



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 / Programme Background and Context:

Provide brief information on the problem the proposed project/programme is aiming to solve. Outline the economic social, development and environmental context in which the project would operate.

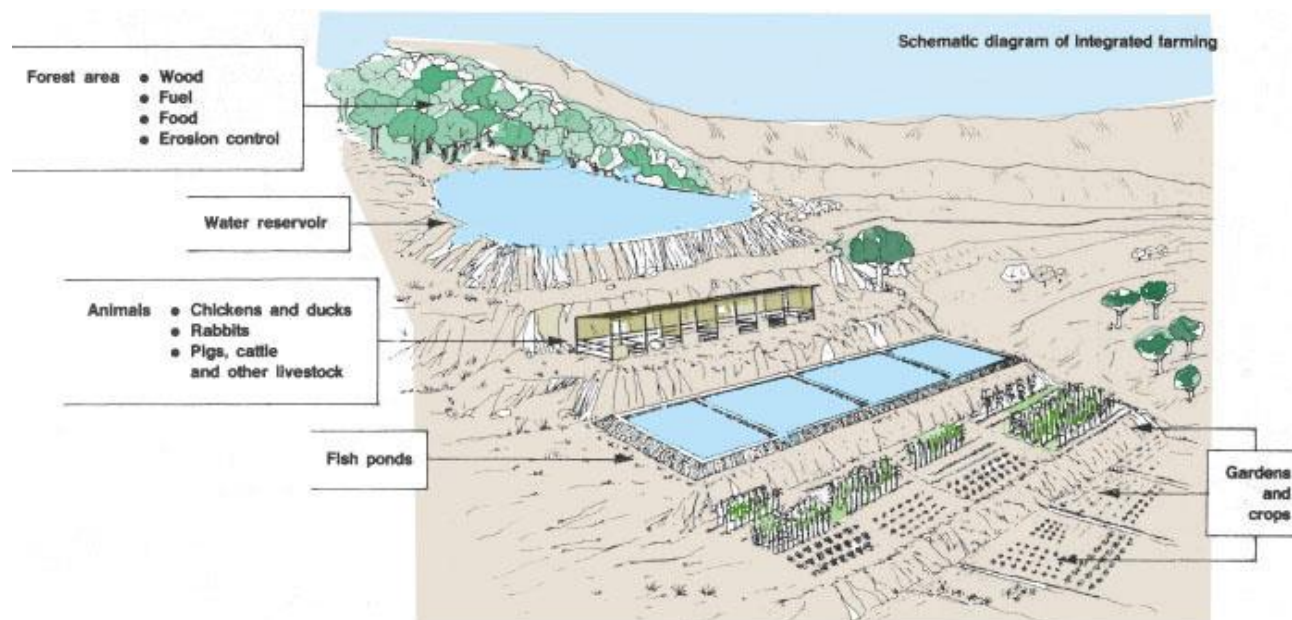
PROJECT TITLE

Strategic Water Harvesting Technologies for Enhancing Resilience to Climate Change in Rural Communities in Semi Arid Areas of Tanzania (SWAHAT)

Majority of Tanzanians live and derive their economy from a rural agrarian setting. Climate change has come with devastating effects on the environment and in turn to people calling for adaptation technologies to address this serious challenge. Drought, floods as well as pests and diseases have become chronic environmental and socio-economic problems that are aggravated by climate change and unsustainable natural resource utilisation. The impacts of climate change in areas affected with drought and floods are more severe. Food production and income generation by communities that are already poor is severely affected. The government and donor community is forced to set aside budget to support such communities for food as well as financing various socio economic needs such as education, health and water supply the cost of which is very high.

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 environment, are exposed to a range of serious climate change related problems such as agriculture failure, deforestation and environmental degradation, malnutrition and illnesses. Research suggests that by 2030, even if the drought frequency and intensity remain stable, 5% of the region's population will go hungry⁶. The ecosystem resilience and capacity to support agriculture and safeguard human health will be jeopardized due to continued land and forest degradation. More severe climate change would inevitably have a far greater negative impact.

Although these problems are known by the research, government, local community as well as donor community, yet interventions have not yielded the needed impact. One of the reasons for the failure is lack of focus to the specific challenges in specific areas, as well as poorly integrated interventions. Problems of farmers affected by climate change are diverse, and therefore calls for integrated interventions i.e. with multidisciplinary and interdisciplinary approach. 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 in Tanzania for improved agricultural and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases. The concept of this proposed project is summarized in Figure 1.



Economic and Social context

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^{1 2}. These emerging pests require immediate intervention technologies to serve small-scale farmers from crop loss leading to low food security.

In addition, the majority of semi arid rural communities are livestock keepers involved in production of cattle, sheep, goat poultry and pigs. Climate change imposes negative impacts due to rise in temperature,

¹ Majule, A. E., Kauz/eni, 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.

² 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>.

CO₂ concentration and precipitation variation and combination of these factors^{3 456}

Temperature affects most of the critical factors for livestock production, such as water availability, animal production, reproduction and health. Also forage and pasture quantity and quality are affected. Livestock husbandry is affected by an increase in temperature and precipitation. In most parts of the semi arid areas in Tanzania, sustainable livestock productivity is affected by reduced availability of water, pasture, and emerging diseases as a result of climate change⁷.

Fish farming is a source of high value protein, income generation, and employment. However, the capita consumption of fish in Tanzania is estimated to be 7.8kg per year, which is low, compared to global per capita consumption 20 kg per year (MLDF, 2016). Combined fish production 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 seasonal rivers and some lakes, and drying of reservoirs. Interventions to reverse this situation are important as fisheries play an important role in household nutrition and livelihoods.

Lack of fresh and clean water for domestic use in these semi arid areas is another serious climate change induced impact. As the results, 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 productive activities, meanwhile children spend less time for schooling, and sometimes prompt them to drop from school completely. Therefore, there is a great need to enhance water availability for domestic use.

Global agriculture uses 70% of fresh water resources, making it the world's largest consumer⁸. 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 production⁹.

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. In this proposed SWAHAT project, construction of dams and alternative water harvesting technologies will significantly lead into increased water availability for the livestock, crops, pasture, trees productivity, as well as for domestic use.

Fresh water reservoirs are occasionally found in village communities as either made by individual person or on side roads left by road construction pits that serve as water harvesting dams. These dams though are

³ Aydinlp, C., Cresser, M.S., 2008. The effects of climate change on agriculture. *Agric. Environ. Sci.* 5, 672–676

⁴ 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

⁵ Nardone, A., Ronchi, B., Lacetera, N., Ranieri, M.S., Bernabucci, U., 2010. Effects of climate change on animal production and sustainability of livestock systems. *Livest. Sci.* 130, 57–69

⁵ Polley, H.W., Briske, D.D., Morgan, J.A., Wolter, K., Bailey, D.W., Brown, J.R., 2013. Climate change and North American rangelands: trends, projections, and implications. *Rangeland Ecol. Manage.* 66, 493–511

⁶ Reynolds, C., Crompton, L., Mills, J., 2010. Livestock and climate change impacts in the developing world. *Outlook Agric.* 39, 245–248

⁶ IFAD (International Fund for Agricultural Development), 2010. Livestock and climate change. <http://www.ifad.org/lrkm/events/cops/papers/climate.pdf>

⁶ Koffi K., Ahoussi E., A. M. Kouassi, O. Kouassi, Kpangui L. C. and Biemi J. (2013). Integration of hydro-climatic 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 2013 DOI: 10.5897/AJEST2013.1453

⁷ 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

⁸ Thornton, P.K., Van de Steeg, J., Notenbaert, A., Herrero, 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.

⁹ 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.

small size, yet have proven to help and rescue nearby village communities as water source for supporting livelihoods throughout the year. However, in many areas herdsmen spend hours in search of water for their animals, whereas constructed dams are expected to serve as feeders for water points for community livestock in the target areas (Plate 1). More analysis of the benefits of the established water-harvesting dams to pastoral community and livestock keepers will be elucidated in term of water availability during the dry seasons in each location of the project.



Photo taken on roadside along Kondoa - Dodoma

Plate 1. Representative of model services provided by remnant dams left from road construction along side roads in semi arid regions where water become available for multipurpose uses: for domestic use, livestock and irrigation water for vegetable crops can be freely obtained and consequently offers resilience to climate change to village community members.

Environmental context

The proposed project target areas will include 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 patterns¹⁰. These regions experience long and dry periods of 6 -8 months resulting into serious water scarcity for agriculture, livestock and domestic uses. The average rainfalls in these regions is 581 mm (Figure 2). The impact of climate change is therefore very significant in these regions causing unreliable crop harvest, declined livestock production and escalated poverty.

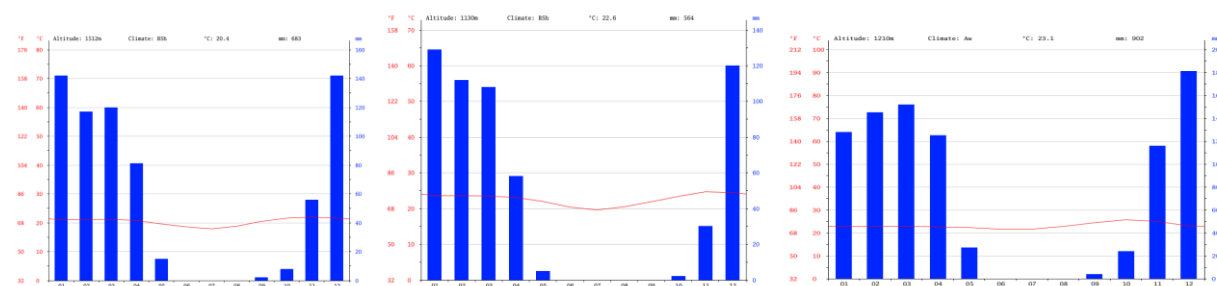


Figure 2: From left to right; Annual rainfall distribution Singida, Dodoma and Tabora Monthly weather data rainfall and temperature (Source: TMA).

The regions in the project area is characterized by miombo woodland vegetation cover which has been threatened by land degradation and deforestation as a result of population growth coupled by environmental

¹⁰ 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

stress (Kalipen 1992). Farming communities in Dodoma, Singida and Tabora have contributed to large scale deforestation for agriculture (shifting cultivation), charcoal/firewood harvesting, human settlements pastoralism which is exacerbated by impacts of climate change results into loss of soil cover implying water runoff, floods and drought in farm lands¹¹. Erratic rainfall results into unpredictable planting dates, poor crop establishment and performance, crop failure and hence low yields. Previous studies has demonstrated that climate change could lead to major crop failures of up to over 40%¹² (Tigchelaar et al., 2018). This has a serious water scarcity for agriculture, livestock and domestic uses. Water resource anomalies in Tanzania are become as natural disasters¹³.

