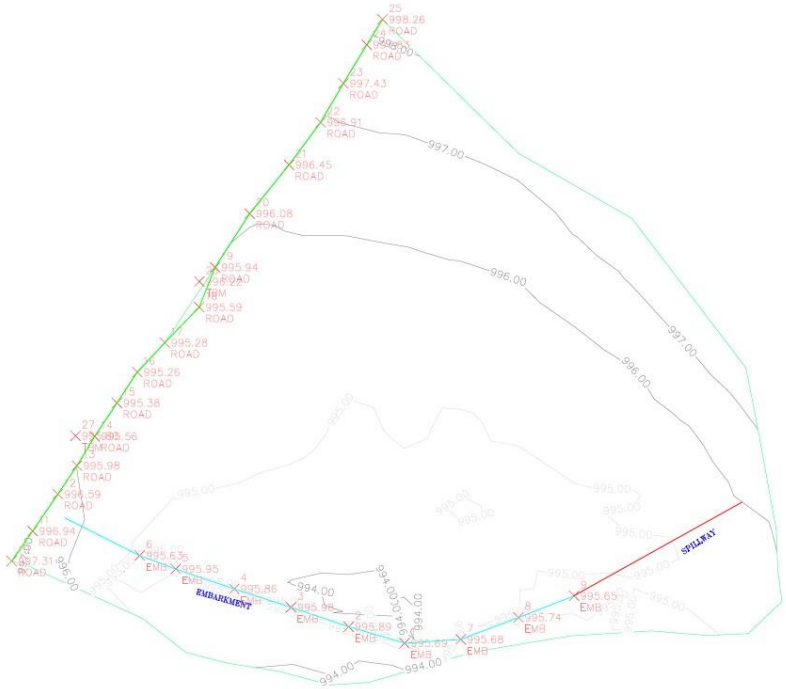
Annex Table: Number of selected project sites and respective beneficiaries by gender disaggregation

District	Villages Selected	Neighbouring villages beneficiaries to the dam	Females	Males	Number of Beneficiaries
Bahi District	Igubule	Nchimila, Ibugule, Mtitaa	7,946	7,335	15,281
	Mtitaa	Mtitaa, Mwitikira, Chibelela, Nyhinila, Nkhome	18,411	17,689	36,100
Manyoni District	Mkwese	Mkwese, Mpamaa, Stendi, Majengo, Miningaa, Tambukareli, Miomboni, Mbuyuni, Mjiti, Kinyika, Kinangali, Kamenyanga, Njirii.	3,209	3,132	6,341
Igunga District	Nguriti	Nguriti, Sungwizi, Ncheli, Mangugu, Mwamapalala, Mgunga, Bukoko, Chama,	15,393	13,650	29,043
		Nkinga			
Nzega District	Utwigu	Utwigu, Mwanhala, Iyombo, Isalalo, Ishike.	11,438	10,643	22,081
	Ntoba	Uhemeli, Kampala, Ntoba, Wita Mabisilo	9,394	8,263	17,657
		Total	65,790	60,713	126,503

Designing and Implementation

Real-Time Kinematics (RTK) instrument used in survey and topographic survey and design of the catchments for water harvesting

In each selected village one dam and borehole will be established. New topographic surveys and mapping will be established (Annex Figure 13:). Rehabilitation of the dam will involve reinforcement of the enmbankenment as detailed in the structural design of the dams (Annex Figure 14) excavation to remove deposited sand and clay so as to increase the depth. This work will involve important resources such as excavators, bulldozers, trucks, engineers and laborers. Reinforcing the area using concrete mortar and gravel reinforced with iron bars and wire mesh will repair spillways.



Annex Figure 13: Topographic outlines of the Ibugule dam for proper design of enforcement of embenkement and water storage capacity of the dam

