

# University of Dar es Salaam

## Institute of Resource Assessment

**Strengthening Local Agricultural Innovation Systems in Less Favoured and More Favoured Areas of Tanzania and Malawi to Adapt to the Challenges and Opportunities Arising from Climate Change and Variability**

### STAKEHOLDER CONSULTATION SURVEY REPORT FOR NATIONAL LEVEL IN TANZANIA



July 2008

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## **Preface**

In many sub-Saharan African countries, poverty and food insecurity are linked to low agricultural productivity which accelerating climate change (CC) threatens to make even worse. In Tanzania and Malawi, a key challenge for decision makers is to understand the context and strategies of farmers and other stakeholders in agriculture for adapting to CC, including increasingly variable climatic conditions. Diverse farming environments and complexities associated with the context of peoples' livelihoods varying over time and space suggest a need for localised innovation to enhance and sustain productivity. There is therefore a need to foster processes for two-way communication and engagement amongst these stakeholders and for supporting their information and other needs in order to strengthen farmers' and other stakeholders' capacities to adapt. It is in this line that consultations with key stakeholders was undertaken to understand the agricultural innovation system in the context of climate change and variability. This was done as a way to contribute to the project overall aim of strengthening the capacity of individuals, organizations and systems within the agricultural innovation systems in Tanzania and Malawi to adapt to the challenges and opportunities arising from climate change and variability (CC & V).

## **Acknowledgements**

The national stakeholder consultations in Dar es Salaam and Arusha regions were carried out with a team of three researchers Dr. Amos Majule, Dr. Shechambo and Brown Gwambene from the Institute of Resource Assessment (IRA), University of Dar es Salaam. The team highly appreciate the support provided from the Directors in all consulted institutions and secretary of division of livestock for organizing the consultations and taking part in this exercise.

The team also wish to take this opportunity to thank all the stakeholders in the study area for their time and enriching discussions. In the course of these consultations, all of the consulted stakeholders have developed keen interest in this study and willing to take part in initiatives involving climate change and variability. The survey involved consultations with 12 stakeholders from various domains in a range of agricultural innovation systems. Special thanks are extended to the consulted stakeholders in the following domains: the, natural resources institutions, agriculture and livestock production institutions, cross cutting institutions and Manufacturing company domains.

## **Summary**

The overall objective was to understand the roles and activities in relation to agricultural innovation system. The consultations further aimed at understanding their current perceptions and practices regarding CC&V and adaptation; Identify patterns of interaction, including relationships; Examine enabling environments and Identify possible individuals and organizations to work with the project e.g. in NCG and/or as part of Learning Alliance. The report provides a synthesis of information obtained from consultations with various national stakeholders in Tanzania.

The survey involved 12 stakeholders from various institutions in a range of agricultural innovation systems. The consulted stakeholders include: Natural Resources institution including: Wildlife Division, Forest and Beekeeping Division, Ministry of water; Agriculture and Livestock production Institutions including: Livestock Division, PADEP, Plant health services section, Ministry of Agriculture, food security and cooperatives; Cross cutting including: TGNP, JET, TMA, Disaster Management Department; Manufacturing: Minjingu Organic Hyper Phosphate and Minjingu mine and fertilizer ltd.

The survey was guided by a checklist, which was developed based on the Innovation System (IS) framework in combination with sustainable livelihood frameworks. This combination provided a conceptual frame and a learning alliance approach to guide our action research. The project builds on: Trans-disciplinary partnerships and initiatives in agriculture and natural resources; Tanzania's and Malawi's NAPAs (National Adaptation Programmes of Action), which prioritize agriculture; Farmers' livelihood strategies in relation to CC; and other agricultural stakeholders' (public & private) strategies.

The findings indicate that most of the stakeholders have some level of understanding with regard to issues related to climate change and variability and agree that this is a priority issues as far as the livelihoods are concerned. However, it was established that there was very little awareness with regard to the country's NAPA to guide the adaptation to changing climate in their respective areas. Nevertheless, to some extent there was some levels of interactions among various stakeholder with regard to sharing and understanding farmers situation. Among the strength of the agricultural; innovation system for adapting to CC & V include a variety of key institutions and a willing community. The CCAA project was also singled out as the key institution to facilitate these linkages and information sharing with regard to issues related to climate change and variability.

## **Acronyms and abbreviations**

AMCOS	Agricultural Marketing Cooperative Society
ARD	Agriculture and Rural Development
ASDP	Agriculture sector Development Programme
CC & V	Climate Change and Variability
DADPs	District Agriculture Development Programs
DALDO	District Agricultural and Livestock Development Officer
DRR	Disaster Risk Reduction
IFDC	International Fertilizer Development Centre
IRA	Institute of Resource Assessment
IS	Innovation System
JET	Journalists Environmental Association of Tanzania
NAPA	National Adaptation Program of Action
NCG	National Consultative Group
NGO	Non Governmental Organizations
PADEP	Participatory Agricultural Development and Empowerment Project
PADPs	Participatory Agriculture Development Programmes
SACCOS	Savings and Credit Co-Operatives
TFA	Tanzania Farmers Association
TFC	Tanga Fertilizer Company
TGNP	Tanzania Gender Network Program
TMA	Meteorological Agency
WD	Wildlife Division

## **1 INTRODUCTION**

### **1.1 Background**

Stakeholder consultations involved National institutions most of them located in Dar es Salaam city and one in Arusha region. Dar es Salaam situated in the eastern side of Tanzania while Arusha is located in northern highlands of Tanzania. In Dar es Salaam more than 60% of the people live in urban area but more than 70% depending on agriculture and livestock keeping as their major economic activities.