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 a strategic water harvesting technologies for enhanced resilience to climate change.

The **forest vegetation** in the target areas has been seriously degraded leading to depletion of forest wood resource for fuel wood energy, opening for agricultural land, construction materials and other ecosystem services to the community. Serious conservation and restoration measures are inevitable in order to bring resilience of the rural community to impact 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 grasslands¹⁴. Anthropogenic activities have extensively modified these types of vegetation, with deforestation and land degradation in these areas 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 lands¹⁵. 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 (URT, 2007). 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.

So far, forest ecosystems are known to be a good repository of biodiversity and also contribute significantly to livelihoods of adjacent communities but are taken for granted. The knowledge of impacts and response of forest ecosystems¹⁶ to climate change resilience and adaptation measures emphasizes on strategies of reestablishment of vegetation cover through afforestation and reforestation, planting of fruits and multipurpose trees.

¹¹ 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>

¹² 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.

¹³ 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

¹⁴ 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.

¹⁵ 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>

¹⁶ 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.

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.

Developmental context

Tanzania with a population of 55 million people has a growth rate of 2.9%¹⁷ is endowed with a significant variety of natural resources including land, rivers, lakes, ocean, forests, woodlands, wild animals, and wetlands. Apart from these regenerative natural resources, Tanzania is rich in a variety of non-regenerative natural resources including minerals, gold, diamond, iron, coal, nickel, Tanzanite, uranium and the recently discovered huge offshore and on-shore deposits of natural gas. Also, the country continues to undertake exploration of oil. 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%¹⁸.

Tanzania is not exempted from the consequences of climate change. However, the magnitude, rates and negative impact on people's livelihood and environment varies 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 most affected regions are Dodoma Singida, Shinyanga, Simiyu, and parts of Arusha, Manyara, Mwanza, Tabora, Mara and Kilimanjaro. 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 household productivity and its eventual contribution to local and national development is seriously impeded by the effects of climate change. It has been stated that in the drought prone regions of Tanzania, whose stage of development is also among the least will continue to be hard hit by climate change effects. 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 landscapes¹⁹.

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.

Problem to be addressed

The proposed SWAHAT project intends to address the climate change-induced challenges of drought, floods and high temperatures in semi arid regions in Tanzania, which results into serious water shortages. Management of the water sector will become increasingly difficult as the quantity and quality of water in rivers is reduced by siltation, erosion and drought, In the event of heavy and erratic rainfalls most of river water is 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 army worm, spider

¹⁷ Tanzania National Bureau of Statistics (2012)

¹⁸URT,2013; World Bank 2014 Reports

¹⁹ 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

mites, races of virus like maize lethal necrosis, and animal diseases are said to come with elements of climate change. Ultimately, these has led into reduction in crops and livestock productivity, forest degradation, emergence of climate change related pests and diseases, as well as water shortage for domestic use. These challenges are increasing the vulnerability of rural target communities in Tanzania, particularly those living in semi-arid areas. The problem is 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 a basis for enhancing adaptation and resilience of rural communities to climate change-induced challenges of drought, floods and high temperatures in semi arid regions in Tanzania for improved crops and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases. The project will construct 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.

Project / Programme Objectives:

List the main objectives of the project/programme.

1. Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture
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
3. Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture for fish, crops and livestock production
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

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 12 selected target villages. This will be achieved through implementation of the following strategic components: i) Designing, construction and establishment of community water harvesting technologies; 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 for fish, crops and livestock production, and iv) Formulation and implementation of interventions for integrated management of emerging climate change related pests and diseases that affect fruit trees, fish, 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 to be financed as shown in Table 1.

Table 1: project components/objectives, indicative outputs and outcomes.

| Project Components | Expected Concrete Outputs | Expected Outcomes | Amount (US\$) |
|--|---|---|---------------|
| 1.Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture | 1.1: At least 12 water harvesting dams constructed for increased water availability 1.2: Increased agroforestry trees, crop, fish and livestock productivity, biodiversity and vegetation cover. | Improved livelihoods and resilience to climate change of the rural communities, improved food and nutrition security, and ecosystem services Reduced drudgery for women and children from long distance walk in search of water and firewood | 538,510 |
| 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 | 2.1: At least 5 nurseries with multi purpose fruits and forest trees per village established 2.2: At least 20,000 locally adapted fruits and forest trees per village established in local communities, 2.3: Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species (50 youths per village) 2.4: sustainable use fruits and forest tree products developed | Improved ecosystem health and delivery of ecosystem goods and services Increased sources of employment opportunities resulting from fruits and forestry venture Reduced land and forest degradation in the community landscape | 123,090 |
| 3.Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture for fish, crops and livestock production | 3.1: Aquaculture farms established in the project villages; 3.2: Improved fruits and vegetable productivity per unit of water from rainfall or from water harvested 3.3: Developed model for improved productivity of poultry and livestock in the vicinity of established water harvesting dams with high in-situ nutrient retention. | Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use. Improved equitable water use for multiple agroecological needs by the community; Improved governance of water and use of forest resources for climate resilience in target village communities | 172,920 |
| 4.Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect fruit trees, | 4.1: At least one guideline for each insect pest/vector and disease produced and distributed to target farmers. 4.2: At least 70% of the farmers (crop and livestock keepers) involved in the project adopted and implementing the IPM technologies for resilience to climate change | Reduced losses from climate change associated emerging insect pest/vector and diseases, hence leading to improved crop and livestock productivity consequently increased | 77,685.00 |

| | | | |
|---|--|--|---------------------|
| fish, crops and livestock productivity | | farmers' resilience to climate change impacts. | |
| 6. Other Operating Project cost | | | 172,544.00 |
| 7. Total Project Cost | | | 1,084,749.00 |
| 8. Institutional Administrative Cost (9.5%) | | | 103,051.00 |
| 9. Project/ Fee charged by the Implementing Entity (8.5%) | | | 92,203.67 |
| Amount of Financing Requested | | | 1,280,004.00 |

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

| Milestones | Expected Dates |
|---|----------------|
| Start of Project/Programme Implementation | 2019 |
| Mid-term Review (if planned) | 2021 |
| Project/Programme Closing | 2023 |
| Terminal Evaluation | 2023 |

PART II: PROJECT JUSTIFICATION

A. *Describe the project components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience..*

i. Project components focusing on the concrete adaptation activities

The proposed SWAHAT Project will comprise the following different components focusing on the concrete adaptation activities

Project Component 1: Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture:

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 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 women and children from long distance walk in search for water. This will save time for women and children to venture into income generating activities and education respectively.

Output 1.1: At least 12 water harvesting dams constructed for increased water availability

This will involve technological adaptation 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 run off, 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. The following activities will be implemented in this output:

1.1.1 Survey and selection of dam sites: Selection of the dam sites will be done in participatory involving district land use, agriculture, forestry, livestock, aquaculture and irrigation experts, CBO/ NGOs and members of the local community. It will also include the survey on social and economic wellbeing status, potential weather and meteorological data, catchment point, vegetation, soil types, crops grown, livestock population and types. The sizes of the dams are expected to be 6-8 m deep, 80 m wide and 250 m long expecting to hold over 120 million litres of water.

1.1.2 At least 2 dams will be constructed in each of the strategically selected vulnerable villages from 2 districts of the 3 semi arid regions of Tabora, Singida and Dodoma (12 dams = 2 x 2 x 3).

1.1.3 Installation of overheads tanks and water supply channels for water delivery on nursery, poultry, livestock units.

1.1.4 Map, validate and quantify short and long term catchment characteristics (determining flow rates, water collection capacity, overflows, siltation rates, and linking to meteorological data).

Output 1.2: Increased agroforestry trees, crop, fish and livestock productivity, biodiversity and vegetation cover.

The water-harvesting dams constructed from output 1.1 will be used for supporting technological activities related to agroforestry trees, crops, fish and livestock production and enhancing biodiversity and vegetation cover. The set-up of the dams will be positioned in such a way that the dam become a key player of source of livelihoods, improving vegetation cover, reducing run off, source of irrigation water, domestic water, community animals and livestock, forests and fruit trees nursery management and down-stream feeding water for fish ponds and aquaculture for village community.

Output 1.3 Improved governance on water use rights and management of forest resources

Major activities for this out put include:

- i) Establish water user groups for governance mechanism for equitable water sharing
- ii) To develop and analyze gender differentiated water use rights, governance, relieve farmers from drudgery related to water use in domestic, crop and livestock and its impacts on resilience climate change
- iii) Conduct workshops in topics related to water safety economically viable use of community harvested water for households use, animal husbandry as main source of water for village animals

Project 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

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 agro-ecosystems 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 sustainable harvesting and use of resources. They will include integrated apiary sites, improved harvesting and 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 well-being of the natural habitat. Consequently this component will lead into following outcomes: Improved ecosystem health 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 community landscape.

Output 2.1: At least 5 nurseries with multi purpose fruits and forest trees per village established. Among the fruit trees species to include; mango, cashew, grapes, guava, oil palm, avocado and citrus, adapted forest trees to include Neem tree, Acacia, Cassia, Trichilia and Grevilea. Final selection of the best adapted tree species will be made based on consultation from local communities. This output will emphasize forestry interventions that incorporate fruit trees in the target community farms landscapes as a way of counteracting deforestation, protecting the environment and meeting the energy needs of the rural and urban communities, through efficient production of fuel wood. Communities will be trained on better management and conservation of natural forests and smallholder forestry and fruit trees management practices. Best propagation methods for each of the selected species will be optimized under standard nursery establishment and management. Groups of farmers will be trained on nursery techniques, establishment, and distribution of germplasm material as well as management of trees on sites.

Output 2.2: At least 20,000 locally adapted fruits and forest trees per village established in local communities: Seedlings obtained from output 2.1 will be used for restorations of degraded landscapes will be done using locally adapted fruits and forest tree species. The identified and selected adapted trees will be planted in farmlands as wind breaks, in small plots as fuel wood lots, along the dams, and serve as afforestation and reforestation strategies.

An assessment and monitoring of performance of improved germplasm of selected forest and introduced fruit tree species in the project area for adaptation and resilience to climate change by local community

Output 2.3: Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species (50 youths per village)

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. Publications will be made available for wider knowledge dissemination; Project findings and technologies disseminated through radio, TV and newspapers; Workshops held in various platforms; Established farmer schools where knowledge and skills for improved natural resource management can be obtained. Apart from farmers' groups, also schools will be involved through Environmental Clubs with the purpose of inculcating environmental awareness, adaptation to climate change and resilience. Women and youths in the target communities will be trained on nursery techniques for income generation through sale of forest and fruit tree seedlings.

