

## Adaptation Planning And Implementation: Agriculture And Food Security

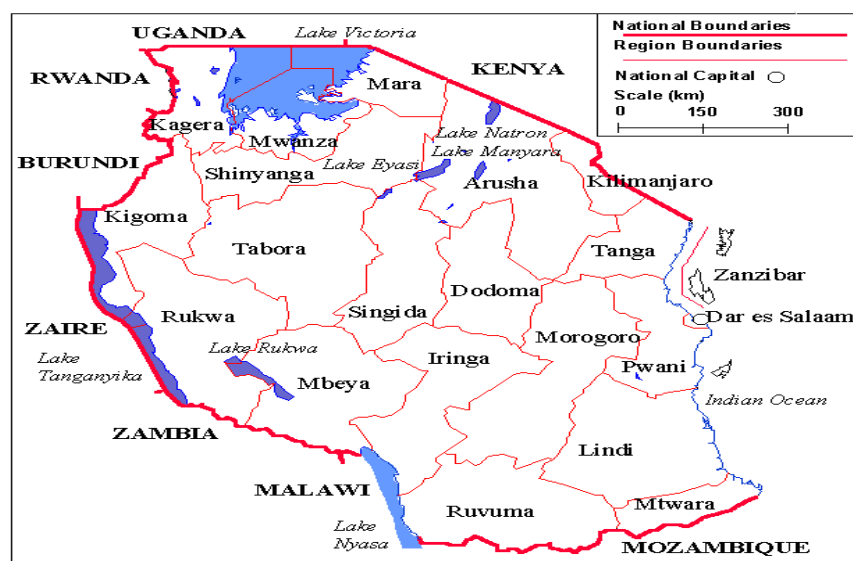
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### INTRODUCTION

The United Republic of Tanzania is located in the Eastern Part of Africa is one of the largest countries in Africa continent. Tanzania is located between 1°S to 12°S and 30°E to 40°E. The eastern boundary is an 800-km coastal liner fronting the Indian Ocean from Kenya in the North at 4°38'S to Mozambique in the South at 10°30'S. Some 40 km offshore are the islands of Zanzibar (i.e. Unguja and Pemba) and Mafia (to the South), plus numerous smaller islands. Except for the coastal belt, most of the country is part of the central African plateau at between 1,000-3,000 meters above sea level, characterized by gently sloping plains and plateaus broken by scattered hills and low-lying wetlands. The country can be roughly divided into four main climatic/topological zones namely: lowland Coastal Zone, The Highlands zone, the plateau Zone, and the Semi-desert Zone.

Mount Kilimanjaro, which is located in the Northern part of Tanzania, is the highest point in Africa at 5896 m above sea level. Tanzania also has the famous Great Lakes in Africa namely Tanganyika, Lake Victoria, Lake Nyasa, and Lake Rukwa. Fig. 1 shows the map of administrative boundaries of the United Republic of Tanzania.

Figure 1 Map of Tanzania showing administrative boundaries



## **Rainfall**

The climate of Tanzania varies from place to place in accordance with geographical location, altitude, relief and vegetation cover. Rainfall patterns in the country are subdivided into: tropical on the coast, where it is hot and humid (rainy season March - May); semi-temperate in the mountains with the short rains (*Vuli*) in November-December and the long rains (*Masika*) in February – May; and drier (*Kiangazi*) in the plateau region with considerable seasonal variations in temperature. The mean annual rainfall varies from 500 millimeters to 2,500 millimeters and above. The average duration of the dry season is 5 to 6 months. However, recently, rainfall pattern has become much unpredictable with some areas/zones receiving extremely minimum and maximum rainfall per year.

## **Temperature**

As explained above, temperatures in Tanzania vary according to the geographical location, relief and altitude. In the Coastal Regions and the off-shore Islands the average temperatures ranges between 27 °C and 29 °C, while in the Central, Northern and Western parts temperatures range between 20 °C and 30 °C and higher between the months of December and March. In the Northeast and Southwest where there are mountainous areas and Makonde Plateau, the temperature occasionally drops below 15 °C at night during the months of June and July. In some parts (Southern Highlands) temperature can reach as low as 0 °C - 6 °C. This temperature variation has significant impact on the agro-ecological zones and the adaptation strategies in the agriculture sector.