### **1.2 Aims**

The objectives of the consultation survey were to:

- Identify key stakeholders, their roles and activities in relation to agricultural innovation system and CC &V;
- Understand key stakeholders' current perceptions and practices regarding CC&V and adaptation;
- Identify patterns of interaction, including relationships;
- Examine enabling environments (policies, infrastructure, informal institutions, and incentives);
- Identify possible individuals and organizations to work with the project eg in NCG and/or as part of Learning Alliance.

### **1.3 Approach**

The survey was guided by a checklist, which was developed based on the Innovation System (IS) framework. An Innovation System (IS) is defined as a 'network of organizations, enterprises and individuals focused on bringing new products, new processes and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance' (Agricultural and Rural Development -ARD World Bank 2006). A combination of a sustainable livelihoods framework and innovations systems thinking provide a conceptual frame and a learning alliance approach will guide our action research. The project builds on: Trans-disciplinary partnerships and initiatives in agriculture and natural resources; Tanzania's and Malawi's NAPAs (National Adaptation Programmes of Action), which prioritize agriculture; Farmers' livelihood strategies in relation to CC; and other agricultural stakeholders' (public & private) strategies.

The Innovation Systems concept, although originating from policy debate in more industrialized countries in the 1970s and 1980s, still provides useful insights into strengthening agricultural innovation capacity in developing countries. It is envisaged that the framework will be of benefit to our project because the emphasis of the approach is not only on professional scientists but the totality and interaction of actors involved in innovation. The IS concept moves beyond the creation of knowledge and encompasses factors affecting demand for and use of knowledge in novel and useful ways (Arnold and Bell, 2001).

Although there is increasing interest in the IS concept as a means of understanding agricultural innovation in developing countries, approaches to applying the concept to interventions are still being explored. In the World Bank ARD (2006) study, an analytical framework for the IS concept was developed and included four main elements: 1) key actors and their roles 2) the actors' attitudes and practices 3) the effects and characteristics of patterns of interaction and 4) the enabling environment for innovation. The same study suggests an intervention framework comprising: 1) A typology of agricultural innovation environments which helps in the analysis of IS in a particular context 2) Diagnostic features for each stage of IS development 3) Principles for intervention and 4) Options for interventions. The consultations thus drew on elements of the IS concept and the World Bank ARD approach.

Consultations involved the following stakeholders:

1. Ministry of Water
2. Meteorological Agency (TMA)
3. Forest and Beekeeping Division
4. Tanzania Gender Network Program (TGNP)
5. Wildlife Division
6. Livestock Division
7. Journalists Environmental Association of Tanzania (JET)
8. Disaster management Department
9. Participatory Agricultural Development and Empowerment Project (PADEP)
10. Plant Health Services Section
11. Ministry of Agriculture Food Security and Cooperatives
12. Minjingu Organic Hyper Phosphate

## 2 FINDINGS

### 2.1 Range of stakeholders and grouping (see appendix 2 below) (Qs 2 and 3)

**Table 2.1.1 classification of stakeholders consulted by sector, location and prime role with respect to agricultural innovation and cc & v in national institution**

Sector+	Prime role++ (be detailed)	Location+++
Ministry of Water	Sustain development and management of water resources and water supplies for villagers and urban areas	Dar es Salaam
Meteorological Agency (TMA)	Observation and forecasting of the weather over Tanzania, Monitoring the climate and archiving climate data of Tanzania and providing various weather and climate services including warnings related to severe weather and climate extremes	Dar es Salaam
Forest and Beekeeping Division	Insure sustainability of forest product and services	Dar es Salaam
TGNP		Dar es Salaam
Wildlife Division	Manage and sustain conservation of wildlife and wetland resources	Dar es Salaam
Livestock Division		Dar es Salaam
JET	Create awareness to the public on Environmental management, sustainability and conservation through the media	Dar es Salaam
Disaster management Department	Coordinate disaster relief issues in the country	Dar es Salaam
PADEP	Increase farm income and reduce food insecurity, there by contributing to poverty reduction	Dar es Salaam
Plant Health Services Section	Control outbreak of pest and diseases	Dar es Salaam
Ministry of Agriculture Food Security and Cooperatives	Manage agriculture as a stronghold of the national economy, food security assurance for national wide population and strengthen farmers competitive capacity in a liberalized economy policy environment	Dar es Salaam
Minjingu Organic Hyper Phosphate	Minjingu Mines and Fertilizer LTD provide raw material to feed TFC and Fertilizer	Arusha

+ eg NGO, private, public

++ eg Not for profit Extension/ seed provision, Distributing/ retailing inputs, commercial input supply to intermediaries, extension, policy, regulation, funding, research

+++ eg S.Highlands, Central Zone, Dar es Salaam,

For the purposes of this report, the stakeholders consulted are grouped as follows:

See Appendix 2 for suggestions.