Output 2.4: Sustainable use of fruits and forest tree products developed

For sustainability of intervention from this project component communities need to be equipped with methods and strategies that will enable them realize early benefits (food and nutrition security, income generation and other incentives) from these fruits and forest tree products. The project will support farmers to engage in sustainable tree (forest and fruit species) farming and utilization as a business capitalizing on both wood and non-wood farm forest products. Tree farmers will be facilitated to form groups or even associations that would enable them be trained in entrepreneurship development and access to better markets. Economic analysis have indicated that tree farming has more returns than conventional farming since the inputs and labour requirements are low but the returns are higher even though it takes about 6 years to harvest.

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 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 (vegetables gardens). This will involve rotational use manure from poultry or livestock for fertilizing fish ponds placed downstream of the dams, vegetable gardens, and preparation of tree nursery potting media. In turn, nutrient-rich water drained from the fish ponds will be reused for irrigation of vegetable crop gardens plots. This component will also include apiculture for enhanced income generation and insect pollination of vegetable crops and fruit trees species. The major outcomes from this component will include: Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use, Improved equitable water use for multiple agroecological needs by the community; and Improved governance of water and use of forest resources for climate resilience in target village communities.

Output 3.1: Aquaculture farms will be established in the project villages.

To accomplish this output, the following activities will be undertaken: i) Excavations and establishment of model fish ponds down stream of the water harvesting dams; ii) Stocking of fingerlings; iii) Training of farmers in the target communities on fish farming practices, management of ponds and sustainable harvesting of fish; iv) Development of manuals and fliers on aquaculture and value addition and marketing;

v) Develop efficient fish feeds for rural aquaculture in the target community; and vi) To monitor survival and adaptation of different species of fish in aquaculture ponds and dams in project areas of the Intervention to determine their productivity, growth rates survival rates, reproductive and longevity

Output 3.2: Improved horticultural crop productivity per unit of water from rainfall or from water harvested

In order to achieve this output, major activities will include: i) establishment and management of vegetable production gardens down stream of the water dams; ii) design and establish irrigation systems for vegetable gardens (overhead, furrow or drip irrigation); iii) Training of farmers on vegetable production value chain of difference adapted commercially marketable vegetable crops; iv) Training on postharvest handling and packaging of vegetable crops for local and distant domestic markets; and v) Develop horticultural technology for enhance production efficiency of selected adapted fruits vegetable crops in the project areas.

Output 3.3: Developed model for improved productivity of poultry and livestock in the vicinity of established water harvesting dams with high in-situ nutrient retention and ecosystem services. This will involve rotational use of manure from poultry or livestock for fertilizing fish ponds placed downstream of the dams, vegetable gardens, and preparation of tree nursery potting media. In turn, nutrient-rich water drained from the fishponds will be reused for irrigation of vegetable crop gardens plots. In addition pasture plots will be established along the dams for fodder to feed livestock other livestock feeds will be obtained from vegetables that are not suitable for markets, remains from vegetable harvests and postharvest grading. Major activities in this output will include: i) Establish poultry and livestock units along the dams. Livestock to include dairy or fattening beef and goats; ii) Construction of collection units for manure; iii) Connecting drainage systems from animal units to fishpond and down stream to vegetable gardens reuse of water in the upstream; iv) Establish pasture paddocks for rotational grazing; v) Establish apiary units for honey and pollination of fruits and vegetable crops in the project area vi) Construction of water drinking points and water delivery trenches for community livestock along the dams to reduce siltation and contamination of water; and vii) To develop a model for improved crops –poultry, fish and livestock complementarity for climate change adaptation and resilience

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

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 test options for integrated pest and diseases management in order to reduce risks of crop and livestock loss. In order to enhance resilience of our farmers, the project will design reliable management options and quarantine mechanism to avoid the spread of pests and diseases. 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 arthropod-borne diseases such as African swine fever, rift valley fever, east coast fever, Newcastle disease, fowl pox, and CCPP (Contagious Caprine Pleural Pneumonia) affecting goats. 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.

Output 4.1: At least one guideline for each insect pest/vector and disease produced and distributed to target farmers. This will include: i) Participatory surveillance and scouting for identification of major insect pests and vectors that occur in the project areas affecting crop and livestock production; ii) Participatory

identification of diseases in crops, poultry and livestock production in the target project areas; iii) Participatory testing and implementing best and economically feasible pest and disease management options /IPM technologies; iv) Development of guidelines for management of pests and diseases for sustainable use by target community.

Output 4.2: At least 70% of the farmers (crop and livestock keepers) involved in the project adopted and implementing the IPM technologies for resilience to climate change. Activities include: i) Training of farmers groups of best adopted IPM technologies in the target project areas; ii) To establish types and status of adopted technologies for improved crops, poultry and livestock production.

ii. Contribution to Climate Resilience

Water reservoirs that will be built in the target project areas will drive livelihoods of rural farmers in the community through several dimensions. The proposed project is expected to contribute to increased resilience in crop productivity by ensuring crop survival from drought and during the dry season due increased water availability for irrigation. Checks dams will e establish will raise water table ad mage water available for growing a wide range of crops including vegetables that will serve for income generation. Aquaculture and fish farming technologies will be introduced to the communities for income generation and improved access to protein based nutrition security. Furthermore, the planned project is involved in reducing the drives of land degradation by establishing forest tree nurseries intended for forest restoration and provision of fuel wood, timber, and ecosystem services. Water from the dams will greatly contribute to increased availability of water for village livestock and will be used for stimulation of pasture growth through out the year. More important is the water from dams will be the major source of clean water for domestic use by the community thus reducing cumbersome long distance search of water by women and children. Community water availability is a major challenge threatening resilience of rural dweller to climate change. Therefore, the planned cost related objectives of the project will clearly address outcomes of increasing resilience of target rural communities in the selected semi-arid areas of Tanzanian thus contributing to direct improvement of people's livelihoods.

Throughout the above mentioned concrete adaptation activities, there will be elements of capacity building to local communities, improved access to technical information, change of behaviour and practice, improved infrastructure, improved resource governance, enhanced ecosystem health, improved knowledge for resource management, utilisation, and market access. All these will contribute to increased capacity of rural communities for adaptation and resilience to climate change.

B. Describe how the project provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project will avoid or mitigate negative impacts, in compliance with the *Environmental and Social Policy of the Adaptation Fund*.

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 harvesting thus reduce drudgery and time spent by women and children in search of water 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 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 project components.

Table: 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 |
| Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture | <ul style="list-style-type: none"> • 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 • Improved nutrition of local communities as a result of access to fruits and vegetables | <ul style="list-style-type: none"> • Increased and diversified sources of income generation • Increased productivity of diversified crops, poultry, livestock and fish farming • 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 | <ul style="list-style-type: none"> • Increased water availability for enhanced resilience 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,. |
| Project component | Social benefits | Economic benefits | Environmental benefits |
| | 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 entailing nursery establishment, tree planting, management and sustainable harvesting and utilization | <ul style="list-style-type: none"> • 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 access of fire wood | <ul style="list-style-type: none"> • Increased business opportunities through sales of timber and non-timber forest products • Increased alternative sources of income generation from sales of fruits and forest tree seedlings from nurseries • 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). | <ul style="list-style-type: none"> • Improved ecosystem health and delivery of ecosystem goods and services • 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 apicultures, agriculture for fish, crops and livestock production | <ul style="list-style-type: none"> Improved household livelihoods through adoption of diversified sources of incomes, food, and skills Improved equitable water use for multiple agroecological needs by the community Improved knowledge of farmers on fish farming practices, Increased knowledge preparation of efficient fish feeds for aquaculture Increased resilience of livestock as a result of increased fodder production | <ul style="list-style-type: none"> 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 knowledge of farmers on production value chain of vegetables . Increased income from adoption the developed model for improved crops –poultry, fish and livestock complementarity for climate change adaptation and resilience. | <ul style="list-style-type: none"> Increased afforestation and reforestation of degraded land Improved catchment health for sustainable water harvesting Reduced run-off, soil erosion, siltation and rain water loss Increased maintenance and provision of ecosystem services. Reduced soil and water pollution as a result of use of natural fertilizers 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 fruit trees, fish, crops and livestock productivity | <ul style="list-style-type: none"> 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 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, poultry and livestock production | <ul style="list-style-type: none"> Reduced losses from climate change associated emerging insect pest/vector and diseases improved crop and livestock productivity through adoption of economically feasible pest management options | <ul style="list-style-type: none"> Reduced use of pesticides in crop and livestock production for environmental well being Increased knowledge on Identification of major insect pests and vectors that occur in the project areas affecting crop and livestock production . |

C. Describe or provide an analysis of the cost-effectiveness of the proposed project

The SWAHAT project seeks to address problems associated with climate change-induced challenges of drought, floods and high temperatures in semi-arid regions of Tanzania. Water is a very important resource for all forms of life and yet it continues to be scarce while its demand grows. Its spatial and temporal

availability continue to be irregular and unreliable. The semi-arid central regions of Tanzania are particularly dry with run off due to floods. Construction of dams and eventual use of harvested water for agriculture purposes, domestic as well as restoration of the ecosystem services will be highly beneficial to enhance resilience of the target rural community for climate change.

Approach to ensuring cost-effectiveness

The SWAHAT project is designed to maximize the benefits to vulnerable communities by identifying the most cost-effective options for improving resilience and adaptation to climate change using water harvesting technology as a prime driver of interventions. The project interventions have been prioritized using cost-effectiveness and cost-benefit analysis for adaptation of wider economic, social and environmental climate change consequences. A number of interventions have been adopted based on those listed as climate change adaptation measures identified in the UNEP-GEF report²⁰. Cost-benefit analyses undertaken in the UNEP-GEF McKinsey Report demonstrate clearly that a country can prevent much of its expected losses through relatively low cost measures.

The expected benefits of strategic water harvesting project described in Components 1, 2, 3 and 4 are relatively low costs in terms of implementation compared to the actual impacts of climate change related hazards to vulnerable communities. The anticipated benefits from implementation of project components will greatly exceed the costs and help prevent climate change-induced losses. Whereas component 1 will benefit local community by increasing availability and access to water that will be used for domestic, 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, soil erosion and siltation, increased fuel wood availability and improved ecosystem services. In addition, fruit trees will lead to increased alternative sources of income generation from sales of fruits and forest tree seedlings from nurseries. Cost effective 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. Furthermore, cost effective application of activities in component 4 will have the following tangible benefits: 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 pesticides²¹ 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.