## **Economy**

Tanzania's economy depends on agriculture (including livestock); mining; tourism; industries; energy; and wildlife, forestry, marine and coastal resources. Agriculture is the dominant sector in Tanzanian economy, providing livelihood, income and employment to over 80% of the population which is around 36 million people and it accounts for around 50 percent of GDP and about 60 percent of export earnings. However, in recent years, the agricultural sector has shown increasing vulnerability, including decreased production of different crops exacerbated by climatic variability and unpredictability of seasonality, erosion of natural resource base and environmental degradation.

The changing climatic conditions have resulted to shrinking rangeland areas and overgrazing problems resulting from high livestock numbers that surpass the carrying capacity of most areas. This situation has also caused land use conflicts between stakeholders using land for different purposes.

The receding glaciers of Mount Kilimanjaro, the frequent floods, droughts and poor harvests in recent years have been major issues for concern as these have brought some impacts to the local communities. These are becoming more than ever imminent evidence of climate change due to evident temperature increases caused by global warming. The frequency of extreme weather events such as El Nino floods

in 1997/98 and the recent drought are few but important reminders of the deadly effects of climate change to Tanzania.

The most vulnerable areas/sectors impacted by the effects of climate change include:-

- Agriculture
- Water
- Energy

Agriculture becomes particularly highly vulnerable to changes in climate since it depends mostly on rainfall. Some outcomes include low food production, shrinking rangeland areas, overgrazing and land use conflicts among various stakeholders.

## **ENVIRONMENTAL CHALLENGES RESULTING IN CLIMATE CHANGE**

Tanzania has been faced with rapid and widespread environmental degradation particularly that of land and water catchments. This environmental problem has been due to the following factors:-

- Unsustainable agricultural activities in water catchments, on mountain tops, mountain slopes and in other fragile sections of mountain ecosystems;
- Overgrazing resulting from higher livestock numbers than the recommended carrying capacity;
- Uncontrolled felling of trees for firewood, charcoal and building poles;
- Loss of vegetation due to forest fires leading into floods, soil erosion and loss of fertile land for agriculture during the rainy seasons.
- Unsustainable irrigation resulting to loss of water resources;
- Unsustainable mining activities resulting in tree felling and loss of vegetation cover.
- Low knowledge on environmental management aspects.

Degradation of the environment is the root cause of desertification, drought and the drying up of water sources in the country. On average, about 91,300 hectares of forest are lost every year. Data on water sources show that the water level at various dams has been constantly decreasing, while some considerable number of wells, dams and other water sources are reported to have dried. The effects of environmental degradation in the country are now so obvious.

In the electricity energy sector, the decrease of water in the dams, apart from other reasons has caused a decrease of the contribution of hydroelectric power from around 65 percent in the year 2003 to 40 percent in the year 2005 which has in turn resulted in increased use of fuel generated electricity, power rationing and impaired economic activities and social development.

The high human population growth rate, the low economic growth, deforestation rates, high incidences of forest fires, loss of vegetation due to overgrazing and high dependency of fossil fuels are some of the factors resulting in increasing rates of global warming and the consequent climate change.

## **MITIGATION STRATEGIES OF THE CAUSES OF CLIMATE CHANGE**

In order to mitigate the root causes of climate change, Tanzania has adopted a number of measures, including development of some policies, strategies and legislations that are aimed at reducing the vulnerability of natural systems, human population and economies to climate stresses and climate change, including development and implementation of initiatives that promote equity and sustainable development and consideration of climatic risks in the design and implementation of national and international development initiatives. Some of the policies/strategies/legislature geared towards mitigation of causes of climate change include:-

### **(a) Environmental Policy**

Realising the environmental problems facing the country, the Government in 1997 put in place a National Environmental Policy seeking to provide the framework for making fundamental changes that are needed to bring environmental considerations into the mainstream of decision making in Tanzania. It seeks to provide policy guidelines, plans and give guidance to the determination of priority actions, and provides for monitoring and regular review of policies, plans and programmes. It further provides for sectoral and cross-sectoral policy analysis in order to achieve compatibility among sectors and interest groups and exploit synergies among them.

The overall objectives of the National Environmental Policy are therefore the following:

- (i) To ensure sustainability, security and equitable use of resources for meeting the basic needs of the present and future generations without degrading the environment or risking health or safety;
- (ii) To prevent and control degradation of land, water, vegetation, and air which constitute our life support systems;
- (iii) To conserve and enhance our natural and man-made heritage, including the biological diversity of the unique ecosystems of Tanzania;
- (iv) To improve the condition and productivity of degraded areas including rural and urban settlements in order that all Tanzanians may live in safe, healthful, productive and aesthetically pleasing surroundings;
- (v) To raise public awareness and understanding of the essential linkages between environment and development, and to promote individual and community participation in environmental action;
- (vi) To promote international cooperation on the environment agenda, and expand our participation and contribution to relevant bilateral, sub-regional, regional, and global organizations and programs, including implementation of Treaties.