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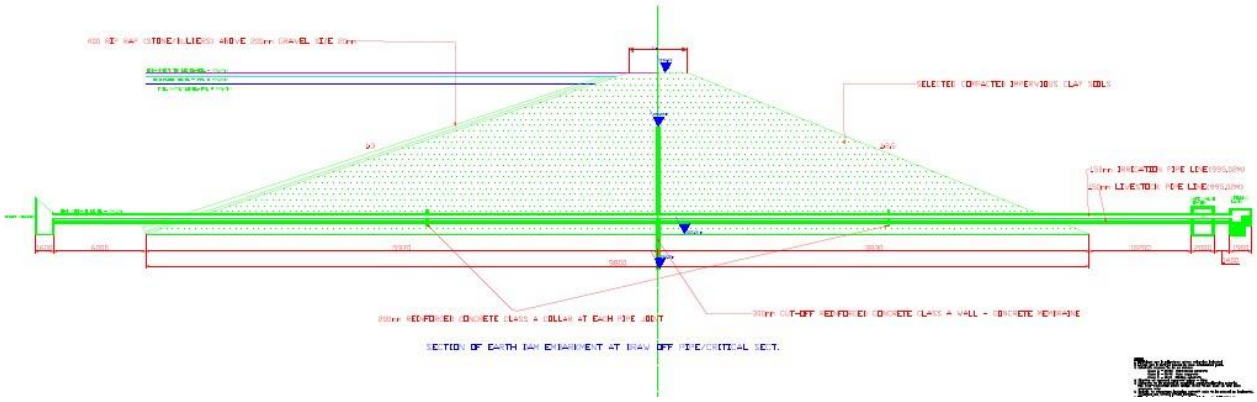
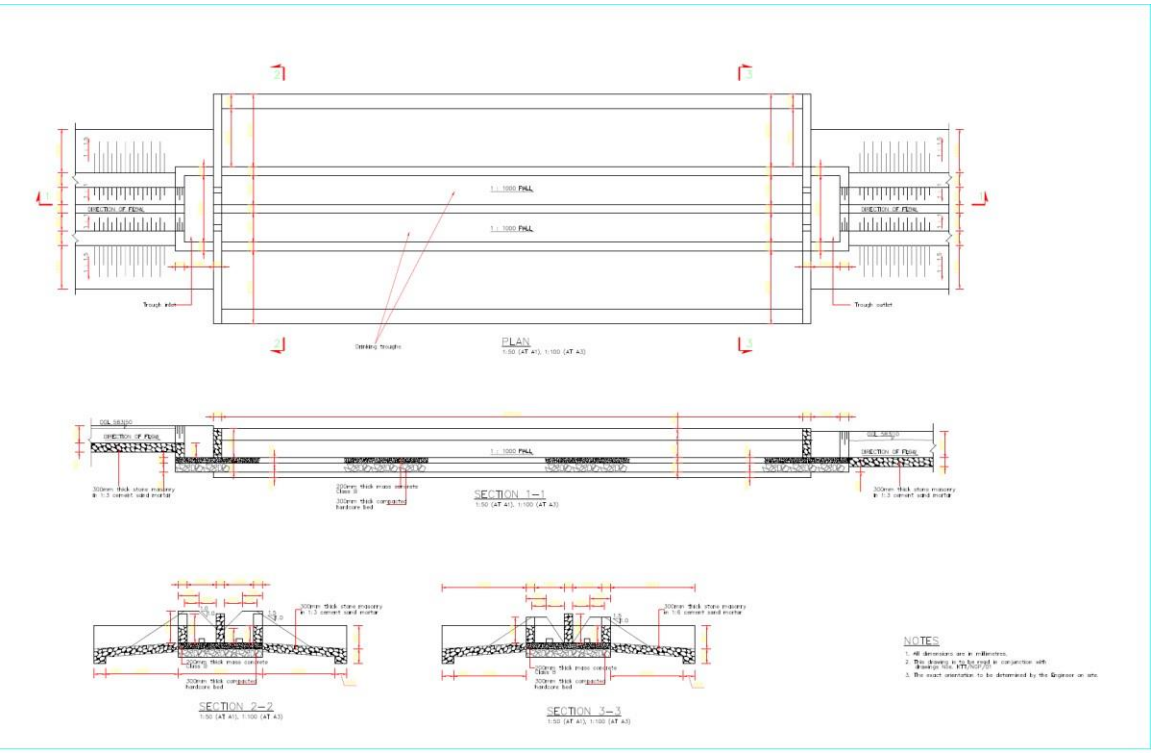


Annex Figure 14 Design of the embankment and water storage capacity of the Ibugule dam

To avoid direct use of water by livestock and farming activities from the dam that could cause extra contamination and avoidable damage to the dam a water gate and distribution channels will be installed. A water gate will be installed on one side of the dam to control water to be channeled to the livestock drinking points (Annex Figure 15:) and irrigation farms. From the water gate a concrete canal will be constructed direct the water to a distribution point. From this point some of the water will be pumped to an erected water tank placed strategically from which water will be used for drip irrigation to minimize loses. In addition, water will be channeled through smaller canals to deliver water to at least 2 animal drinking troughs.



Annex Figure 15: Project Design of livestock drinking troughs to be held by the dams to reduce direct use of water from the dams for animals

A borehole will be drilled and fitted with solar driven pump to serve clean water for domestic use (drinking, cooking, washing, etc). Hydrological surveys will identify appropriate points for drilling. Borehole drilling machines will be employed to drill at least 70 meters deep where there is enough water and fitted with delivery polyethylene pipes and solar driven pumping system. The water quality and safety for human consumption will be tested and certified by relevant agencies before use.

Key Risks & Safeguarding Issues

The key environmental and social issues associated with the rehabilitation of the dams for improved water harvesting are outlined in table below.

ENVIRONMENTAL AND SOCIAL SAFEGUARD COMPLIANCE	**RISK MITIGATION ACTIONS INCORPORATED IN THE DESIGN**
Compliance with the law Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.	The project will rehabilitate degraded dams and therefore no private land will be taken from farmers. In case of additional land requirements, village governments have pledged to provide for free. All interventions and their designs have no known conflict with the law. The project components and outputs align with many national legal and regulatory aspects including the main legal framework which is the Constitution of the United Republic of Tanzania as well as other laws and policies as described in part II section E of the

	proposal.
Access and Equity Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.	The project is participatory and will include women, youth, the elderly, and community leaders. They have participated in project design and will be engaged in implementation. The use of the harvested water for agriculture, livestock and domestic purposes will benefit all members of the community and especially the most affected and vulnerable groups who are women, children, elderly and disabled. Continued monitoring will be done during the project to ensure all social groups are able to participate fully and equitably so as to receive comparable social and economic benefits from the project
Marginalized and Vulnerable Groups Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.	Vulnerable women, youths, disabled, elderly and people living with HIV/AIDS receive special attention in implementation of the project. Water harvesting and the associated strategic interventions will not affect marginalized and vulnerable people. Their adaptation needs and vulnerabilities will be carefully analyzed and integrated in the implementation. Additionally, The project will empower vulnerable groups to make decisions on concrete adaptation measures, valuing their traditional and local knowledge. Periodic assessment of vulnerability status in project site/wards and village levels will be done. Environmental and Social Impact Assessment (ESIA) during screening phase, and compliance assessment during implementation will be done to ensure any potential risks are checked and amended
Human Rights Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.	The constitution and legal proclamations respect human rights and the interventions of this projects abides to all national and international laws