### 2.2 Aims, interests and activities of stakeholders (Qs 2 and 3)

Characterize the main stakeholder groups according to their overall aims, interests and activities. Emphasis on what the stakeholders in a group have in common whilst also explaining variability within the group. This could be done through 1-3 paragraphs on each stakeholder group

## **2.2.1 Natural Resources Institutions**

### **Forest and Beekeeping Division**

Forest and Beekeeping Division was established during colonial era with the purpose of managing forest resources to ensure its sustainable use and ecosystem stability. The main role of forest and beekeeping division is to manage and sustain conservation by ensuring sustainable supply of forest products and services, increase employment through forest-based industries, ensure ecosystem stability through conservation of biodiversity, water catchments and soil fertility and enhancement of national capacity to manage sector.

The main activities of the division are forestland management; Forest based industries and products, Ecosystem conservation and management, institutions and human resources managements. The division of forest and beekeeping operates in Tanzania main lands.

### **Water Resources Division**

Water Resources Division was establishment as a ministry in 1970 with the aim of supplying water in villages and urban areas with more focus to ujamaa villages by that time. The main objective of the ministry is to sustain development and management of water resources by formulating water policy, disseminating, coordinating, facilitating, reputation and monitoring its implementation. The mission is to have sustainable and well-managed water resources for social, economic development and environmental conservation. Main activities are Qualitative and quantitative water assessment and monitoring of water resources. Area of operation is the whole Tanzania.

### **Wildlife Division**

Wildlife Division was established in 1921 with the purpose of administering game reserves, enforcement of hunting regulations and protecting people and crops from raiding animals. The main role of Wildlife division is to manage and sustain conservation of wildlife and wetland resources. The main activities include administration and regulation, promotion of stakeholder's participation in conservation development and utilization of wildlife and wetland resources for economic development and promotion of information shearing. The Wildlife Division operates in villages, district and all regions in Tanzania.

## **2.2.2 Cross cutting Institutions**

### **Tanzania Meteorological Agency**

Tanzania Meteorological Agency was established on December 3, 1999 as an Executive Agency, in July 1, 1977 was established as a Government department while before June 30, 1977 was a department of the Defunct East African Community (EAC). The main roles include observation and forecasting of the weather over Tanzania, Monitoring the climate and archiving climate data of Tanzania and providing various weather and climate services including warnings related to severe weather and climate extremes. Main activities of the organization include weather observation and climate monitoring, weather forecasting and climate prediction and provision of weather and climate information, services and warnings. It operates in whole area of the united republic of Tanzania.

### **JET**

Journalists Environmental Association of Tanzania (JET) was established in 1991 with the aim of creating awareness to the public on environmental management, sustainability and conservation through the media. It operates in all regions in Tanzania where they will be on environmental problems. The main role includes creation of awareness, networking, organizing trainings, and informing the public on environmental destruction through the media. Among the main activities of the organization include: campaign on the removal of Usangu Pastoralists, campaign on the reservation of wetlands areas (Ramsar Sites) and sharing knowledge with the people of Lake Natron on the worries of environmental destruction in the area.

### **Disaster management Department**

Disaster management Department was established in 1990 (though the disaster Relief coordination act No. 9 of 1990) with the aim of coordinate disaster relief issues in the country. The main roles of the department are: to carry out research on disaster related issues; collect, analyze and disseminate information; insure that mitigation, preparedness, response plans are in place; provide public awareness on policy, legislation and operations

issues. The main activities include: coordination of relief interventions, conducting disaster/ damage assessments and creation of public awareness. The geographical operation area is Tanzania mainland (21 regions) with focus on vulnerable areas and incidents as they occur.

### **2.2.3 Agriculture and Livestock production Institutions**

#### **PADEP**

Participatory Agricultural Development and Empowerment Project (PADEP) was established in August 2003 for the purpose of increase agriculture and livestock production. The main objective is to increase farm income and reduce food insecurity, there by contributing to poverty reduction. Its activities include funding of smallholder agricultural innervations that are implemented at community level through community based and farmer groups approach. The organization operates in 32 districts in Tanzania mainland and 5 districts in Zanzibar.

#### **Plant Health Services Section**

As a unity established since independence 1961 and as a section was established in 1980's with the main object of controlling outbreak of pest and diseases. The plant Health services section has the mandate to: control pests in the country using integrated pest management approaches, prevent introduction of pests and invasive plants, transfer plant protection related technology to extension agents and farmers and insure safe use/ handling of pesticides.

The main activities health services section is management of community based armyworm forecasting, up scaling of integrated pest management and mass captures research for *Quelea* birds. Also it involved in strengthening plants Quarantine and phytosanitary services and pesticide stewardship and review of the plant protections. The section operates in the whole Tanzania mainland.

#### **Ministry of Agriculture Food Security and Cooperatives,**

Ministry of Agriculture Food Security and Cooperatives is the governmental ministry, which existed alongside the government survival. The aim is managing agriculture sector, food security and cooperative movement. Main roles of the ministry are to manage agriculture as a stronghold of the national economy, food security assurance for national wide population and strengthen farmer's competitive capacity in a liberalized economy policy environment.