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

²¹ FAO. 2011. "Climate-Smart" Agriculture – Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Food and Agriculture Organisation, Rome

Table: 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: Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture | 538,510.00 | <ul style="list-style-type: none"> • Easy access to water resource for domestic, crop and livestock production in the community • Increased and diversified agricultural productivity • Increased sustainable supply of food and water • Reduced time spent by women and children in search for water could be invested to other economic activities • Increased knowledge on water harvesting, water use rights for resilience to climate change | <ul style="list-style-type: none"> • Crop and livestock loss due to drought and flood, • Food insecurity and malnutrition based health problems • Water losses as a result of excessive runoff | <ul style="list-style-type: none"> • Timely planting time of locally adapted crops and use of early maturing crop varieties <p>Trade-off:</p> <ul style="list-style-type: none"> • Knowledge and information of meteorological forecasting is limited to farming community • Cost implication to farmers in term of input use due to erratic and unreliable rainfall • Limited access to expensive hybrid seeds, • Dependence on food aids <p>Trade-off:</p> <ul style="list-style-type: none"> • High cost for importing and distribution foods • Food sovereignty is jeopardised • Dependence on rain-fed agriculture <p>Trade offs:</p> <ul style="list-style-type: none"> • Risks and uncertainties • Unreliable and erratic rainfalls • Digging of shallow wells and charcoal dams <p>Trade off:</p> <ul style="list-style-type: none"> • 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. <p>Trade-off:</p> <ul style="list-style-type: none"> • High cost for the government |
| Component 2: Develop and implement | 123,090.00 | <ul style="list-style-type: none"> • improved ecosystem health and delivery of | <ul style="list-style-type: none"> • deforestation • soil and land cover loss • land degradation | <ul style="list-style-type: none"> • Implementing forest Act, by laws and regulations <p>Trade off:</p> |

| Project component | Project Cost USD | Tangible adaption benefits | Averted losses | Alternative interventions and trade-offs |
|--|-------------------|---|---|---|
| participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization | | <ul style="list-style-type: none"> ecosystem goods and services, • reduced land and forest degradation in the community landscape. • Increased alternative sources of income generation from sales of fruits and forest tree seedlings from nurseries | <ul style="list-style-type: none"> water losses as a result of excessive run-off and minimal water infiltration into the soil • food insecurity • river siltation | <ul style="list-style-type: none"> • Limited enforcement 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 <p>Trade offs</p> <ul style="list-style-type: none"> • Needs expertize • High cost investment • Dependence on forest resource for income generation (charcoal and fire wood illegal logging) <p>Trade off:</p> <ul style="list-style-type: none"> • 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 agriculture | 172,920.00 | <ul style="list-style-type: none"> • Increased climate resilient livelihoods diversification through adoption of diversified income generation strategies, • Diversified food sources as a result of use of smart agriculture skills • Increased knowledge on use of organic fertilizers and manures | <ul style="list-style-type: none"> Deforestation and land degradation • Human resettlement and urban migration • Food insecurity and malnutrition • Engagement in illegal income generating activities by rural dwellers (local spirit, and growing cannabis) | <ul style="list-style-type: none"> Increased use of industrial fertilizers <p>Trade offs:</p> <ul style="list-style-type: none"> • 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) <p>Trade off:</p> <ul style="list-style-type: none"> • High deforestation • Depletion of natural forest • Aggravate impacts of climate change • Loss of biodiversity • Rural to urban migration of youth <p>Trade off:</p> <ul style="list-style-type: none"> • Loss of agricultural manpower in rural areas |

| Project component | Project Cost USD | Tangible adaption benefits | Averted losses | Alternative interventions and trade-offs |
|--|------------------|---|--|--|
| | | | | <ul style="list-style-type: none"> • 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 fruit trees, fish, crops and livestock productivity | 77,685.00 | <ul style="list-style-type: none"> • Strengthened early warning systems for pest surveillance • Reduced health risks to human and animals as a result of minimum pesticide application, • Reduced 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 through adoption of IPM technologies for controlling emerging pests and diseases | <ul style="list-style-type: none"> • Crop and livestock losses due to infestation of pests and diseases • Increased health risks from pesticide use • Increased pesticide and herbicide pollution in rivers and environment • Food and nutritional security • Increased death of non target beneficial insects and microbes as a result insecticide and herbicide use | <ul style="list-style-type: none"> • Intensified agricultural production through heavy use of pesticides, herbicides and fertilizer <p>Trade off:</p> <ul style="list-style-type: none"> • Has high costs; • Build up of resistance • Has negative environmental impacts; and • Can still result in crop failure from climate change hazards. \ <ul style="list-style-type: none"> • Farmers resorting to use untested local knowledge practices to control emerging pests and diseases in climate change <p>Trade-off:</p> <ul style="list-style-type: none"> • Not always reliable and efficient • Lack of standard formulation • Limited availability • Limited up scaling to other communities • Not scientifically proven and documented |

D. *Describe how the project is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.*

The proposed SWAHAT project is in consistence with a number of initiatives including policies, strategies, programs, just to mention a few which have been put in place by the Government as due to continued challenges and impacts of climate change, as described below:

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 Strategy²². 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: 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.

Forestry: With regards to the forestry sub-sector, climate change is reported to have affected many of forest and ecosystem processes. 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. All the same, the proposed SWAHAT project will further strengthen efforts invested by the Government 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: In Tanzania, the agricultural sector is reckoned being among the economic development pillars of which more than 80% of population within the country depending on climate sensitive rain-fed agriculture as source of livelihood²³. However, adverse effects of climate change have also been recorded within different government reports^{24 25} as cited from CIAT and 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 has set several priorities, of which the SWAHAT project will also thrive to make its contribution to enhance the resilience of the communities to climate change induced impacts, through: a) Assessing crop vulnerability and suitability (cropping pattern) for different Agro-ecological zones; c) Promoting appropriate irrigation systems; d) Promoting early maturing and drought tolerant crops; e) Enhancing agro-infrastructural (input, output, marketing, storage) systems; f) Promoting

²² UNDP (2007). Human Development Report 2007/2008: Fighting climate change: human solidarity in a divided world. Palgrave Macmillan, New York

²³ United Republic of Tanzania - URT (2009a). Climate change and agriculture policy brief. Vice President's Office, Division of Environment, Dar es Salaam

²⁴ United Republic of Tanzania - URT (2008). State of the environment report 2008. Vice President's Office, Division of Environment, Dar es salaam.

²⁵ 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.

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.

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 including the Ruaha and Ruvuma Rivers, which has challenged irrigation and contributed to increased livestock migration. 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 Arusha, Dodoma, Kilimanjaro, Shinyanga, Mara, Mwanza, Iringa, and Tabora²⁶.

Likewise, livestock vector borne diseases and spread of tsetse flies may narrow the area under rangeland. As a consequence, the already low productivity of grazing livestock could be further diminished. Hence, need to strengthen resilience of livestock producers so as to be able to adapt with climate change impacts and ensure food security. To enhance resilience of livestock industry development to climate change impacts. This goal 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 countrywide; f) Promoting livelihood diversification of livestock keepers; and g) Promoting improved traditional livestock keeping system.

Fisheries: As far as fisheries sector is concerned, the goal of Tanzanian Government is to have fisheries resource is 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: (c) Promoting aquaculture (d) Enhancing protection and conservation of aquatic ecosystems productivity and diversity of the aquatic ecosystems and fisheries sector in general.

ASDP II: In collaboration with other stakeholders, Tanzania has developed phase two of the Agricultural Sector Development Programme (ASDP II) 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. The ASDP II has identified a number of priority areas of interventions within which the proposed SWAHAT project fits in, and most particularly on the following: a) Priority Area 1 (PA 1) emphasize on sustainable water and land use management for crops livestock and fish and system resilience to climate change this is inline with **component 1**; b) PA 2 of ASDP emphasize on enhanced agricultural productivity and profitability (crops, livestock and fish); c) PA 3 – rural commercialization and value addition (market access, value addition, trade and private sector development ; and d) PA-4: is emphasizing on strengthening sector enablers (including policies food and nutritional security and safety nets, ICT, CKM, coordination and M&E).

NAPA: Similarly, the Government further recognizes the extreme vulnerability of communities to climate change as the aspect of poverty, which needs to be addressed from different perspectives include instituting the National Adaptation Programme of Action (NAPA) in 2007. NAPA underscores that Agriculture, Water and Forestry are of high priority sectors that requires interventions for adaptation to climate change. The

²⁶ URT (2013c). Climate change adaptation information toolkit for farming communities in Tanzania. 28pp.

proposed project is in consistent with the NAPA as it is contributing to the following NAPA emphasized activities in order to enhance climate resilience to the vulnerable rural communities in Tanzania.

Agriculture Sector: i) Increase irrigation to boost crop production in all areas; ii) Introduce alternative farming systems; iv) Create awareness on the negative effects of climate change; v) Increase the use of manure and fertilizer; vi) Range management for livestock production; and vii) Control pests, weeds, and diseases.

Water Sector: i) Develop alternative water storage programs and technology for communities 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.

Forestry sector: i) Increase irrigation by using appropriate water efficient technologies to boost crop production in all areas; iii) Develop water harvesting and storage programs for rural communities particularly those in dry lands; vii) A forestation programmes in degraded lands using more adaptive and fast growing tree species; and xii) Water harvesting and recycling.

Based on this, 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. Describe how the project meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the *Environmental and Social Policy of the Adaptation Fund*

I. National Standards

The project will engage construction engineers for the dams work and ensure that they follow all the necessary codes of conduct. NEMC will be consulted by submitting preliminary environmental assessment (EIA) information to find out whether there is need or no need for environmental impacts assessment OR rather a simple or full EIA is necessary.

II. B. 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. In addition, the project will comply to both national and international laws. Access and equitability of the project benefits will be promoted. 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.

F. Describe if there is duplication of project with other funding sources, if any.

There is no duplication. However, some projects and programs conducted and or proposed previously in Tanzania addressed some components of the proposed SWAHAT. The following table list some of related projects for climate change adaptation conducted in Tanzania:

Table: Climate change related programs/projects in Tanzania

| Project/Program | Objectives | Potential synergism |
|--|--|---|
| Enhancing Pro-poor Innovations in Natural Resources and Agricultural Value-chains – EPINAV. A climate change 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 change-induced 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 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. | To develop and sustain adequacy 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 | No duplication 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 Cambodia 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 technologies for forest restoration, agriculture and ecosystem services. |

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The SWAHAT project is expected to generate knowledge, skills and experiences, which will be disseminated to national and international community. The lessons learnt from this project will mainly be captured through various approaches: Site visits reports, mid term and annual review reports, project progress reports, publications, workshop reports, conference paper proceeding and project meetings

including end of the project reports. Information generated from different outputs and outcomes from the project will be shared or disseminated to farmers in the target communities through seminars, workshops, demonstrations sites, farmers field schools, hands-on practice training especially activities in component 2, 3 and 4 of the project. Furthermore, 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 outside stakeholders will be conducted using signboards, posters, booklets, pamphlets 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 improve livelihoods will be developed in components 1 through 4, for instance those covering the complete model idea in fish farming, nursery management, water and nutrient recycling. Web based dissemination through website, blogs, and other social media will be part of this approach. Since disseminating project results is useful to: i) inform future projects in best practices; ii) effectively overcome information barriers to the uptake of adaptation measures; and iii) prevent duplication of efforts, SWAHAT project will emphasize and put significant weight in knowledge management component to capture and disseminate lessons learned.