Gender Equity and Women's Empowerment Projects/programmes supported by the Fund shall be designed and implemented in such away that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.	The project team will comprise a gender expert will ensure that gender and women empowerment is central to all interventions. Provision of clean water for domestic use will reduce drudgery to women and girls who are normally tasked with the role of walking long distances to fetch water (Component 1). Tree planting will provide fuel woods near the households and relieve women and children from the hard labor of collecting wood far from where they live (Component 2). Income
	generation interventions will be given priority to women so as to empower them economically and eventually socially through involvement in decision-making processes in society (Component 3). All gender groups will be given equal opportunities to participate in the project activities
Core Labour Rights Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.	The project will ensure respect for international and national Labour laws as prescribed by the International Labour Organization. Personal protective equipment and all other safety regulations in accordance with Occupational, Safety and Health Authority (OSHA) will be provided and implemented accordingly. This will especially target workers and laborers involved in dam excavation, embankment and spillway repairs, afforestation activities, irrigation farming, aquaculture and apiculture interventions, as well as all other construction works. Wages and working hours will be instituted in accordance to the government guidelines.
Indigenous Peoples The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.	There is no specific national legislation on this aspect. However, there is no record of presence of indigenous people in the project areas but just traditional and tribes people with certain traditions that are largely influenced by other cultures including the western one. Nevertheless, the existing traditions, religious and tribal cultures in the project areas will be respected and incorporated in implementation. Their rights and way of life will be protected as a means to respect local traditions but also of ensuring total support from these immediate project recipients.

Involuntary Resettlement Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.	There will be no Involuntary Resettlement in this project. All land to be used for project activities is owned by the village government and was in the past designated for water harvesting.
Protection of Natural Habitats The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical	The project involves catchment conservation, water harvesting, afforestation and improved agriculture interventions. The project will result into restored vegetation and

natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.	rehabilitation of degraded landscapes and soils. All of these will lead to enhanced protection of the ecosystem hence the natural habitats and assets. Dam excavation and repair of embankments and spillways will take place in existing damaged dams, and therefore there is neither conversion nor degradation of natural habitats.
Conservation of Biological Diversity Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.	This project will involve afforestation using locally adapted species. This will avoid biodiversity risks associated with introduction of species from other areas. Should that be a necessity, such as local community demanding certain improved varieties of fruit species; thorough assessment will be done to ensure that the species does not have invasive behavior and other niche characters that may jeopardize biodiversity. Afforestation will restore the ecosystem while reducing soil erosion that degrades landscapes of semi arid areas. Birds, mammal and plant species are expected to increase and flourish hence improving biodiversity

Climate Change Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.	The proposed project will involve use of machinery and vehicles in construction of the dams and also outputs such as crop harvests may need vehicular transportation. Emissions from these activities are insignificant and are not expected to exacerbate climate change. On the contrary, it is the project outcomes that will lead to adaptation and mitigation of climate change. The vulnerability of semi arid communities to impacts of climate change will be reduced the integrated interventions of component 1-4 while the increased vegetation cover through component 2 will improve the national capacity in carbon sequestration.
Pollution Prevention and Resource Efficiency Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.	Component 4 is on Integrated Pest management (IMP), hence there will be minimal to non-use of fertilizers and pesticides. Manure produced by livestock will be used in fishponds and pasturelands while the water from the fishponds will be reused for gardening as irrigation and nutrient rich water. Solar is the proposed energy source to power water pumps. The machinery to be used in construction of dam infrastructure will use fuels and oils that if poorly handled and spilled may cause soil and water pollution. Machinery and vehicles can also cause noise and air pollution especially if old and unmaintained units are used. Despite
	these facts, pollution levels will still be very low and insignificant since the interventions are considered small scale. Oil and any other types pollutants will by no means be released to the environment. Also the project will ensure that contractors use new and well-maintained units. Any waste generated will be handled and disposed using standard procedures.
Public Health Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.	Clean and safe water from the boreholes will minimize water borne diseases in the community unlike the current sharing of water with livestock from the contaminated dam water resources. Products from the gardening, aquaculture, apiculture, livestock and fruit farming will diversify nutrition of the community thus improve health. The use of IPM technologies will significantly reduce use of pesticides and fertilizers; hence minimize release of contaminants to the environment and food chain and risking of human health.

Physical and Cultural Heritage Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.	All project activities will take place on pre existing dams, thus there is no evidence of physical, cultural or intangible heritage at the sites.
Land and Soil Conservation Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.	Adaptation interventions of component 2 (afforestation) and 3 (integrated interventions) will lead to restoration of degraded landscapes and soils. Capacity building in all 4 components of the project will enhance land and soil management capacities of local communities for sustainability. – Reduction of use of fertilizers and pesticides will minimize pollution of land, soil and associated components of semi arid landscapes.

Community Engagement

The local communities have been proactive and enthusiastic in requesting solutions to the climate change problems of floods and water scarcity. During the consultation meetings helped to identify the dam for rehabilitation and pledged to contribute labor force and other forms of support that will be required during the implementation of the project. SWAHAT will ensure continued engagement of local communities through active participation and solicitation of ideas and opinions from them. Priority of hiring will be given to the community for any available employment opportunity based on qualification.

Adaptation Benefits

A total of 126,503 people living in and around the project villages will benefit from increased water availability for enhanced resilience and productivity of agro-ecosystems goods and services. The water will be used for livelihood improvement through agriculture and horticulture (crop production), improved livestock husbandry, aquaculture, and improved forest ecosystem services. Safe and clean water will be available for the community through bore holes.

Budget ($ 341,840)

Activity	**Cost items**	**Cost (USD)**
Survey and designing	Labour	16,800
Excavation of the silted dam to increase water storage capacity	Machine and labour	44,000
Restoration of broken spillways and embankment of the dams	Machine and labour	209,040
Installation of borehole for clean water	Machine, Labour, and equipment	72,000
	Total	341,840

Annex 4.2

Component 2 - Project design and implementation for community fruits and forest trees' nurseries

Project sites: Nzega, Igunga, Manyoni, and Bahi

Major Output: Six community fruits and forest trees nurseries established with afforestation interventions for protection of water catchment.