Main activities include: Agriculture Sector Development Programme (ASDP) embraces a number of activities geared to manage agriculture sector, Participatory Agriculture Development Programme (PADP) and District Agriculture Development Programmes (DADPs) etc. It operates in 21 region of Tanzania mainland.

### **2.2.4 Manufacturing Institutions**

#### **Minjingu Organic Hyper Phosphate**

Minjingu Mines and Fertilizer LTD is the private company, which officially privatized in 2000. It provides raw material to feed TFC and Fertilizer in range and use the raw materials to produce fertilizer. The main role originally was to produce raw material for Tanga fertilizer Industrial, now the same raw material is utilized as a direct fertilizer. The main activities include the production of fertilizer source and blending of product on different foundations. The operation area of the company is mine area – Manyara region at minjingu and coverage of product are: Tanzania, East AfricaRegion (Kenya and Uganda) South Africa, Rwanda, DRC, Ethiopia and Central Africa region (Zambia).

## **2.3 Aims, interests and activities of stakeholders with respect to CC &V and agricultural innovation (Qs 4, 6, 7, 15, 20)**

Characterize the main stakeholder groups according to their specific aims, interests and activities in relation to CC&V and agricultural innovation. Emphasis on what the stakeholders in a group have in common whilst also explaining variability within the group. This could be done through 1-3 paragraphs on each stakeholder group. This would include any experiences in climate change e.g. other projects they have been involved in.

All stakeholders in general agreed to have experienced changes / variations in the climate within their areas of operations. Those changes include increase in temperature, increase in wind strength, changes in rainfall pattern, intensity, and rain season. Rainfall perceived to be unpredictable, which has negative effects on natural vegetation, wildlife, water resources and to crops production. Destructive birds, pests and diseases incidence have been also reported.

### **2.3.1 Natural Resources Institutions**

#### **Forest and Beekeeping Division**

There is a climate variability that reported to have variation in every ten years. The aspects of change include amount and intensity of rainfall, temperature and wind which fluctuating. Indicators for change are: frequent drought and floods. These changes affect the organisation by changing the survival rates of planted trees. In response to changes the organisation involve in conservation of degraded areas. In relation to agricultural innovation the division of forest and beekeeping involved in agroforestry and environmental management activities. The primary beneficiaries of the organisation are all communities who use forest resources.

#### **Wildlife Division**

Climate is changes from year to year and becoming more unpredictable and threatens the animals' survival. The aspects of change include rainfall, temperature and wind which fluctuating and have no regular pattern. Indicators for change are: frequent drought, and global warming.

These changes in climate have had some effect on the institution activities. It affects animal distribution, pattern, mortality rate, fatality, increases incidence of diseases and behavioural changes that affects the normal activities and increase management costs. In response to the climate changes the institution has to advocate on community conservation. The institution discourages shift cultivation and cultivation within wetlands as it results into depletion of biodiversity. Since such activities can aggravate climate change, increase drought, pollution and intern increase hunger and poverty.

Local communities are the primary beneficiaries of the organization's activities and the national in general.

#### **Water Resource Division**

The area experience changes in climate. Rainfall is irregular/ is not normal; the dry season is more prolonged than past decade in the area of two-rain season there is almost no vuli rain. The aspect of change is rainfall, which have changed in duration and becoming shorter and unpredictable. Indicators for change include the late of on set rainfall, intensity of rainfall and the fall of ground water recharge (is minimal) and increase in rainfall uncertainty.

The climate change and variability has influence on organisation activities. It affected the quantity of surface and ground water, which affects water availability and distribution. In response to climate change the organisation focuses on rainwater harvest, constriction of charcoal dame, dames gutters etc. drought resistant crops. In relation to agricultural innovation system the organisation construct the infrastructure for water storage such as dames, household tanks, charcoal dame and community mobilisation in community water resources management.

Community are primary beneficiaries of the organisation, industries and public institution are service provider and government ministries and departments are policy actors. The impacts on the primary beneficiaries include provision of improved innovations and scientific advice. Service providers are supported and the policy actors in different management levels get improved innovations and scientific advice.

### **2.3.2 Cross cutting Institutions**

#### **TMA**

Generally the area has tropical climate, which show some indications of climate change. Elements of change include rainfall, increased trend of temperatures and winds. Indicators of change include increase and frequency occurrence of severe and extreme climatic events. Other indicators are the decline in Lake levels (Tanganyika and Victoria) and decreasing extent of Kilimanjaro glacier.

The organization responds to climate change and variability by increasing weather stations and putting more emphasise on processing and analysing historical climate data. All sectors are the primary beneficiaries of the organisation. The organization impacts on primary beneficiaries through provision of information to enhance productivity and to service provider avail the right services and to policy actors put the right policies accordingly to remove hindrances to adaptation.

## **JET**

Climate is changing, for example Dar es Salaam region has been experiencing cold weather in two years compared to the past. In other areas there is an increase in temperature and frequency of drought. Elements of change include temperature and variation in rainfall. Indicators for changes are increased heat and cold spells in some areas, melting of snow at Kilimanjaro Mountain and drying of lakes.