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the **Environmental and Social Policy of the Adaptation Fund.**

Through 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 to include: poor crop performance and crop failure due to insufficient and unreliable rainfall, land degradation due to water surface runoff and flooding, lack of water for domestic use and livestock, lack of alternative means for income generations, and emergence of new crop pests and diseases. 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. The consultative meeting carried out in the local governments in proposed project target areas identified a number of stakeholders: (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 sustainability of the innovations that will be established after the project end for continuity; (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 (PO-RALG) provide institutional support to sectors in the local government in project implementation.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

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, malnutrition and illnesses. Research suggests that by 2030, even if the drought frequency and intensity remain stable, 5% of the region's population will go hungry. The ecosystem resilience and capacity to support agriculture and safeguard human health will be jeopardized due to continued land and forest degradation.

Component 1 Dams construction and water harvesting (baseline Without Funding)

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 FAO²⁷, 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.

With funding of Component 1 will enable SWAHAT project to construct water harvesting dams which will solve the water scarcity challenges facing communities in the semi-arid areas. By making water available, crop productivity livestock production and farm forestry will be significantly improved which in turn will translate into improved livelihoods in term of food security, income, and restoration of ecosystem services. Eventually, the communities and surrounding ecosystems will become more resilient to impacts of climate change. With this funding at least 12 water harvesting dams will be constructed for increased water availability. The project will construct 2 dams in each of the strategically selected vulnerable villages from 2 districts of the 3 semi-arid regions namely Tabora, Singida and Dodoma. The sizes of the dams are expected to be 6-8 m deep 80 m wide and 250 m long expecting to hold over 120 million litres of water. This amount of water is sufficient to serve average of 200 households in a one village per year for domestic and agricultural and livestock use. This is based on per capita water consumption estimated at 40 – 200 litres of water per day for domestic use only. In addition to the large dams, check dams will be developed and tested in the target village with intent to raise water table so as to recharge the soil with moisture.

Component 2 (Baseline without funding): Different types of vegetation occupy the semi-arid areas of Tanzania, including grasslands, dense thickets, miombo woodlands, baobab (*Adansonia digitata*), acacia and seasonally inundated grasslands²⁸. Anthropogenic activities have extensively modified these types of vegetation, with deforestation and land degradation in these areas on the increase (Shechambo et al., 1999). These anthropogenic activities include forest clearing for agricultural expansion (especially shifting cultivation), pastoralism, fire, human settlements, charcoal making and mining. 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 lands²⁹. 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 gases³⁰. Based on these facts, it is obvious that

²⁷ 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.

²⁸ 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.

²⁹ 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>

³⁰ 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

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.

With Funding in Component 2: Funding will be used to establish at least 5 nurseries in each project village to produce and supply multi purpose fruits and forest trees seedlings for planting in strategically selected sites on the farming landscapes. Among others, the planted fruit and multipurpose trees will provide food, fodder, timber, and fuel woods as well as reduce the rate of deforestation and land degradation. This component will include interventions that incorporate fruit trees and adapted forest trees in the target community's farms landscapes. Communities will be trained on nursery techniques, germplasm distribution, better management and utilization of fruits and forest trees products and services. The plan is to train at least 50 members of the community in each village. The training will be conducted 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. Best propagation methods for each of the selected species will be optimized under standard nursery establishment and management. The fund will also be used to support planting of at least 20,000 locally adapted fruits and forest trees per village Using participatory approaches, prioritization of options for restorations of degraded landscapes will be done using locally adapted fruits and forest tree species. The identified and selected adapted trees will be planted in farmlands as wind breaks, in small plots as fuel wood lots, along the dams, and on road sides and serve as afforestation and reforestation strategies. Publications will be made available for wider knowledge dissemination; Project findings and technologies disseminated through radio, TV and newspapers; Workshops held in various platforms; Established farmer schools where knowledge and skills for improved natural resource management can be obtained. Apart from farmers' groups, also schools will be involved through Environmental Clubs with the purpose of inculcating environmental awareness, adaptation to climate change and resilience. Sustainable utilization of fruits and forest tree products will be conducted so as to i) add value and diversify products from fruits and forest trees ii) maximize benefits, iii) prevent overharvesting which results into degradation of established fruits and forest trees.

Component 3 (baseline without funding): Develop integrated climate resilient livelihoods diversification - Because the agricultural system is largely-rain fed which is increasingly becoming unpredictable and unreliable with the continuing effects of climate change, the largest employer of the population is kept in jeopardy (Paavola, 2003, URT, 2003). Shortening and/or change of the growing season are trends that have already been observed. For example in Dodoma region there had been an 80% decrease in harvests as a direct result of poor or late arrival of rainfall. The shortage of rains triggers food aids to the starving people especially in coastal and northeast regions (URT, 2007).

Being a staple food for most Tanzanians, maize that is widely grown in Tanzania is projected to be affected the most by recent climate variability ¹², resulting into decrease in maize harvest by up to 33%. With the current climate variability, livestock productivity, survival and distribution will be affected through reduced quantity and quality of range-land and prevalence of vector-borne livestock diseases (IPCC, 2001, URT, 2003). Studies show that milk and meat production will be reduced following the stress on the grazing lands (URT, 2003, 2007, IPCC, 2001). As a result, pastoralists are forced to relocate to places where pasture and water are available (Shayo, 2006, URT, 2007). However, the tendency has already caused conflicts between different pastoralist societies on one hand and farmers and pastoralists on the other.

Chicken production is an important source of animal-source food and income for rural subsistence producers in Tanzania. In terms of livestock ownership, chicken is dominant in Tanzania, with more than 86% of the 4.6 million livestock-keeping households owning chickens. These demonstrate the central importance of poultry production to poverty reduction and nutrition improvement in the country. Poultry has therefore a natural advantage over other livestock industries because of its low global The impacts of

climate change on chicken (Costa, 2009) productivity will greatly reduce resilience of vulnerable farmers to climate change.

Component 3 (With Funding): Develop integrated climate resilient livelihoods diversification.

This component seeks to use the harvested water to integrate crop, livestock and fish production interventions. It will also integrate apiculture for enhanced insect pollination of vegetable crops and fruit trees species and other plants in the landscape. This integrated climate resilient smart agriculture will lead into increased income generation thus making these communities more resilient to climate change impacts. Funds allocated to this component will be used will generate the following major outcomes: improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use. Funds allocated to this component will be used to establish Aquaculture farms in the project villages by executing the following activities: i) Excavations and establishment of model fish ponds down stream of the water harvesting dams; ii) Stocking of fingerlings; iii) Training of farmers in the target communities on fish farming practices, management of ponds and sustainable harvesting of fish; iv) Development of manuals and fliers on aquaculture and value addition and marketing; v) Develop sustainable, nutritious and efficient fish feeds for rural aquaculture in the target community; vi) adaptation of different species of fish in aquaculture ponds and dams in project areas of the intervention. vii) Establishment and management of vegetable production gardens down stream of the water dams; viii) design and establish irrigation systems for vegetable gardens; ix) Training of farmers on vegetable production value chain; and x) Training on postharvest handling and packaging of vegetable crops

In terms of livestock production, the funding will be used for: i) Establish poultry and livestock units along the dams. Livestock to include dairy or fattening beef and goats; ii) Construction of collection units for manure; iii) Connecting drainage systems from animal units to fish pond and down stream to vegetable gardens reuse of water in the upstream; iv) Establish livestock pasture paddocks on the landscapes down stream the dams for rotational grazing of established carrying capacity; v) Establish apiary bee hive unit for honey and pollination of fruits and vegetable crops in the project area; vi) Construction of water drinking points and water delivery trenches for community livestock along the dams to reduce siltation and contamination of water; and To develop a model for improved productivity of poultry and livestock in the vicinity of established water harvesting

Component 4 (Baseline Without funding): Formulate and implement interventions for integrated management of emerging climate change related pests and diseases

Crop pests, which include insects, pathogens and weeds, continue to be one of the biggest constraints to food and agricultural production. Climate change has been associated with new emerging races and ecotypes of insects and disease pests. As of recent in Tanzania, new species of fall army worms, spider mites, devastating grasshoppers and strains or races of virus such as Maize Lethal Necrosis (MLN) Disease have emerged as a result of climate change. Currently the outbreak MLN disease has been a serious threat for maize production in Tanzania and other East African countries³¹. According to the survey conducted by CIMMYT in 2012, potential yield loss of more than 60% was reported in the affected areas. Infection rate and damage can be very high seriously affecting yields and sometimes causing complete crop loss^{32 33}. Other pests like Fruit flies³⁴, for instance, cause extensive damage to fruit and vegetable production and, as

³¹ Wangai AW, Redinbaugh MG, Kinyua ZM, Miano DW, Leley PK, Kasina M, Mahuku G, Scheets K, Jeffers D (2012). First report of Maize chlorotic mottle virus and Maize Lethal Necrosis in Kenya. *Plant Dis.* 96:1582-1582

³² Kiyyo J. G.1 and Kusolwa P. M. (2017) Estimation of heterosis and combining ability in maize (*Zea mays* L.) for maize lethal necrosis (MLN) disease. *Journal of Plant Breeding and Crop Science* Vol. 9(9), pp. 144-150. DOI: 10.5897/JPBCS2017.0657

³³ Innocent Ritte, Marceline Egnin, Paul Kusolwa, Papias Binagwa, Kheri Kitenge, Desmond Mortley, Steven Samuels, Gregory Bernard, Osagie Idehen and Conrad Bonsi (2017) Evaluation of Tanzanian maize germplasms for identification of resistant genotypes against maize lethal necrosis. *African Journal of Plant Science*. Vol. 11(10), pp. 377-391, DOI: 10.5897/AJPS2017.1581

³⁴ Mwatawala, M., Maerere, AP., Rwegasira, GM., Makundi, RH., Virgilio, M. and De Meyer, M. (2012). Seasonal and annual abundance of *Bactrocera invadens* in Central Tanzania. 2nd Tephritid Workers of Europe, Africa and the Middle East (TEAM) Meeting (Kolymbari, Crete). Book of abstracts. 43.

the globe's temperatures continue to increase, are finding more areas to call home. Controlling such pests often requires the use of pesticides, which can have serious side effects on human health and the environment. Climate change may also play a role in food safety. A growing number of pests and diseases could lead to higher and even unsafe levels of pesticide residue and veterinary drugs in local food supplies. And changes in rainfall, temperature and relative humidity can readily contaminate foods like groundnuts, wheat, maize, rice and coffee with fungi that produce potentially fatal mycotoxins. Livestock and poultry diseases in the target farmers community are prevalent as a result of climate change. Among other include; arthropod-borne diseases such as African swine fever, rift valley fever, east coast fever, Newcastle disease, fowl pox, and CCPP (Contagious Caprine Pleural Pneumonia) affecting goats.