Location	**Nzega, Igunga, Manyoni, and Bahi**
Problem	Climate change is contributing to land degradation and leading to deforestation of village forest reserves aggravated by drought and anthropogenic activities. Community lack seedlings supply, cannot afford expensive seedlings available from distant suppliers, start-up support for nursery establishment, the required nursery running skills and knowledge and how to handle and transport seedlings for transplantation
Deliverables for Adaptation and resilience to Climate change	Establishment of nurseries for forest and fruit trees species A number of fruits and forest tree seedlings made available for planting: mango, cashew, grapes, guava, oil palm, dates, avocado and citrus, and adapted forest species such as include Senna, *Azadirachta, Acacia, Cassia, Trichilia, Leucaena* and Moringa trees.
Beneficiaries	The Seedlings from six nurseries will be accessed by communities from the neighboring villages 12,000 Community members (especially women and youths) will benefit directly from production and sale of nursery fruits and tree seedlings. However the environmental benefits of afforestation will reach almost every community members (126, 503). Training will lead to increased knowledge on tree nursery management for increased alternative sources of income generation and reduction of land and forest degradation in the community landscape threated by climate change.
Budget (USD)	**155,020**

Problem and vulnerability to Climate Change

Climate change is causing severe land degradation, deforestation and loss of biodiversity leading to poor delivery of ecosystem services. In the semi arid regions of the project target areas, natural resources mainly forest trees and wild fruits have been significantly degraded by pressure of unsustainable utilization and impacts of climate change such as drought and heat. Semi-arid communities are therefore deprived of these important natural resources, which would have provided resilient, and sufficient ecosystem products and services necessary for adaptation to climate change. For semi-arid rural communities, unsustainable use of natural resources and environmental degradation inhibits future economic growth, exacerbates multidimensional poverty over time, and undermines the achievement of key development goals such as poverty reduction and food security. Drought, floods, temperature rise due to climate change has been the key drivers of unsustainable utilization of natural forest resources by the people in the semi arid community for survival. The forests and woodlands are threatened by increasing deforestation and degradation. The causes of deforestation include clearing for agriculture and settlements, overgrazing, wild fires, and charcoal making.

In addition, some forest areas are important water catchments supplying water to different regions, the loss of forest cover, as illustrated by deforestation of most of the semi arid forest tree cover have reduced water supply. Conservation and restoration of degraded natural forests to increase species diversity will have to be considered. The proposed project is expected to establish forest and fruit tree nurseries that will supply seedlings for afforestation and fruit trees planting in the landscape. During consultation visits in all of the selected project sites, it was revealed that majority of villagers especially women and children spend up to 8 hours walking a distance of 6 to 20 km per day in search and collecting firewood (Annex Figure 17:) indicating high level of

deforestation in the surrounding villages. It was also evident during consultation that no strategy was put in place for forest nurseries as intervention for deforestation and land degradation. Forest restoration is expected to reduce pressure in existing diminishing natural forest stands in the semi arid regions and thus enhancing availability of fuel-wood, construction materials, and animal fodder, ecosystem restoration and habitat integrity. Establishment of tree nurseries is expected to generate alternative income to local community youths. Farmers in the project sites lack sufficient knowledge on nursery techniques and therefore unaware of the opportunities associated with fruits and forest tree nursery business as an alternative source of income generation through sale of seedlings and products. Therefore there is a need to empower technologies and skills in this area in order to allow for increased resislience and adaptation capacity to impacts of climate change.

Designing and Implementation

One nursery will be established in each selected project site. The nursery will receive water from the established dams in each site for irrigation of seedlings. Selection and collection of of the best adapted tree species for semi arid areas will be carried out in a participatory manner where local communities and researchers will have to prioritize the types and number of trees species adapted to the local environments. This will be made based on further consultation with local communities and feasibility assessments. This activity will emphasize nursery interventions that will produce quality seedlings to be used for afforestation of the semi-arid landscapes as a way of counteracting deforestation, protecting the environment and meeting the ecosystem goods and services needs of the rural communities. Farmers Groups in the project sites will be trained on nursery techniques, establishment and management. Training will focus on seed and vegetative propagation methods and distribution of germplasm material. Although technologies on establishment, propagation and management of fruits and forest tree species exists, yet the challenge has been the lack of knowledge and access to these practices by the vulnerable rural community. The training will involve formulation of farmers' field schools and exchange visits in collaboration with other farmers, researchers and local institutions on establishment, propagation and management of fruits and forest tree species. Several species were mentioned as priority for forest and fruit tree species. Forest species included: *Acacia spp (various), Azadirachta indica, Cashew, Cupressa lustanica, Pinus patula, Leucaena leucocephaela, Mbukwe, Trichelia, Mfuku, Mgunga, Mhozolo, Migombwe, Milumba, Miyombo, Mjiha, Mkambala, Mkola, Mkole, Mkungugu, Mkuyu, Moringa oleifera, Mnguji, Mpogolo, Mponda, Msuha, Mtamba, Mti maji, Mtundu, Mtunduru, Pterocarpus angolensis and Senna siamea.* Fruit tree species in this intervention will include: Citrus species (orange, lime, lemon, and tangerine, Mango, Papaya, Guava, banana, Soursop, Sweetsop, Avocado, Cashew, Pomegranate, Jackfruit, and Rose apple.

Community Engagement

Communities will be engaged in the implementation of the following project activities:

- Establishment of community nurseries
- Selection and collection of the best adapted tree species for semi arid areas
- Propagation of the selected tree species
- Participation in training on nursery techniques, establishment and management
- Planting of forest trees and fruits in the farm land and degraded land for conservation Management, monitoring and evaluation of performance of planted trees

Adaptation Benefits

A total of 6 nurseries with multi-purpose fruits and forest trees established will serve as alternative income generation activities to youth and women in the community. This will allow for adaptation to impacts of climate change.