The climate change and variability influence organization's activities, as her programs are based on awareness creation on any environmental problem that has impact on environment. In response to climate changes and variability by engaging on awareness creation on the effects of climate change to the public through writing future story articles, radio programs and TV documentation. Public are the primary beneficiaries. The organization impacts to Primary beneficiaries, policy actors and service providers by providing relevant information on impacts and adaptation to climate change and variability.

### **Department of Disaster Management**

Climate is change over time and it is evidenced by prolonged drought and erratic rains. The aspects of change included change in rainfall pattern and increase in temperature. Indicators for change include inadequate food production, increase of food prices, floods and increase in disaster relief budget. The changes in climate have affected pre-plans and budgets since it is very difficult to predict the effects of climate change and variability. In collaboration with responsible sectors, ministries the department advocates improvement of food storage and processing facilities. The department also build districts capacities to integrate disaster risk reduction (DRR) in development plans and ability to respond to disasters.

The primary beneficiaries of the department include all people or community who are negatively affected and need/ get relief assistance. The impacts on the primary beneficiaries include provision relief support during disasters. The policy actors are being impacted through emphasizing the integration of adaptation measures to climate change and variability in development plans.

## **2.3.3 Agriculture and Livestock production Institutions**

### **PADEP**

The climate is considered to have changed markedly presently as compared to ten years back. The aspects of change include rising in temperature, late onset rainfall and change in rainfall pattern and amount. The indicators of the changes include increase of temperature, late onset rainfall and decreasing in amount of rainfall. Unpredictable rainfall affects yield of crops and livestock production. Such effects influence the organization's activities on which responds by introducing a new activities like training on environmental conservation as intervention measure for the organization.

The primary beneficiaries of the organization are the farmers and livestock keepers. The impacts of the organization on the primary beneficiaries in the context of climate change include capacity building on environmental management.

### **Plant Health Services Section**

The area experience changes in climate, the temperature has increased and rainfall becomes more unpredictable. The aspects of change include rainfall, temperature and wind. Indicators for change include fall in crop production, increase of incidence of pest and diseases for plant, animals and human diseases.

Agroecological settings are no longer stable; there is a change in planting dates as well as harvesting period. These changes have influence on organization activities. In response to climate change the organization institutionalise early warning system, cross cutting institution to address the impact of climate change in the country.

The primary beneficiaries of the organization are farmers, traders, planners, NGOs and government institution. The organization impacts to the primary beneficiaries by providing sustainable food security information. Service providers are provided by information services and policy actors are given policy guidance.

### **Ministry of Agriculture Food Security and Cooperatives**

It was reported that climate is changing to the worst. There is an increase in pest outbreak for example in 2003/2004 and 1997 there was gray leaf spot of maize, banana wilt and coffee wilt diseases in southern highland. The aspects of change include change in rain season and rainfall becoming more unreliable and

erratic. The major indicator climate changes are change in growing season and decline in crop production and productivity. Farmers are primary beneficiaries of the organisation. The impacts on the primary beneficiaries include provision of impending of pests and insects outbreaks. Service providers are supported on market certainty of agricultural inputs and the policy actors in district management levels effectively allocate pesticide and plant protection equipments according to the demand.

### 2.3.4 Manufacturing Institutions

#### Minjingu

There is a change in climate in east Africa. Aspects of change include changing in rainfall it starts in November or December and it continues to May with no defied two-rain season (*Vuli* and *Masika*). Indicators of change include change in rainfall pattern and seasons and the increase in rainfall intensity in East Africa.

The changes affect the mining activities. However it increased the demand of the products this is a positive effect. The organisation responds by increasing production capacity, improvement of the product to meet users demands particularly to handle all application.

### 2.4 Perceptions of the climate situation in the area the organisation operates (Qs 4, 5, 8, 9, 10)

Table 2.4.1 perceptions of importance of cc and v issues by stakeholder group (q5)

	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
V. Important	√	√	√	√
Important				
Slightly important				
Not important				
Total				

**Table 2.4.2. Perceptions of CC and V by element and associated indicators of change by stakeholder group (Q4)**

Element of change	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Rainfall</b>	Rain season is highly unpredictable in recent years. The dry season is more prolonged than past decade in the area of two-rain season there is almost no vuli rain	There is a change in rainfall pattern, intensity and shift in rain season. Rain season is much shorter than in the past and rainfall becoming more unreliable and erratic	There are changes in rainfall in terms of total amount of precipitation received, prolonged drought and rains becoming more erratic	There is a change in rains seasons and pattern. It starts in November or December and it continues to May with no defied two-rain season ( <i>Vuli</i> and <i>Masika</i> )
<b>Temperature</b>	There is an increase in temperature	There is an increase in temperature, in the past they used to have frost	There is a slight increase in temperature, there is too much sunshine during winter season	
<b>Strong winds</b>	Increased occurrence of Strong wind in some areas	Increase of wind		
<b>Diseases</b>		Increase in pest and diseases such as leaf spot of maize, crop, animals and human diseases have increased.	Increase in malaria cases	