### **(b) Environmental Management Act**

The Environmental Management Act was enacted in October 2004 and became operational 1st July 2005. Enactment of EMA is an implementation of the National Environmental Policy (NEP), 1997 which provides for the need and necessity to have framework environmental management legislation. EMA provides a solid legal basis and assign different institutions functions (mandates) for sustainable management of the environment and natural resources.

#### **Objectives**

- To provide legal and institutional framework for sustainable management of the environment
- Outlines principles for management, impact and risk assessment,
- Outlines principles for prevention and control of pollution, waste management, environmental quality and standards, public participation, compliance and enforcement, basis for the implementation of international instruments on environment
- To implement NEP, 1997

EMA seeks to provide for and promote the management, enhancement, protection, conservation and management of the environment.

### **(c) National Strategy for Growth and Reduction of Poverty- NSGRP**

The government has recently adopted the National Strategy for Growth and Reduction of Poverty - NSGRP, which is a national organizing framework for putting the focus on poverty reduction high on the country's development agenda. The NSGRP strives to widen the space for country economic ownership and effective participation of civil society, private sector development and fruitful local and external partnerships in development and commitment to regional and other international initiatives for social and economic development.

The strategy makes explicit mention of sustainable development as a basic principle and it allows for environment concerns complying with the requirements under MDG 7.

### **(d) National Adaptation Programme of Action**

Tanzania National Adaptation Programme of Action (NAPA) was recently prepared in order to look at the country's climate change related vulnerabilities in various sectors which are important for the economy. NAPA recognises and is built on the aspirations of National Development Vision 2025 for high and shared growth, quality livelihood, peace, stability and unity, good governance, high quality education and global competitiveness. Since Tanzania's economy is largely dependent on agriculture, it is deemed

that sustainable development can be achieved when strategic actions, both short term and long term are put in place to address climate change impacts on agriculture and other key economic sectors. NAPA looks at the effects of climate change as a threat mainly to the agrarian population that still depends on subsistence agriculture for their daily livelihood. NAPA identifies priority areas in various sectors, and further prioritizes project activities in those sectors. These activities need immediate and urgent actions for the country to adapt to such climate change effects on a short term basis as well as putting in place mechanisms for addressing long-term adaptation initiatives.

NAPA identified 14 priority areas based on their importance regarding impacts on poverty reduction, some of them being directly related to agriculture. However, all of them are focused towards environmental conservation and reduction of the effects resulting in climate change. The areas include:-

- (i) Water efficiency in crop production irrigation to boost production and conserve water in all areas
- (ii) Alternative farming systems and water harvesting
- (iii) Develop alternative water storage programs and technology for communities
- (iv) Community based catchments conservation and management programs
- (v) Explore and invest in alternative clean energy sources e.g. Wind, Solar, bio-diesel, etc. to compensate for lost hydro potential
- (vi) Promotion of application of cogeneration in the industry sector for lost hydro potential
- (vii) Afforestation programmes in degraded lands using more adaptive and fast growing tree species
- (viii) Develop community forest fire prevention plans and programmes
- (ix) Establishing and Strengthening community awareness programmes on preventable major health hazards
- (x) Implement sustainable tourism activities in the coastal areas and relocation of vulnerable communities from low-lying areas.
- (xi) Enhance wildlife extension services and assistance to rural communities in managing wildlife resources
- (xii) Water harvesting and recycling
- (xiii) Construction of artificial structures, e.g., sea walls, artificially placing sand on the beaches and coastal drain beach management system
- (xiv) Establish good land tenure system and facilitate sustainable human settlements

The proposed project activities form the basis of required financial and technical assistance from national level as well as the international community.

## **ADAPTATION STRATEGIES**

### **1. National Level**

#### **(a) Good Governance and political stability**

In order to succeed in its endeavour towards poverty reduction in the country, political stability and good governance is essential. Realising this fact, the Government of Tanzania has established a Ministry responsible for Good Governance. Therefore, since poverty and environmental degradation are inseparable, it is expected that environmental degradation, including factors resulting in climate change will be reduced.