At least 20,000 locally adapted fruits and forest trees seedlings per village established in local communities. These once planted and well established will increase land cover, reduce forest degradation and will improve availability of fuel woods and house construction materials and hence allowing for better adaptation and resilience to impacts of climate change.

Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species have large out scaling impacts and contributes to innovative ideas for alternative income generation to youths in the community. Sustainable use of fruits and forest tree products will be developed allowing for better nutrition and food security.

Afforestation and reforestation in combination with fruit trees, locally adapted forest tree will provide high environmental benefits including restoration of land cover, ecosystem services and enhanced biodiversity. This will increase availability of vital ecosystems services such as improved water retention capacity, soil moisture recharge, availability of pollinators as well as improved microclimate.

Environmental benefits will be realised through restored vegetation cover due to fruit and forest trees planting. At least 100,000 trees will be planted during the project implementation while the local government and communities will be capacitated to continue production of seedlings and planting after the project. **Budget**

Activity	**Cost items**	**Cost (USD)**
Establishment of community nurseries	Labour, equipment	31,800
Selection and collection of the best adapted tree species for semi arid areas	Tree seeds, seedlings labour	10,000
Propagation of the selected tree species	Labour	11,500
Capacity building on nursery techniques, afforestation and management (200 participants per site)	Training costs	47,900
Planting of forest and fruits trees in the farm land and degraded land for conservation	Labour, and equipment	25,020
Management, monitoring and evaluation of performance of planted trees	Labour and equipment	28,800
	Total	**155,020**

Annex Figure 17: A teenage girl from the semi-arid project site hauling fuel wood from distant location after 4 hours of pedaling.

Annex 4.3

Project design on Component 3 - Establishment aquaculture and vegetable model farms

Problem and vulnerability to Climate Change

Most parts of the semi arid regions are experiencing long dry seasons resulting into lack of alternative income generating and nutritional sources. These areas are highly impacted by water scarcity impeding any aquaculture farming and limited gardening opportunities in vegetable production. The provisional water-harvesting dams will provide water for integrated aquaculture and horticultural vegetable production for income and nutritional supply. Aquaculture is an emerging and promising livelihood option in Tanzania but is yet to be capitalized due lack of awareness and the required skills and knowledge.

Location	**Nzega, Igunga, Manyoni, and Bahi**
Issues	Diversify sources of income generation and nutritional security during dry season as a strategy for resilience and adaptation to climate change in semiarid areas
Brief Activities	Integration of tailored aquaculture, horticulture. Capacity building of communities with the technologies on stocking and management of fish farms in villages; Establish model farms for horticultural vegetable production during dry season of the year
Adaptation Benefits	Farmers in the project areas will benefit through improved household livelihoods and nutrition by adoption of fish farming and horticultural vegetable production practices as divesrsified sources of incomes, and nutrition security
Beneficiaries	A total of **26,216** farmers are expected to benefit from these two intervention representing 20.8% of the population in the target communities.
Budget (USD)	**230,280**

Designing and Implementation

In each project sites, fish ponds will be eatablished through excavations at each of the down stream of the water harvesting dams; the ponds will be 40m long and 20m wide with a depth of 150cm deep. These ponds (12 ponds) will be filled with compacted clay soil mixed (8:2) with sand to allow water holding. Following excavation of ponds, cowdung or chicken manure will be added for fertilization before stocking of fingerlings. Construction of water and nutrient reusing systems from fish to vegetables will be done. Training of farmers in the target communities on fish farming practices, management of ponds and sustainable harvesting of fish; and development of manuals and fliers on aquaculture and value addition and marketing will also be conducted.

Land for vegetable production model farm (6 model vegetable farms) will be set apart by the side of the dams in each project location. This land will be graded accordingly to allow for better cultivationand irrigation of the crops. Overhead tanks and drip irrigation systems for vegetable production will be installed in each project site. TAST company will be consulted for installation of drip irrigation system in each of the project sites. Primary and secondary nurseries for vegetable seedlings will be estbalished to allow for continuous production of selected vegetable crops in each location. Some of the proposed

vegetable crops highlighted from the consultation meetings with communities in each location include: Okra, Onion, tomato, cabbage, amaranth, egg plant , pepper, cucumber, kale, chinese cabbage and carrot.

To ensure sustainability and upscaling of the intevention as alternative income generation and strategy for increased resilience and adaptation to climate change, training of farmers on horticultural value chain of different adapted commercially marketable crops. Frequent training on identification, monitoring and management of emerging pests and diseases in different vegetable crops will be conducted in conjuction with the activities in component 4 of this project implementation plans. Additional training on postharvest handling and packaging of horticultural crops for local and distant domestic markets will be emphasized.

Community Engagement

During consultation process, it was highlighted that a certain area of the communally owned dam is owned by the village government and thus these areas will be used for establishment of the model vegetable production farms. The local communes in consultation with District and Village Extension officers will manage these model farms. Eventually it is expected that the technologies will be up-scaled to other farms in the community using their own land. The will project after training interested groups of farmers will provide initial seeds for vegetable production. Brochures for practical guidelines on GAPs associated with production and management of vegetable crops will be provided by the project.