**Table 2.4.3. Perceptions of who is vulnerable to CC and V and why by stakeholder group (Q8)**

Vulnerable groups identified	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Large scale Farmers</b>				Limited land preparation, transportation of products from field to the central market
<b>Small scale farmers and rural communities</b>		Depends on climate to produce	They have limited access to information regarding to climate change and variability and all their activities are linked to climate	
<b>Livestock keepers</b>	Livestock are affected by diseases during heavy rainfall (foot and mouth disease)	Depends on climate to produce	all their activities are linked to climate	
<b>Women</b>	Are burden with activities as they are supposed to take of	-	Women are more involved in agricultural	

family matters (water, firewood, food) take care of children's production in rural areas while men are decision maker

Children, Infirm and Elderly No ability to find food, water and fire woods

**Table 2.4.4. Perceptions of how different groups are adapting to CC and V by stakeholder group (Q9)**

Groups identified	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Large scale Farmers		Use environmental and social management plans for intervention, growing resistance/ tolerant varieties, involve in early warning systems	Food storage, conserve water sources/ catchments, Improve farming techniques and the government waived taxes to import cereals	Improve storage use energy for drying grains, and adaptation of alternative tillage methods
Small Scale Farmers	Resource use planning Rainwater harvesting and use of ground water (wells construction)	Use environmental and social management plans for intervention, growing resistance/ tolerant varieties, involve in early warning systems	Food storage, conserve water sources/ catchments, Improve farming techniques and the government waived taxes to import cereals	
Women, children, infirm and elderly	Resource use planning, Rainwater harvesting and use of ground water (wells construction)	Adapt drought tolerant crops, water harvest techniques, and improvement of irrigation infrastructures		

**Table 2.4.5. Perceptions of how other organizations/ stakeholders are making changes in response to CC and V by stakeholder group (Q10)**

Organizations/ stakeholders	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Government	Provide education and extension services	Conducting Environment Impact Assessment before implementation of intervention		
Natural resources departments	Facilitate environmental conservation measures	Links water recourses management and usage	Conservation of water catchments, rehabilitation of environmental, involving in different forums, seminars, meetings and information sharing	Environmental conservation,

## 2.5 Trends in agricultural innovation systems (various Qs)

[Text summarising interview findings]

An Innovation System (IS) may be defined as a 'network of organizations, enterprises and individuals focused on bringing new products, new processes and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance' (Agricultural and Rural Development –ARD World Bank 2006). Following this definition, its hard to establish trends in agricultural innovation systems in National consultation (Dar es Salaam) since almost all stakeholders consulted work separately to fulfill their organization goals and aims.

## 2. 6 Patterns of interaction & relationships between stakeholders (Qs 11, 12, 13, 14)

**Table 2.6.1. Approaches for sharing and understanding information on farmers' situation and how they could be improved (Q11 and 12)**

Approaches	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Community based conservation</b>	Involve community in environmental activities and other developmental issues	Participatory technology development and monitoring		
<b>Awareness campaigns</b>	Produced more relevant materials and provision of formal training	Appropriate outreach programmes and regular and routine information retrieval systems		Organising field trips for learning purposes
<b>Entrepreneurship training</b>	Produced more relevant materials and provision of formal training			
<b>Workshops/trainings</b>	Organise different workshop to educate stakeholders on various issues regarding good agricultural practices and environmental conservation: This can be improved through Field visits and action research	Organise different workshop and seminars for all stakeholders		Participation on seminars, meeting, workshop and conferences
<b>Radio, Television and newspapers</b>	Share information among stakeholders through media		Writing articles on climate change and environmental and disseminating to all	Use of public media, radio, TVs, leaflets and publications

			stakeholders. Producing special programs on TVs and radios
<b>Networking and collaboration</b>	Develop database and networking		Collaborative links for information sharing (multi-sectoral, technical experts group and all stakeholders)
<b>Meetings</b>	Organizing regular meetings with different stakeholders and provision of feedback		

**Table 2.6.2. Approaches for sharing and understanding information on other stakeholder’s situation (Q11)**

Other stakeholders	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Community based conservation	✓	✓		
Awareness campaigns	✓	✓		✓
Entrepreneurship training	✓			
Workshops/trainings	✓	✓		✓
Radio, Television and newspapers	✓		✓	✓
Networking and collaboration		✓	✓	
Meetings		✓		

**Table 2.6.3. How approaches for sharing and understanding information on other stakeholders’ situation could be improved (Q12)**

Stakeholders	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Community based conservation		Participatory technology development and monitoring		
Awareness campaigns	Produced more relevant materials and provision of formal training	Appropriate outreach programmes and regular and routine information retrieval systems		Organising field trips for learning purposes
Entrepreneurship training	Produced more relevant materials and provision of formal training			

<b>Workshops/trainings</b>	This can be improved through Field visits and action research		
<b>Radio, Television and newspapers</b>	Share information among stakeholders through media	Develop database for networking	Producing special programs on TVs and radios Use of public media
<b>Networking and collaboration</b>			Involve multi-sectoral, technical experts group and all stakeholders
<b>Meetings</b>		Provision of feedback and Organisation of regular meetings with different stakeholders	