#### **(b) Intensification of the early warning systems**

The Government realises the contribution of early warning systems as one of the adaptation measures to climate change. Currently, the government is implementing Famine Early Warning System and it is in the process of finalising the establishment of a Livestock Early Warning System. To facilitate this process, networking among different actors in the implementation of the early warning systems is highly encouraged. While the main actor in the Famine and Livestock Early Warning Systems are Ministries of Agriculture, Food security and Cooperatives and Ministry of Livestock Development, respectively, the Meteorology Department has a great role in providing good quality data to facilitate these processes.

#### **(c) Mainstreaming Environment into NSGPR, sector and Local Government Plans and budgets**

There have been some efforts to achieve the Millennium Development Goals by integrating all aspects of environmental considerations in to the NSGPR and the sectoral and local Government's plans and budgets. Public participation regarding integration of environmental concerns to the planning processes at all levels of the local; communities ("Opportunity and Obstacles for Development (O&OD))" is being implemented. So far, this process has been implemented in 38 out of 123 districts in the country.

#### **(d) Agricultural research and extension**

The Agricultural Sector thrives to reduction of poverty through improved and sustainable agricultural production. As a requirement, agricultural research projects in the country are supposed to be demand driven in order to solve the problems encountered in the agricultural sector, including the effects of climate change. In recent years therefore, research projects have been directed towards development of drought resistant and short duration crop varieties; selection of suitable pasture species and livestock breeds to

suit various agro-ecological zones; determination of types and appropriate levels of fertilizers; and development of suitable storage methods and efficient water use methods.

**(e) A Strategy for Urgent Actions to combat degradation of Land and Water Catchments**

In order to control this environmental degradation and the consequent green house emissions and climate change, the Government has recently adopted a Strategy for Urgent Actions to combat degradation of Land and Water Catchments. The Strategy identifies specific challenges on land and water catchments degradation in the country. It identifies areas affected, measures/strategic actions required to address the challenge, the timeframe for the actions and responsible institutions/actors.

- (i) Environmental degradation arising from the invasion of water sources and catchment areas by livestock keepers/herdsmen. To address this challenge, the strategic actions include the following:
  - Identification and mapping of all of water sources countrywide.
  - Identification of stressed water catchment areas encroached by large numbers of livestock.
  - Identification of areas suitable for livestock development to which such livestock can be relocated.
  - Information regarding the type of livestock, quantities/numbers, and carrying capacities of the land.
  - Drawing an implementation plan to relocate and resettle livestock keepers.
  - Identification, popularization, and use of traditional methods and indigenous knowledge for environmental protection. Examples include Ngitiri in Shinyanga and Alalili in Masailand.
  - Ban of unauthorized movement of livestock.
  - Identification, supervision, monitoring and management of permitted livestock transfer routes.
  - Construction of chacos, and provision of alternative water sources to herdsmen.
  - Continuous education and creation of awareness on livestock carrying capacities and maintenance and use of water infrastructure.
  
- (ii) Environmental degradation arising from illegal human activities related to agriculture and human settlement along steep slopes of mountains and mountain ranges, near river banks and around water sources. Strategic actions being undertaken are:
  - Identification of encroached and severely degraded areas.
  - Removal of illegal occupiers of areas concerned.
  - Determination of boundary of mountain ranges above which no human activities will be allowed.



- Popularisation of rain water harvesting technologies and implementation of programmes and projects associated with rainwater harvesting.
- (iii) Environmental degradation due to deforestation and massive tree cutting for fuel wood and charcoal and construction in urban areas (excessive use of wood poles, timber, etc.). Strategic actions include:
- Require institutions such as prisons, schools, and training institutions that use massive amounts of wood, to have wood plantations.
  - establish nurseries for appropriate tree species
  - Sensitize villages and urban centres to establish forest farms for firewood and charcoal.
  - Encourage research, development, and application of alternative energy sources and appropriate technologies.
  - Promote then use of kerosene, gas and coal as alternatives to wood fuel.
- (iv) Unsustainable small and large scale irrigation projects and programmes, with negative consequences on biodiversity and general water availability. The strategic actions include the implementation of regulations and procedures related to:
- Water rights.
  - Maintenance of irrigation infrastructure and regular inspecting of the said.
  - Irrigation canals such that excess water returns to the main water sources.
- (v) Inadequate accurate data and information at district level regarding water sources and land use. Actions are to ensure that:
- Identification of all water sources and assessment of their environmental status.
  - Development, dissemination and implementation of land use master plan, and
  - Giving title deeds to water source areas for proper protection.
- (vi) Environmental degradation due to wild fires. Actions include:
- To award individuals or organizations that provide information on forest or rangeland fires,
  - To empower local leadership in the prevention and control of such fires in their areas of jurisdiction.
  - To create a data/information on incidences of wild fires.
- (vii) Land and Water Degradation resulting from alien and exotic tree species. The Strategic Actions include the following:
- Identification of such unsuitable tree species.
  - Development of a community participatory programme for the removal of such species.