Budget

OUTPUT	Activities	Cost Items	Cost (USD)
Aquaculture model farms	Excavations and establishment of model fish ponds	Labour	24,000
	Stocking of fingerlings and management of fish ponds	Labour and fingerlings	20,920
	Construction of water and nutrient recycling systems from fish to vegetable	Labour and materials	9,200
	Training of farmers in the target communities on fish farming practices	Transport, and workshop costs	23,600
	Development of manuals and fliers on aquaculture and value addition and marketing	Labour, materials and production costs	4,800
Vegetable Production model farms	Eestablishment and management of horticultural crops	Labour, materials, consultation fees	20,580
	Design and establish irrigation systems for horticulture crops	Labour, materials, consultation fees	20,660
	Training of farmers on horticultural value chain of different adapted commercially marketable crops	Transport, and workshop costs	20,400
	Training on postharvest handling and packaging of horticultural crops	Transport, and workshop costs	16,600
	Develop tree nurseries and vegetable gardens	Labour, Materials, and consultation fees	15,520
Establish water drinking points, pasture and fodder for livestock production	Training on modern livestock management for climate change adapatation	Transport, and workshop costs	18,000
	Construction of water drinking points and water delivery trenches	Labour, Materials, and consultation fees	18,000
	Establish model pasture paddocks for rotational grazing	Labour, Materials, and consultation fees	18,000
			230,280

Project design on Establishment of water drinking points, pasture and fodder for livestock production

Problem and vulnerability to Climate Change

Pastoralists have had resilience to the historical risk of climate variability in arid and semi-arid lands. However, it is reported that climate change present new risks that will decrease resilience and system stability causing significantly high impacts on livestock keeping. The major challenge to cattle, goat, sheep and other livestock mamals is associated with water scarcity, inadequate pasture and diseases and pests. This will aggravate conflicts between pastoral and agricultural communities, which continue destabilize peace and harmony among communities in various parts of the country. Poultry production is an important livelihood activity in the semi-arid areas where 100% of households are engaged. Poultry diseases stand out to be the major challenge affecting the industry. The toll on poultry production caused by diseases such as Newcastle disease impacts livelihood income and food security aggrevating their vulnerability to the consequences of climate change impacts.

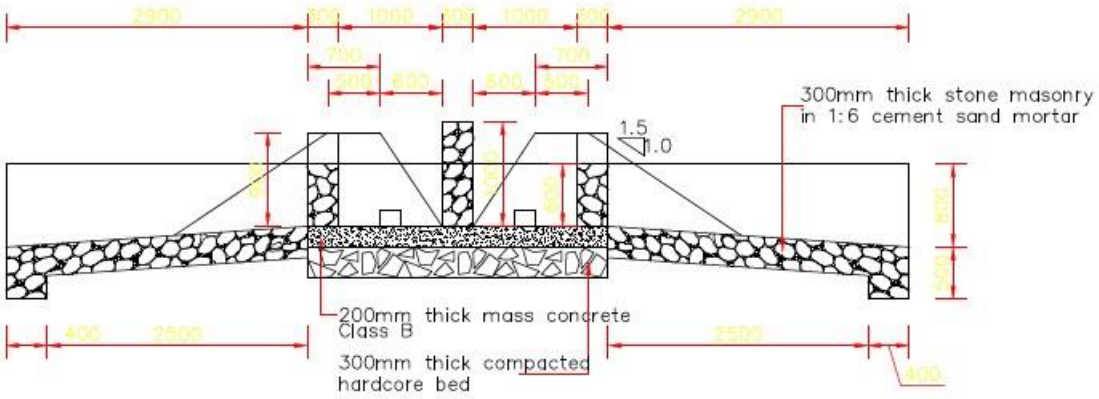
The major outcomes from this component will include: (i) Improved and sustainable farming systems that are in line with conservation of semi-arid landscapes, (ii) Improved livestock production that will translate into improved nutrition and food security and hence more adaptation capacity by a healthy society, and (iii) Improved household livelihoods and income generation of local communities from sale of livestock products, and reduced rural to urban migration in search for better life.

Location	**Nzega, Igunga, Manyoni, and Bahi**
Issues	Reduced productivity of livestock and poultry due to prevalence of pests and diseases, limited availability of water, pasture and feeds. Low institutional and community capacity on skills and knowledge for improved management of livestock under harsh semi-arid and climate change conditions.
Brief Activities	Establish poultry and livestock demonstration units, and Construction of livestock water drinking points to serve for community livestock herds; Construction of dip tanks; Capacity building of local communities through training

Adaptation Benefits	At least 40% Increased resilience of livestock as a result of increased access to fodder, water and improved diseases and pests' control to village community livestock herds. At least 30% increased household nutrition and income from adoption the developed model for improved crops –poultry, fish and livestock complementarity for climate change adaptation and resilience. Enhanced institutional capacity, and farmers equipped with improved capacity in livestock husbandry for increased adaptation and resilience
	to climate change
Beneficiaries	A total of 10,300 community members will benefit from this intervention, which is equivalent to 20% of the population of people in the project site. This intervention is therefore an investment of USD 5.2 per person
Budget USD)	**54,000**

Designing and Implementation

This will involve integration of livestock and poultry as part of components utilizing harvested water for diversification of community livelihoods. Pasture plots will be established along the dams for fodder to feed livestock. Water drinking troughs will be constructed at each project site to service livestock (Annex Figure 18:). Drinking torughs outside the main dams will avoid the problem of water contamination and trampling of the dam by livestock.



SECTION 3–3
1:50 (AT A1), 1:100 (AT A3)

Annex Figure 18: Cross-section layout of livestock drinking troughs

Model pasture paddocks will be established for production of nutritive pasture for livestock. The harvested water will be channeled to the paddocks for irrigation purposes. Adapted drought resistant pasture species including legumes will be introduced and planted in the model pasture paddocks.

To control poultry diseases a vaccination program against Newcastle disease, Fowl pox and infectious coryza will be initiated and implemented 3 times a year. Every household in the project villages will be visited where all poulty will be vaccinated.