**Table 2.6.4. Examples of links between stakeholders consulted and other stakeholders (Q13)**

Stated links	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing	Number
Farmers			✓	✓	2
Researcher	✓	✓	✓	✓	4
International organization IFDC				✓	1
Universities			✓		1
Disaster management Department			✓		1
District extension staff		✓			1
Relevant NGO and CBOs				✓	1
District Council	✓	✓			2
Food security Department			✓		1
Public / communities	✓	✓	✓		3
Media			✓		1
LOCAL GOVERNMENT	✓	✓			2
Natural Resource Department	✓	✓	✓		3
Ministry of Agricultural	✓	✓	✓		3

✓ = Mentioned by at least one stakeholder in that group

For each stakeholders group consulted try to characterize the pattern of interaction with other stakeholders  
E.g. The ARD World Bank Study (2006) pp 50-53 describes the following types of interactions: Farmer to farmer interaction, Interactions of businesses with the poor, Company-company interaction, Technology transfer interaction, Public-private partnerships, Interactions of multiple actors. The study also identifies 'missing interactions'.

**Table 2.6.5. Awareness of NAPAs and assessment of NAPA process (Q14)**

Most of stakeholders consulted were not aware of the National Adaptation Programme of Action. This could be due to poor stakeholder's consultations during preparation of this Programme. Project team members had to provide a copy of NAPA document and explain what NAPA is to all stakeholders, but it was not enough due to time constraints. Few of them understand NAPA after reading the document. Therefore there is still a need to raise awareness on NAPA to all stakeholders.

Awareness (number/ % aware)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Assessment of process				
Understand		✓	✓	
Not understand	✓			✓
Number of understand		2	2	

## 2.7 Strengths, weaknesses, opportunities & threats analysis of agricultural innovation systems and adaptation to CC & V (Qs 16, 17, 18, 19)

**Table 2.7.1. Stakeholders' perceptions of the *strengths* of the agricultural innovation systems for adapting to climate change and variability (Q 16)**

Strengths (broad categories)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Political will		✓		
Better Understanding			✓	
Basic Meteorological Stations			✓	
Historical climate information			✓	
Public demand		✓		✓
Research potential		✓		
Human Resource		✓		
WILLING COMMUNITY			✓	

**Table 2.7.2. Stakeholders' perceptions of the *weaknesses* of the agricultural innovation systems for adapting to climate change and variability (Q 17)**

Weaknesses (broad categories)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Difficult to change with changing climate		✓		

Poverty governs most of decisions	✓	
Low level of awareness	✓	
Budgetary constraints	✓	
Poor innovation system	✓	
Inadequate coverage of weather stations		✓
Shortage of financial and working gears	✓	
Poor Infrastructure		✓
Lack of participation of important stakeholder		✓

**Table 2.7.3 Stakeholders' perceptions of the *opportunities* for improving the situation for adapting to climate change and variability (Q 18)**

Opportunities (broad categories)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Expansion of weather stations			✓	
Human resources	✓	✓		
Willing community		✓		
Possibility of Capacity building	✓	✓		
Innovation system		✓		
Extension service		✓		
Awareness creation		✓		

**Table 2.7.4. Stakeholders' perceptions of the *threats* to improving the situation for adapting to climate change (Q 19)**

Threats (broad categories)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Cultivation within wetland cause biodiversity loss	✓			
Government policy and support (Political will)		✓	✓	
High staff turnover		✓		
Budgetary constraints		✓		
Finance			✓	
Willingness of farmers to apply new system			✓	

## 2.8 How stakeholders could strengthen their own organization’s capacity to adapt to CC&V (Q21, 22)

**Table 2.8.1. How stakeholders reported their own organizations’ capacity to adapt CC&V could be improved (Q21)**

Broad category of capacity improvement	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Awareness creation, Training and Workshop</b>	Involved in Training on appropriate measures for climate change and variability and environmental management. Awareness creation, information sharing and participate in meetings	Involved in Training on appropriate measures for climate change and variability and good agricultural practices techniques Involved in human training on appropriate measures for climate change and variability, capacity building, outreach programme to vulnerable communities and development of appropriate technologies	Facilitating agency on capacity to monitor the climate and timely dissemination of information. Strengthening the link with ministry of agriculture and food security and ensure a legal mandate to national platform on DRR	Involved in IDRC capacity building programs on climate change and variability at all levels

**Table 2.8.2. How stakeholders reported their own organizations’ information, training and product needs to enhance their capacity to adapt CC&V could be improved (Q22)**

	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Information</b>	On the effect of climate change in wildlife and development of website for information sharing	Network in information sharing	Relevant weather information	Climate, prediction Market information
<b>Training</b>	Involved in Training on	Training personares on	Involved in Training on	

	climate change and variability	appropriate measures for climate change and variability	appropriate measures for climate change and variability and integration of adaptation measures in development planes	
<b>Products</b>		Infrastructure and tools to control quelea birds	Financial supports, meteorological instruments and communication facilities	Provide farm inputs for example fertilizer