- Identification and promotion of tree species suitable for the protection and conservation of land and water sources, countrywide.
- (viii) Desertification and drought in many parts of the country. The actions that are being undertaken include:
- Preparation for further guidelines for continued implementation of a National Tree Planting and Maintenance Campaign.
  - Continues to sensitize the public on the Tree Planting and Maintenance Campaign.
  - Establishment of tree nurseries, with each district required to plant and maintain 1.5 million trees per year.
  - Preparation and gazetting of a list of types of protected indigenous flora (trees and other plant species).
- (ix) Public awareness and involvement in environmental protection and sustainable utilization of natural resources. Strategic actions include:
- Preparation and implementation of a countrywide Environmental Educational and Public Awareness Programme.
  - Monitoring and evaluation of the programme.
- (x) Land use conflicts among various stakeholders. Actions on this area include the following:
- Preparation of Environmental conservation and participatory land use plans for every district,
  - Determination of livestock carrying capacities in villages and districts
  - Surveying and mapping 6000 villages, and
  - Mainstreaming the Environmental Management Act 2004 into sector environmental laws and oversee their implementation.

This is an ambitious and comprehensive strategy. It requires substantive resources for its implementation in order to attain the expected impacts. The envisaged budget for its implementation is USD 30 Million per year for 5 years. The Government has committed USD 9 million for this financial year (2006/2007) in order to kick start its implementation. Implementation of this Strategy started in April 2006.

#### **(f) Participation in Regional and International Initiatives**

Tanzania participates and is implementing a number of regional and International environmental programmes. Some of these include the Nile Basin Initiative, Lake Victoria Environmental Management Programme, UNFCCC, UNCCD, etc.

## **Local Level (Indigenous knowledge)**

### **(a) Use of local varieties and seed selection**

In many cases, the local seed varieties are more resistant to drought than the improved high yielding varieties. To avoid the risks of drought and a considerable number of farmers set aside a plot which is being planted with some selected seeds from the local varieties. Local varieties are also known to be having a longer shelf life.

### **(b) Inter-cropping and diversification**

The changing climate has made the farmers to avoid the risk of planting only a single crop as they were used before. In the most vulnerable areas, such as in the low-rainfall areas, many farmers plant different crop varieties and species in the same piece of land. It is very common to find a piece of land having more than 5 types of crops.

### **(c) Drought resistant varieties**

In many areas, farmers have either switched from planting their traditional crops or they have adopted some non-traditional and drought resistant crops in order to cope with the changing climatic conditions. Some farmers, who used to plant maize as their traditional crop for example, are now planting more drought resistant crops such as cassava, millets and sorghum.

### **(d) Early warning systems**

Realising the effects of climate change, some local methods for predicting short, medium and long term climatic changes are increasingly being used. The methods differ from place to place. In this case therefore, if drought is anticipated the farmers would plant more of sorghum and millet than maize. For livestock keepers, they would tend to take precautionary measures such as shifting their animals to other places or distribute them to avoid the risk.

### **(e) Pasture reserves**

To avoid the effects resulting from climate change, livestock keepers particularly in the low rainfall areas have adopted a system of reserving pasture areas for use by young, sick and lactating animals in cases of drought.

### **(f) Disease control and grain storage and preservation**

Realising that price of inputs is high, there have been several local technologies that used by various communities to adapt to this problem. Such technologies involve disease control in livestock, grain preservation, etc.

## **CONCLUSIONS**

Despite the fact that environmental degradation in Tanzania is increasing at a considerable pace, Tanzania's contribution to Greenhouse emissions in the global context is still very low. However, since climate has no physical borders, factors resulting in climate change should receive concerted mitigation efforts from each country. Governments should therefore put in place some policies and strategies to address root causes of climate change and adaptation strategies. The adaptation measures undertaken by the local communities should be encouraged and promoted.

The high dependency on agriculture and forest sectors, high population growth rates and poverty exacerbates the vulnerability of the local societies. Therefore, adaptation efforts towards climate change should be complemented by mitigation of the factors resulting to global warming and climate change. More research is required to better understand whether and how food production is threatened by potential climate change and the adaptation mechanisms.