Capacity bulding on livestock and poultry management including feeding, forrage conservation and storage innovation to improve availability during dry seasons will be done to farmers and extension officers under this component. Under forage conservation and storage improvement; capacity bulding will include establishment of pasture lands using sunken beds which conserve water that will recharge moisture to the soil where pasture is grown. Capacity building on disease identification and timely control will be conducted.

Community Engagement

Through community engagement it was also found out that livestock drink direcly from the existing damaged dams shortky after the rain season when they still have water. This practice damages the dam embarkmet in addition to contamination of the water throughgh trampling, faeces and urine; water which is also used for domestic purposes. In all project sites, there are no managed pustures and hence ecerbating the problem of pasture shortage caused by climate change impacts. The community emphasized the demand for capacities building in various areas so as to enable them improve livestock productivity, and hence their adaptive capacities to climate change is attained.

Annex 4.4:

Project Component 4 - Project Design and Implementation of interventions for integrated management of emerging climate change related pests and diseases that affect crops and livestock productivity

Project sites: Nzega, Igunga, Manyoni, and Bahi

Location	**Nzega, Igunga, Manyoni, and Bahi**
Problem	Crop loss due to emerging pests and diseases as a result of climate change. Some of the common identified emerging pests are Tomato leafminer/pinworm /(*Tuta absoluta*) fall armyworm (*Spodoptera frugiperda*), Fruitfly (*Bactocera invedas*,),
Adaptation Benefits	• Reduced losses emerging insect pest/vector and diseases, • Increased preparedness of farming communities in management/control of emerging pests and diseses • Improved crop and livestock productivity • Increased farmers' resilience to climate change impacts.
Beneficiaries	All farming comunities in the project area **129,000** people from crop growers and livestock keepers will be reached with this intrvention
Budget (USD)	**97,200**

Problem and vulnerability to Climate Change

Under climate change, pressures from pests, weeds, and diseases have been reported to increase, with detrimental effects on crops and livestock. In the semi arid areas of Tanzania, climate change has lead to emergence of new crop and livestock pests and diseases. This has led to emergence of new diseases such as maize lethal necrotic virus, cassava and sweet potato mosaic which affect the major crop types of semi arid regions in Tanzania. Fruit flies and *Tuta absoluta* maggots (tomato, pepper, melons, onions), cause extensive damage to fruits and vegetables leading to 80% crop loss. As the globe's temperatures continue to increase, these pests are spreading to new areas. Of recent there has been frequent outbreaks of maize fall armyworms (Annex Figure 19:) causing severe damage of maize crops contributing to 50-80% crop loss in maize. Other new races of spider mites and races of virus like maize lethal necrosis contribute to significant high crop damage and losses. In the case of livestock, distribution of the main vector borne diseases spread by ticks, tsetse flies and mosquitoes have been observed in the semi arid regions.

In order to enhance resilience and adaptation of farmers to climate change associated impacts include halting emergence of new crop pests and diseases the project will establish concrete pest management early warning system in order to combat diseases causing vectors and insect pests in crops and livestock. The project is suggesting design of reliable management options and mechanism to avoid the spread of pests and diseases and thus reducing crop and livestock losses.

Designing and Implementation

The project will build crop pest traps in target village farms for collection, identification, monitoring and providing management options of major threat pests in each crop season. For crop pests and diseases some of the IPM technologies will include among others testing economically feasible pest management options involving the use of pest and disease resistant crop varieties, use of natural products, cultural control strategies, push-pull technologies and minimum use of synthetic pesticides. Crop pests and diseases diagnosis tools will be developed targeting specific emerging pests in order to equip farmers with knowledge (symptoms, suitable climatic conditions) for early warning detection of emerging pest and diseases. Plant health diagnostic tools will be established to allow farmers and extension workers to individually use these guidelines for identification, monitoring and management of pests and diseases. For animal disease vectors; dip tanks will be constructed in each target project villages for control of vectors of tick-borne diseases. These concrete structures will be coupled with other IPM strategies in control emerging pests and diseases in crop and livestock. Farmers training and training of trainers on IPM packages will be conducted for management of emerging pests and diseases affecting crops productivity as a result of climate change.

Vaccination campaigns for poultry disease control will be conducted to increase awareness and broader understanding of appropriate and routine application of vaccines.

Annex Figure 19: Fall armyworm (*Spodoptera frugiperda*).

Community Engagement

Through baseline study farmers expressed the need for IPM technologies in order to manage the new emerging pests. Farming community has some knowledge on different emerging pests while additional knowledge on management of these pests is limited. Farmers will be engaged through participatory learning in farmers' field schools. Pest affected farms will be used for learning, surveillance, diagnosis and sample collection and management of emerging pests.

During the baseline study, the community was also engaged to identify emerging psts and diseases in livestock and poultry production in semiarid regions. These included livestock diseases are East Coast Fever, Black Quarter, Contagious Bovine Pleural Pneumonia, Contagious Caprine Pleural Pneumonia, Brucellosis and Lumpy Skin disease. Major poultry diseases are
Newcastle diseases, which cause almost 100% mortality, Fowl pox, and Infectious Coryza. During the implementation process, participatory identification and treatment of these diseases will be done so as the community becomes knowledgeable of the procedures involved and can perform treatment activities themselves in collaboration with extension officers or vet doctors where available.