With Funding of Component 4: Funding in this component will be directed to test various options for integrated pest and diseases management in order to reduce risks of crop and livestock loss. The funds will be allocated interventions that will lead to 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. The funding from this project component will be used to develop guidelines for each insect pest/vector and disease which will later be distributed to target farmers. The funding will be used to conduct participatory survey and sampling for identification of major insect pests and vectors that occur in the project areas affecting crop and livestock production. Other activities to be supported by the funding include participatory sampling and identification of diseases in crops, poultry and livestock production in the target project areas and participatory testing and implementing best and economically feasible pest and disease management options /IPM. The funds allocated to this component will also be used to train farmers groups of best-adopted IPM technologies in the target project areas and generate information on types of technology and status of adoption in crops, poultry and livestock production. It is expected that at least 70% of the farmers involved in the project will adopt and implement the IPM technologies for resilience to climate change

J. *Describe how the sustainability of the project/programme outcomes has been taken into account when designing 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. 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.

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 centre 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 experiences from other development actors 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 change of the people as well as enhancing a sense of ownership of the project's interventions amongst the stakeholders. Apparently, this project approach serves as the cornerstone for sustainability of the project interventions even beyond after the project has come to an end. The project will also be implemented using existing government and community 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, established forests and farms, orchards, tree nurseries, fish farms and apriary units will handled over to the local institutions for continued management and operations.

Technical sustainability: During the project, district technical staff will be engaged. Training of trainers that will be implemented in the project will improve the technical capacity of the local experts who will

eventually continue to provide technical backstopping to the target communities beyond the project life. The project will have a dissemination component of the lessons learnt to the wider audience thus, making them aware of the successful interventions allowing them to apply elsewhere. The participatory nature of the project will equip the local community with technical knowledge and skills and instil the sense of ownership to the local community who 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 choosing to engage in quick income ventures. The proposed integrated technologies for crops, fishery, livestock, fruits, vegetables and forestry activities are designed in such a way that there is short term income generation from the investment. This will motivate project and non-project farmers to adopt the interventions and hence a sustainability window.

Environmental sustainability: Environmental sustainability will be ensured through – i) Planting of locally adapted forest tree species will lead to restoration of land 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 renewable energy supply such as solar powered water pumps which will continue to be used after the project; 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 and v) Application of IPM technologies and climate smart agriculture will be implemented.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project.

| Checklist of environmental and social principles | No further assessment required for compliance | Potential impacts and risks – further assessment and management required for compliance |
|--|--|---|
| <i>Compliance with the Law</i> | No further assessment required for compliance | The project components and outputs are in line with many of the provisions of the Constitution of the United Republic of Tanzania. |
| <i>Access and Equity</i> | Compliance assessment during implementation may be required | - Initial assessment if men and women are able to participate fully and equitably and receive comparable social and economic benefits |
| <i>Marginalized and Vulnerable Groups</i> | Compliance Assessment during implementation may be required | Initial assessment of vulnerability status during project site/wards and village levels ESIA screening phase, and compliance assessment during implementation is required |
| <i>Human Rights</i> | No further assessment required for compliance | The constitution and legal proclamations respect human rights |
| <i>Gender Equity and Women's Empowerment</i> | Further assessment required, as this is one of the focus areas of project and compliance is key. | Initial assessment during project site/ wards and village levels ESIA screening phase, and compliance assessment during implementation is required |
| <i>Core Labour Rights</i> | No further assessment required for compliance | Labor proclamation protects the rights of contract employees and contains similar provisions with that of Adaptation Principle |

| | | |
|---|--|---|
| <i>Indigenous Peoples</i> | No further assessment required for compliance | There is no specific national legislation on this aspect. In the project areas this may not be relevant because of absence of indigenous people. Should there be any, appropriate actions as per the adaptation funds will be adhered to. |
| <i>Involuntary Resettlement</i> | Initial screening and compliance assessment required, during implementation | Initial assessment during project site/wards and village levels ESIA screening phase and compliance assessment during implementation is required. |
| <i>Protection of Natural Habitats</i> | No further assessment required for compliance | |
| <i>Conservation of Biological Diversity</i> | Compliance Assessment during implementation may be required | Assessment to inform and strengthen the conservation of biodiversity at the project sites may be required |
| <i>Climate Change</i> | No further assessment required for compliance | - |
| <i>Pollution Prevention and Resource Efficiency</i> | No further assessment required for compliance | - |
| <i>Public Health</i> | No further assessment required for compliance | - |
| <i>Physical and Cultural Heritage</i> | Initial screening to verify that physical and cultural heritage sites are not in the vicinity | The criteria for selection of project sites forbids locating project activities in the vicinity of physical and cultural heritage sites |
| <i>Lands and Soil Conservation</i> | Initial assessment and reconnaissance survey will be conducted during selection of placement of the project site | - Elements of land and soil conservation will be evaluated before the execution of the project |

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project implementation.

NEMC will be the lead implementing entity of the adaptation fund. Sokoine University will be the coordinating institution for the SWAHAT project activities through the Directorate of Postgraduate, Research, Technology Transfer and Consultancy (DPRTC). Through SUA the DPRTC has previously coordinated big research programs such as Climate Change Impacts, Adaptation and Mitigation (CCIAM), Enhancing Pro-poor Innovation in Natural Resources and Agricultural Value Chain (EPINAV), Soil Water Management Research Program (SWMRP). In addition SUA host the Southern African Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development (ACEIRPM&BTB), African Centre of Excellence for Infectious Diseases of Humans and Animals in Southern and East Africa (SACIDS-ACE). SUA also hosts the National Carbon Monitoring Centre (NCMC). The University has a dedicated unit in the finance department that is solely responsible for managing project funds. With this track record, SUA has the Capacity and experience to manage fund projects to ensure project objectives are met and outputs are delivered. The University will provide research infrastructure as well as researchers time. A team of multidisciplinary experts who will be coordinated by the Project coordinator will implement the project. 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.

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 acts and National Irrigation act 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 |
| Limited ability and willingness to understand and adopt the innovations | Medium | Capacity building of target village communities 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. Describe the measures for environmental and social risk management, in line with the **Environmental and Social Policy of the Adaptation Fund.**

| Identified risks | Risk Rate | Mitigation Measures |
|---|-----------|---|
| Access and equity | Low | <ul style="list-style-type: none"> Capacity building Participatory resource management |
| Marginalized and vulnerable | Low | <ul style="list-style-type: none"> Sensitization of all social groups Institutionalization of the project activities for continued execution |
| Conservation of Biological Diversity | Low | <ul style="list-style-type: none"> Prior assessment of biodiversity status Sensitization of all social groups Participatory development and implementation of conservation practices |
| Pollution prevention of resource efficiency | Low | <ul style="list-style-type: none"> Compliance to environmental laws Integrated soil fertility and pest management |
| Land and soil conservation | Low | <ul style="list-style-type: none"> Promoting integrated soil conservation practices Minimize soil disturbances by machines during dam construction |

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

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 Implementing 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 NEMC and executing entity. 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: Monitoring and Evaluation Budget

| Activity | Responsible person | Budget | Timeframe |
|-------------------------|--------------------------------------|--------|-------------------------------------|
| Inception meeting | Executing entity project coordinator | 5,841 | Within 2 months of project starting |
| Baseline survey | Executing entity project coordinator | 16,110 | Within 2 months of project starting |
| Mid-term review | External consultant | 32,000 | 24 months |
| NIE annual visits | NIE project coordinator | 5,000 | Annual |
| Annual meetings | | 17,523 | Annual |
| Final evaluation report | External consultant | 8,000 | 48 months |
| Audit reports | External auditor | 5,000 | Annual |
| TOTAL | | 89,474 | |

E. Include a 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 change-induced 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 female and male headed HHs having access to water supply | To be established during the baseline study | 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 adopt diversified sources of income generation activities 700 female and 300 male headed HHs having access to water supply | <ul style="list-style-type: none"> • 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, Mid-term and final project evaluation reports | Within and beyond the project life |
| Component 1: Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture | | | | | |
| Expected results | Indicators | Baseline | Targets | Means of verification | Milestone |
| Community water harvesting dams for integrated agriculture, livestock, tree planting and aquaculture designed and constructed | <ul style="list-style-type: none"> • Number of sites where physical water dams has been constructed to deal with climate risk • Number of dams constructed per village • Number of overhead water tanks installed • Number of constructed water supply channels | | Twelve (12) water harvesting dams each with capacity of 120 million liters constructed Increased agroforestry trees, crop, fish and livestock productivity, biodiversity and vegetation cover Improved governance on water use rights and management of forest resources | 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 |
|--|---|---|---|---|--|
| | | | Reduced drudgery and time for women | | |
| 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 | <ul style="list-style-type: none"> • Number of nurseries established • Number of fruit trees planted on farmlands • Number of catchment areas planted with forest trees • Number of seedlings produced and planted • Number of community members trained on better management and conservation of natural forests • Number of farmer's groups trained on techniques for nursery establishment • Performance of improved germplasm of selected tree species | To be established during the baseline study | <p>At least 5 nurseries with multi purpose fruits and forest trees per village established</p> <p>At least 20,000 locally adapted fruits and forest trees per village established in local communities</p> <p>Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species (50 youths per village)</p> <p>2.4: Sustainable use of fruits and forest tree products developed</p> | <p>Periodic project reports surveys, studies</p> <p>Project annual impact assessment reports</p> <p>Mid-term project reports</p> <p>final project evaluations</p> <p>Village data</p> | At the end of the project implementation |
| Component 3: Develop integrated climate resilient livelihoods diversification through improved technologies in apicultures, agriculture for fish, crops and livestock production | | | | | |
| Expected results | Indicators | Baseline | Targets | Means of verification | Milestone |
| Integrated climate resilient livelihoods | <ul style="list-style-type: none"> • Established model fish ponds downstream of the water harvesting dams | | Twelve model aquaculture farms each with at least 4 ponds | Periodic project reports surveys, studies | At the end of the project implementation |

| Expected results | Indicators | Baseline | Targets | Means of verification | Milestone |
|---|--|--|---|--|--|
| diversification through improved technologies in agriculture developed | <ul style="list-style-type: none"> Number of farmers in the target communities trained on fish farming practices, management of ponds and sustainable harvesting of fish Number of developed manuals and fliers on aquaculture and value addition and marketing List of fish feeds for rural aquaculture The percentage of productivity, growth, survival and reproductive rates of fish in dams and ponds determined Number of women/men from target HH with a new source of income Economic analysis of the model for complementarity improved crop and livestock productivity | To be established during the baseline study | <p>established in the project villages</p> <p>Twelve model vegetable gardens with diversified vegetable crops established</p> <p>At least 30% of households within target community are integrated in aquaculture, horticulture, livestock and apiculture.</p> | <p>Project annual impact assessment reports</p> <p>Mid-term project reports</p> <p>final project evaluations</p> <p>Village data</p> | |
| 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 | <ul style="list-style-type: none"> List of major insect pests and vectors affecting crop and livestock production in target areas List of crops, poultry and livestock diseases in the target areas Developed IPM technologies for management of pests and diseases | To be established during the baseline survey | <p>At least one guideline for each insect pest/vector and disease produced and distributed to target farmers</p> <p>At least 70% of the farmers (crop and livestock keepers) involved in the project adopted and implementing the IPM technologies for resilience to climate change</p> | <ul style="list-style-type: none"> 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 |