Budget

Activity	**Cost Items**	**Budget**
Site selection, excavation of pits and building of dip tanks	Labour and materials	31,200
Formation of village committee for dip tank management	Facilitation and transport costs	7,200
Registration of livestock keepers and training of dip attendants	Facilitation and transport costs	10,800

Establishing plant health clinics and surveillance systems in field crop production	Labour, Materials, facilitation and transport	19,800
Participatory surveillance and scouting for identification of major insect pests and vectors	Transportation and facilitation	12,000
To establish insect traps for early warning	Labour, materials, transport	6,600
Participatory diagnostic of pest and disease and implementation of management options	Facilitation, transport	9,600
		97,200

Annex 5:
List of Stakeholders Consulted and Contacts

Location	**Igunga District – Tabora region**			
Date and time	03 June 2019, 9.00 to 12.30			
Participants	List of participants and their positions			
	SN	NAME	TITLE	CONTACT
	1	Revocatus Kuuli	District Executive Director	+255
	2.	Erasto A. Konga	District Agricultural Officer	+255784784439
	3.	Eng. Gasson R. Ntulo	District Water Engineer	+255 789618345
	4.	Joshua Mbiaji	Technician Water Department	+255622557990
	5.	Emmanual Raymond	Irrigation Engineer	+255626044069
	6	Herman Wambura	District Livestock and Fishery development Officer	+255 754888657

Location	**Manyoni District – Singida Region**			
Date and time	05 June 2019, 9.00 to 11.30			
Participants	List of participants and their positions			
	SN	NAME	TITLE	CONTACT
	1.	Charles Fussi	District Executive Director	+255744464663
	2	Geofrey Kiswaga	Livestock Officer (District)	+255759091200
	3.	Fadhili Chimsala	DAICO (District)	+255784419783
	4.	Emanuel Mlowe	Irrigation Engineer (District)	+255757388614
	5.	Halima Hamisi	Accountant (Village)	+255718518173
	6.	Joseph Ndalachi	Livestock Officer (Village)	+255762125016
	7.	Yohana B Masinga	Ward Councilor	+255624422236
	8.	John Samwel	Chairman (Majiri Village)	+255629664807
	9.	Alex M Mahatiza	Ward Executive Officer	+255622661770
	10.	Jonas Mngala	Village Executive Officer	+255629891519
	11.	Lucas B Cardo	Ward Acting Executive Officer	+255625364992
	12.	Daudi Mwandi	Village member	+255658236267
	7.	Joel Nkesela	DPLO	
	8.	Renatus Kalumbete	Technician Aquaculture	+255752155464

Location	**Bahi District – Dodoma region**
Date and time	03 June 2019, 9.00 to 12.30

Participants	List of participants and their positions			
	SN	NAME	TITLE	CONTACT
	1	Dr. Mganga Fatuma Ramadhan	District Executive Director	+255
	2.	Awadhi A. Mashombo	District Agricultural Officer	+255625808941
	3.	Agnetha C. Maseko	District Cleaning and Environmental Officer	+255 712912164
	4.	Juma K Matola	Technician Water Department	+255622557990
	5.	Adam Idd Lay	Irrigation Engineer	+255784976927
	6	Daniel Kehogo	DLFDO District Livestock and Fishery development Officer	+255 754888657
	7.	Dr Ziwa Michael	District Veterinary Officer	+255625643197

PARTICIPANTS FROM LOCAL COMMUNITIES at Ibugule village in Bahi District

SN	NAME	Gender	TITLE	CONTACT
1.	Vaison Mwaluseke	Male	Village member	+255764917712
2.	Cosmas Msigalla	Male	Village member	+255625120762
3.	Hajra simba	Female	Village member	+255766947528
4.	Mariam Abtwalib	Female	Village Livestock officer	+255654934083
5.	Emily Mliambago	Male	Village Chairman	+255784832103
6.	Eliza John	Female	Village member	
	Anthony Maswaga	Male	Village member	
	Maria Leginado	Female	Village member	
	Emaculata Maganga	Female	Village member	
	Meleya Maganga	Female	Village member	
	Sofia Masanvu	Female	Village member	
	Rosemerry Manyahe	Female	Village member	

	Thomas J Maswaga	Male	Village member	
	Phillimon M Lowiso	Male	Village member	
	Felix Nzindo	Male	Village member	
	Elias Machimu Kongola	Male	Village member	
	Chibago Kalugu Malugu	Male	Village member	
	Hellena F Nzindo	Female	Village member	
	Seveline Felix	Female	Village member	
	Augusta Felix	Female	Village member	
	Lucia Masambi	Female	Village member	
	Eunike Lucas	Female	Village member	
	Maria Chipanha	Female	Village member	
	Savera Lucas	Female	Village member	
	Masumbuko Sostenence	Male	Village member	
	Salehe Ulanga	Male	Village member	
	Ester Galahenga	Female	Village member	
	Maria Amos	Female	Village member	
	Ritta Job	Female	Village member	
	Ester Severino	Female	Village member	

Location	**Nzega District – Tabora region**			
Date and time	05 June 2019, 9.00 to 11.30			
Participants	List of participants and their positions			
	SN	NAME	TITLE	CONTACT
	1	Sekiete Yahaya	District Executive Director	0767302490
	2.	Said Shamahonge	Agricultural Officer	0753441255
	3.	Anna Mponzi	Irrigation Technician	0762069689
	4.	Emmanuel J. Kitundu	Livestock and Water Extension Officer	0784496372

PARTICIPANTS FROM LOCAL COMMUNITIES at Ntobha/Budushi village in Nzega District

SN	NAME	Gender	TITLE	CONTACT
1	Horo Rachel Mang'oha	Female	Agricultural field officer	0689998144
2	Michael Y. Kumbeli	Male	Sub-village Chair	0684492588
3	Amos Elisha	Male	Crop Officer	0686481814
4	Zulfa S. Kheri	Female	Ward executive officer	0685612505
5	Simon Luziga David	Male	Village executive officer	0787604318
6	Ramadhan J. Nchimani	Male	Ward councilor	0783309394
7	Flavian Fulgence Ndanda	Male	Ward Extension Officer	0688854838
8	Joseph N. Mayala	Male	Ward executive officer	0786269752/ 0767269750
9	Ally H. Kadumbaga	Male	Budushi Village Chair	0784850815