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund.

| <i>Project Objective(s)</i> | <i>Project Objective Indicator(s)</i> | <i>Fund Outcome</i> | <i>Fund Outcome Indicator</i> | <i>Grant Amount (USD)</i> |
|---|---|---|--|---------------------------|
| Construction and establishment of community water harvesting dams | <ul style="list-style-type: none"> • Number of established water harvesting dams in three target regions • Number of check-dams established | Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors | 4.2. Physical infrastructure improved to withstand climate change and variability-induced stress | 538,510 |
| Participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization | <ul style="list-style-type: none"> • At least 5 nurseries with multi purpose fruits and forest trees per village established • At least 20,000 locally adapted fruits and forest trees per village established in local communities • Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species (50 youths per village) • Sustainable use of fruits and forest tree products developed | Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress | 5. Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress | 123,000 |
| Integrated climate resilient livelihoods diversification through improved technologies in agriculture developed | <ul style="list-style-type: none"> • Twelve model aquaculture farms each with at least 4 ponds established in the project villages; • Twelve model vegetable gardens with diversified vegetable crops established • At least 30% of households within target community are integrated in aquaculture, horticulture, livestock and apiculture. | Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas | 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 | 172,920 |
| Interventions for integrated management of emerging | <ul style="list-style-type: none"> • At least one guideline for each insect pest/vector and disease | 3. Strengthened awareness and | 3.1. Percentage of targeted population aware of | 77,685 |

| <i>Project Objective(s)</i> | <i>Project Objective Indicator(s)</i> | <i>Fund Outcome</i> | <i>Fund Outcome Indicator</i> | <i>Grant Amount (USD)</i> |
|---|--|---|---|----------------------------------|
| climate change related pests and diseases | <p>produced and distributed to target farmers.</p> <ul style="list-style-type: none"> At least 70% of the farmers (crop and livestock keepers) involved in the project adopted and implementing the IPM technologies for resilience to climate change | ownership of adaptation and climate risk reduction processes at local level | predicted adverse impacts of climate change, and of Appropriate responses | |

| <i>Project Outcome(s)</i> | <i>Project Outcome Indicator(s)</i> | <i>Fund Output</i> | <i>Fund Output Indicator</i> | <i>Grant Amount (USD)</i> |
|---|--|---|--|----------------------------------|
| <ul style="list-style-type: none"> Improved livelihoods and resilience to climate change of the rural communities, improved food and nutrition security, and ecosystem services Reduced drudgery for women and children from long distance walk in search of water and firewood | <ul style="list-style-type: none"> 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) | Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change Impacts, including variability | 4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types) | 538,510 |
| <ul style="list-style-type: none"> Improved ecosystem health and delivery of ecosystem goods and services Increased sources of employment opportunities resulting from fruits and forestry venture | <ul style="list-style-type: none"> 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 | Output 5: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability | 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) | 123,090 |

| Project Outcome(s) | Project Outcome Indicator(s) | Fund Output | Fund Output Indicator | Grant Amount (USD) |
|---|---|--|--|---------------------------|
| <ul style="list-style-type: none"> Reduced land and forest degradation in the community landscape | | | | |
| <ul style="list-style-type: none"> Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use. Improved equitable water use for multiple agroecological needs by the community; Improved governance of water and use of forest resources for climate resilience in target village communities | <ul style="list-style-type: none"> Percent increase in income, Reduced nutrition related illness Increased number of households in food and nutrition security in face of climate change <p>Number of farmers, students and policy makers with improved capacity in strategies in climate change adaptation</p> <p>Number of people adopted to technologies for adaptation and mitigation of impacts of climate change</p> | <p>Output 6: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability</p> <p>Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities</p> <p>Output 7: Improved integration of climate-resilience strategies into country development plans</p> | <p>3.1.2 No. of news outlets in the local press and media that have covered the topic</p> <p>7.1. No., type, and sector of policies introduced or adjusted to address climate change risks</p> <p>7.2. No. or targeted development strategies with incorporated climate change priorities enforced</p> | 172,920 |
| <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> Percent reduction in crop losses by farmers in the target community in face of climate change Increase in diversity of plants, pollinators, and other beneficial organisms | <p>Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities</p> | <p>3.1.1 No. and type of risk reduction actions or strategies introduced at local level</p> | 77,685 |

G. Include a 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 | Personnel | Consumables | Equipment | Transport vehicle | Consultancy | Dam ponds and establishments | Maintenance costs | M&E | Training | Total Cost |
|---|------------|-------------|-----------|-------------------|-------------|------------------------------|-------------------|-----------|------------|--------------|
| Component 1 Design, construct and establish community water harvesting dams | 11,880.00 | | | 4,000.00 | 39,600.00 | 420,000.00 | 59,400.00 | | 3,630.00 | 538,510.00 |
| Component 2: Develop and implement participatory afforestation program for locally adapted fruit and forest trees utilization | 19,800.00 | 14,223.00 | 7,920.00 | | 44,220.00 | | 11,880.00 | | 25,080.00 | 123,123.00 |
| Component 3: Develop integrated climate resilient livelihoods diversification for climate change | 90,090.00 | 19,800.00 | 23,760.00 | | 6,600.00 | 15,840.00 | 5,280.00 | | 46,200.00 | 207,570.00 |
| Component 4: Formulate and implement interventions for integrated management of emerging pests and diseases | 26,400.00 | 15,840.00 | 3,960.00 | 7,400.00 | | | | | 25,080.00 | 78,680.00 |
| Project Execution costs, (vehicle, salaries, M&E, general secretariat services, Coordination fees, Stake holders Meetings,) | 37,884.00 | 11,880.00 | 3,960.00 | 22,440.00 | | | 2,640.00 | 33,000.00 | 25,080.00 | 136,884.00 |
| Total Project operation costs | 186,054.00 | 61,743.00 | 39,600.00 | 33,840.00 | 90,420.00 | 435,840.00 | 79,200.00 | 33,000.00 | 125,070.00 | 1,084,767.00 |
| Administrative cost of NIE (8.5%) | 15,814.59 | 5,248.16 | 3,366.00 | 2,876.40 | 7,685.70 | 37,046.40 | 6,732.00 | 2,805.00 | 10,630.95 | 92,205.20 |
| Institution Administrative costs (9.5%) | 17,675 | 5,866 | 3,762 | | 8,590 | 41,405 | 7,524 | 3,135 | 11,882 | 103,053 |
| Total Fund request | | | | | | | | | | 1,280,025 |

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

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 milestones.

| Project Objective/Component | Time –bound milestones disbursement Schedule per objective - Costs in USD | | | | |
|--|---|-------------------|------------------|------------------|---------------------|
| | Year 1 | Year 2 | Year 3 | Year 4 | Total |
| Survey and construction of water harvesting dams | 467,300.00 | 44,510.00 | 26,700.00 | - | 538,510.00 |
| To develop participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization | 24,675.00 | 51,525.00 | 28,335.00 | 18,555.00 | 123,090.00 |
| Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture | 35,110.00 | 56,000.00 | 51,840.00 | 29,970.00 | 172,920.00 |
| Formulate and implement interventions for integrated management of emerging climate change related pests and diseases | 15,705.00 | 19,120.00 | 22,660.00 | 20,200.00 | 77,685.00 |
| Project operating Costs | 106,962.00 | 21,852.00 | 21,785.00 | 21,945.00 | 172,544.00 |
| Administrative cost of NIE (8.5%) | 55228.92 | 16405.595 | 12862.2 | 7706.95 | 92203.665 |
| Institution Administrative costs (9.5%) | 61726.44 | 18335.665 | 14375.4 | 8613.65 | 103051.155 |
| Total Fund request | 766,707.36 | 227,748.26 | 178,557.6 | 106,990.6 | 1,280,003.82 |


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

- A. Record of endorsement on behalf of the government³⁵** *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:*

| | |
|--|---|
| Eng. Joseph K. Malongo , Permanent Secretary, Vice President's Office | Date: December, 28 th , 2018 |
|--|---|

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, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> 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 4, 2019 | Tel. and email: +255 753 240 517, nieaf@nemc.or.tz / kasigazi.koku@gmail.com |
| Project Contact Person: Prof. Paul Kusolwa | |
| Tel. And Email: +255 785 116 669, kusolwap@gmail.com | |

³⁵ 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.

Annexe 1 Concept Note

1. Project Title: Strategic Water Harvesting Technologies for Enhancing Resilience to Climate Change in Rural Communities in Semi Arid Areas of Tanzania

2. Project Team

| | |
|----------------------------------|---|
| i. Prof. Paul Mbogo Kusolwa | Team Leader, Horticulture Specialist |
| ii. Prof. Maulid Walid Mwatawala | Member, Pests and Diseases Specialist |
| iii. Dr. Dino Andrew Woiso | Member, Forestry Specialist |
| iv. Dr. Justus Vicent Nsenga | Member, Agronomy Specialist |
| v. Dr. Nazaeli Amos Madalla | Member, Aquaculture Specialist |
| vi. Dr. Mirende Kichuki Matiko | Member, Livestock Specialist |
| vii. Dr. Elinorata E. Mbuya | Member, Climate change Specialist |
| viii. Ms. Judith Kahamba | Member, Sociology and Gender Specialist |

3. Background

Majority of Tanzanians live and derive their economy from a rural agrarian setting. Climate change has come with devastating effects on the environment and in turn to people calling for adaptation technologies to address this serious challenge. Drought, floods as well as pests and diseases have become chronic environmental and socio-economic problems that are aggravated by climate change and unsustainable natural resource utilisation. The impacts of climate change in areas affected with drought and floods are more severe. Food production and income generation by communities that are already poor is severely affected. The government and donor community is forced to set aside budget to support such communities for food as well as financing various socio economic needs such as education, health and water supply the cost of which is very high.

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 environment, are exposed to a range of serious climate change related problems such as agriculture failure, deforestation and environmental degradation, malnutrition and illnesses. Research suggests that by 2030, even if the drought frequency and intensity remain stable, 5% of the region's population will go hungry³⁶. The ecosystem resilience and capacity to support agriculture and safeguard human health will be jeopardized due to continued land and forest degradation. More severe climate change would inevitably have a far greater negative impact.

Although, the research, government, local community as well as donor community know these problems, yet interventions have not yielded the needed impact. One of the reasons for the failure is lack of focus to the specific challenges in specific areas, as well as poorly integrated interventions. Problems of farmers affected by climate change are diverse, and therefore calls for integrated interventions i.e. with multidisciplinary and interdisciplinary approach. 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 in Tanzania for improved agricultural and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases.

4. Project Problem (Rationale and Justification)

The proposed SWAHAT project intends to address the climate change-induced challenges of drought, floods and high temperatures in semi arid regions in Tanzania, which results into serious water shortages. Climate change imposes negative impacts due to rise in temperature, CO₂ concentration and precipitation variation and combination of these factors^{36 373839}. Management of the water sector will become increasingly difficult as the

³⁶ Aydinap, C., Cresser, M.S., 2008. The effects of climate change on agriculture. *Agric. Environ. Sci.* 5, 672–676

³⁷ 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

³⁸ Nardone, A., Ronchi, B., Lacetera, N., Ranieri, M.S., Bernabucci, U., 2010. Effects of climate change on animal production and sustainability of livestock systems. *Livest. Sci.* 130, 57–69

³⁸ Polley, H.W., Briske, D.D., Morgan, J.A., Wolter, K., Bailey, D.W., Brown, J.R., 2013. Climate change and North American rangelands: trends, projections, and implications. *Rangeland Ecol. Manage.* 66, 493–511

³⁹ Reynolds, C., Crompton, L., Mills, J., 2010. Livestock and climate change impacts in the developing world. *Outlook Agric.* 39, 245–248

quantity and quality of water in rivers is reduced by siltation, erosion and drought, In the event of heavy and erratic rainfalls most of river water is 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 armyworm, spider mites, races of virus like maize lethal necrosis, and animal diseases are said to come with elements of climate change. Ultimately, these has led into reduction in crops and livestock productivity, forest degradation, emergence of climate change related pests and diseases, as well as water shortage for domestic use. These challenges are increasing the vulnerability of rural target communities in Tanzania, particularly those living in semi-arid areas. The problem is 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 a basis for enhancing adaptation and resilience of rural communities to climate change-induced challenges of drought, floods and high temperatures in semi arid regions in Tanzania for improved crops and livestock productivity, forest restoration and combating emergence of climate change related pests and diseases. The project will construct 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). 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.

5. Project Specific Objectives

5. Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture
6. Develop and implement participatory afforestation program for locally adapted fruit and forest trees entailing nursery establishment, tree planting, management and sustainable harvesting and utilization
7. Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture for fish, crops and livestock production
8. Formulate and implement interventions for integrated management of emerging climate change related pests and diseases that affect fruit trees, fish, crops and livestock productivity

6. Methodology, Outputs and Outcomes

Project Objective 1: Design, construct and establish community water harvesting technologies that will integrate agriculture, livestock, tree planting and aquaculture:

At least 2 dams will be constructed in each of the strategically selected villages from 2 districts of the 3 semi arid regions of Tabora, Singida and Dodoma (12 dams = 2x2x3). In addition to the large dams, check dams will be developed and tested in the target village with intent to raise water table so as to recharge the soil with moisture. Selection of the dam sites will be done in participatory manner involving land use, irrigation experts and members of the local community. The sizes of the dams are expected to be 8-10 m deep 80 m wide and 250 m long expecting to hold over 120 million litres of water. The set-up of the dams will be positioned in such a way that the dam become a key player of source of livelihoods, improving vegetation cover, reducing run off, source of irrigation water, domestic water, community animals and livestock, forests and fruit trees nursery management and down-stream feeding water for fish ponds and aquaculture for village community.

Output 1.1: At least 12 water harvesting dams constructed for increased water availability

Output 1.2: Increased agroforestry trees, crop, fish and livestock productivity, biodiversity and vegetation cover; **Output 1.3** Improved governance on water use rights and management of forest resources

³⁹IFAD (International Fund for Agricultural Development), 2010. Livestock and climate change. <http://www.ifad.org/lrkm/events/cops/papers/climate.pdf>

³⁹ Koffi K., Ahoussi E., A. M. Kouassi, O. Kouassi, Kpangui L. C. and Biemi J. (2013). Integration of hydro-climatic 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 2013 DOI: 10.5897/AJEST2013.1453

Outcomes: Improved livelihoods and resilience of the rural communities to climate change, improved food and nutrition security, and ecosystem services; Increased productivity in Agricultural, forest and ecosystem services; Women and children relieved from long distances to fetch water and redirecting time to productive activities

OBJECTIVE 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

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 agro-ecosystems 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 sustainable harvesting and use of resources. They will include integrated apiary sites, improved harvesting and 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 well-being of the natural habitat.

Output 2.1: At least 5 nurseries with multi purpose fruits and forest trees per village established;

Output 2.2: At least 20,000 locally adapted fruits and forest trees per village established in local communities;

Output 2.3: Increased number of people with knowledge on establishment, propagation and management of fruits and forest tree species (50 youths per village); and **Output 2.4:** Sustainable use of fruits and forest tree products developed.

Outcomes Improved ecosystem health 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 community landscape.

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

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 (vegetables gardens). This will involve rotational use manure from poultry or livestock for fertilizing fish ponds placed downstream of the dams, vegetable gardens, and preparation of tree nursery potting media. In turn, nutrient-rich water drained from the fish ponds will be reused for irrigation of vegetable crop gardens plots. This component will also include apiculture for enhanced income generation and insect pollination of vegetable crops and fruit trees species.

Output 3.1: Aquaculture farms will be established in the project villages;

Output 3.2: Improved horticultural crop productivity per unit of water from rainfall or from water harvested;

Output 3.3: Developed model for improved productivity of poultry and livestock in the vicinity of established water harvesting dams with high in-situ nutrient retention and ecosystem services;

Outcomes: Improved household livelihoods and income generation of local communities from fish, crop, livestock and domestic water use; Improved equitable water use for multiple agroecological needs by the community; and Improved governance of water and use of forest resources for climate resilience in target village communities.

OBJECTIVE 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

This component aims to test options for integrated pest and diseases management in order to reduce risks of crop and livestock loss. In order to enhance resilience of our farmers, the project will design reliable management options and quarantine mechanism to avoid the spread of pests and diseases. 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.

Output 4.1: At least one guideline for each insect pest/vector and disease produced and distributed to target farmers.

Output 4.2: At least 70% of the farmers (crop and livestock keepers) involved in the project adopted and implementing the IPM technologies for resilience to climate change.

Outcomes: 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

7. Stake holders

(i) Local communities: Identification of project problem, project implementation, project beneficiaries

(ii) District and Local Government Authorities: Problem identification, project implementation and take up after completion

(iii) Academic and Research Institutions: Problem identification, project implementation, reporting, technical backstopping and dissemination.

(iv) Government Ministries and Institutions: Financing, facilitation, dissemination, liaison issues and policy frameworks.

(v) Civil Society Organizations (CSOs): Advocacy, capacity building and out-scaling

8. Project budget and Timeframe

| Project Objective/Component | Costs and time frame for project implementation (Costs in USD) | | | | |
|--|--|-------------------|------------------|------------------|---------------------|
| | Year 1 | Year 2 | Year 3 | Year 4 | Total |
| Survey and construction of water harvesting dams | 467,300.00 | 44,510.00 | 26,700.00 | - | 538,510.00 |
| To develop participatory afforestation program for locally adapted fruit and forest trees and sustainable harvesting and utilization | 24,675.00 | 51,525.00 | 28,335.00 | 18,555.00 | 123,090.00 |
| Develop integrated climate resilient livelihoods diversification through improved technologies in agriculture | 35,110.00 | 56,000.00 | 51,840.00 | 29,970.00 | 172,920.00 |
| Formulate and implement interventions for integrated management of emerging climate change related pests and diseases | 15,705.00 | 19,120.00 | 22,660.00 | 20,200.00 | 77,685.00 |
| Project operating Costs | 106,962.00 | 21,852.00 | 21,785.00 | 21,945.00 | 172,544.00 |
| Administrative cost of NIE (8.5%) | 55228.92 | 16405.59 | 12862.2 | 7706.95 | 92203.665 |
| Institution Administrative costs (9.5%) | 61726.44 | 18335.66 | 14375.4 | 8613.65 | 103051.155 |
| Total Fund request | 766,707.36 | 227,748.26 | 178,557.6 | 106,990.6 | 1,280,003.82 |



Annex 2: Project Formulation Grant (PFG)

Submission Date: **January 4, 2019**

Adaptation Fund Project ID:

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**

Type of IE (NIE/MIE): **National Implementing Entity (NIE)**

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

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

A. Project Preparation Timeframe

| | |
|------------------------|-----------------------|
| Start date of PFG | March 18, 2019 |
| Completion date of PFG | May 26, 2019 |


B. Proposed Project Preparation Activities (\$)

Describe the PFG activities and justifications:

| List of Proposed Project Preparation Activities | Output of the PFG Activities | USD Amount |
|---|---|------------|
| Desk work (Literature search) | Concrete literature review | 1,000 |
| Conduct site visit in community level consultations to validate the designs and inputs into the full proposal | Validated project design for the full proposal development | 9,900 |
| Consultation meetings with stakeholders to obtain technical inputs | Reports, stakeholders attitudes/technical inputs; refined methodology and project implementation plan | 6,500 |
| Critical analysis of technical project components and prepare project log frame | Concrete project components and log frame developed | 4,900 |
| Critical analysis of project budget to justify concrete project components | A concrete project budget developed in reconciliation with components | 1,600 |
| Full project document development | Project proposal developed for submission | 6,000 |
| Printing and binding of the project proposal documents | Printed and soft bound copies of full project proposal | 100 |
| Total Project Formulation Grant | | 30,000 |

C. Implementing Entity

This request has been prepared in accordance with the Adaptation Fund Board's procedures and meets the Adaptation Fund's criteria for project identification and formulation

| Implementing Entity Coordinator, IE Name | Signature | Date (Month, day, year) | Project Contact Person | Telephone | Email Address |
|--|---|-------------------------|------------------------|---------------|--------------------|
| Fredrick Mulinda |  | Jan-4-2019 | Prof. P. M. Kusolwa | +255785116669 | kusolwap@gmail.com |



ADAPTATION FUND

Annex 3: Government Endorsement Letter

**THE UNITED REPUBLIC OF TANZANIA
VICE PRESIDENT'S OFFICE**

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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**