## 2.9 How can farmers’ and other stakeholders’ capacity to adapt to CC & V be improved? (Q24)

**Table 2.9.1. How stakeholders reported farmers’ capacity to adapt to CC & V can be improved? (Q24)**

Broad category of farmer capacity improvement	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
<b>Training on good agricultural practices/innovation</b>	Training on agricultural practices/ innovation, awareness creation and the use participatory planning. Improvement of infrastructures, storage charcoal dame construction and rainwater harvesting.	Training agricultural practices/innovation and involve in forecasting. Creation of awareness through media and capacity building in implementation of intervention.	Improve extension services and provision of information on climate change and variability. Sensitization, information sharing and application of networking training on the use of meteorological information	

**Table 2.9.2. How stakeholders reported other stakeholders' capacity to adapt to CC & V can be improved? (Q24)**

<b>Stakeholder category for capacity improvement</b>	<b>Natural Resources</b>	<b>Agriculture and Livestock production</b>	<b>Cross cutting</b>	<b>Manufacturing</b>
<b>Involved in training on appropriate measures for climate change and variability</b>	Involved in training on appropriate measures for climate change and variability.	Provision of information and involve in training on appropriate measures for climate change and variability	Training and Providing them with more knowledge and opportunities to cope with climate change and variability	Improvement of extension services
<b>Involve in environmental management</b>				
<b>Enhance networking,</b>	Awareness creation and improvement of training	The use of bottom up initiatives	Improvement of networking, and information sharing with stakeholder	
<b>Improve Participatory research</b>	Involve all stakeholders in planning (use of participatory approach)	Use the interactive monitoring and evaluation		
<b>Diversification of crops and improve inputs</b>	Rain water harvest and improve storages	Support farmers positive change for adaptation		

## 2.10 How stakeholders would like to be involved in an initiative to improve capacity to adapt to CC & V? (Q23)

**Table 2.10.1. How stakeholders would like to be involved in improving capacity to adapt to CC&V (examples below relate to improving seed systems please remove and enter your findings (Q23))**

Broad categories	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Involvement in action research		<i>Involve in action research</i>	Involved in action research	Involved in action research
Involvement in seminar, workshop and awareness creation on appropriate measures for climate change and variability	Involve in training, sensitization, mobilization and education provision on environmental conservation	<i>Involve in awareness creation to different stakeholder on climate change and variability</i>	Share early warning information and mitigation measures	Involve in marketing of products
Involvement in Training on appropriate measures for climate change and variability	Involved in Training and workshop on appropriate measures for climate change and variability and preparation of materials	Involved in Training and workshop on appropriate measures for climate change and variability	Involve in awareness creation through media	
Facilitation	Facilitation on assessment of water, and infrastructures building	Involve in initiatives for responding/ or adaptation measures for climate change and variability impacts	Coordination, monitoring and early warning signalling	

### 3. OVERVIEW OF MAIN FINDINGS AND IMPLICATIONS

- Appendix 1 Checklist
- Appendix 2 Project Flyer
- Appendix 3 SWOT analysis of agricultural innovation systems

#### Appendix 3 Details of SWOT analysis of agricultural innovation systems for adapting to CC&V STRENGTHS

Strengths (broad category)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Political will		Put in place environment and social management plans		
Better Understanding			Better capacity of understanding of strategies related to adaptation to climate change and variability to stakeholders	
Basic Meteorological Stations			Have basic meteorological stations network and historical climate information	
Historical climate information			Have basic meteorological stations network and historical climate information	
Public demand		There is more public demand of services		There is more public demand of services
Research potential		There is high research potential		
Human Resource		Qualified professionals in agriculture, economics and environmental conservations		
Willing Community			Willingness of communities to learn and practice new idea	

## WEAKNESSES

Weaknesses (broad category)	Natural Resources	Agriculture and Livestock production	Cross cutting	Manufacturing
Difficult to change with changing climate		Low capacity and of knowledge on adaptation strategies		
Poverty governs most of decisions		Most of decisions are governs by ability of communities or institutions		
Low level of awareness		Low level of awareness on climate change and variability		
Budgetary constraints		There is budgetary constraints		
Poor innovation system		Most of innovation system are not put in place environment management before its implementation or are not adhered		
Inadequate coverage of weather stations			The current meteorological stations does not cover the whole country	
Shortage of financial and working gears		Effective outreach are constrained by lack of financial resources and working gear		
Poor Infrastructure			There is low capacity of the infrastructure to link all stakeholders especially farmers in rural area	
Lack of participation of important stakeholder			Low participation of all stakeholders especially farmers in adaptation projects	

**OPPORTUNITIES**

<b>Opportunities (broad categories)</b>	<b>Natural Resources</b>	<b>Agriculture and Livestock production</b>	<b>Cross cutting</b>	<b>Manufacturing</b>
<b>Expansion of weather stations</b>			There is possibility of expansion of weather stations	
<b>Human resources</b>		Ministries set to improve situation		
<b>Willing community</b>		Willing community to learn and adapt new technology		
<b>Possibility of Capacity building</b>		There is a possibility of Capacity building		
<b>Innovation system</b>		Links with international relevant institutional, funding and capacity building exist		
<b>Extension service</b>		There is a reasonable number of personnel at the national, zone and local government levels		
<b>Awareness creation</b>		There is a possibility of Awareness creation		

**THREATS**

<b>Threats (broad categories)</b>	<b>Natural Resources</b>	<b>Agriculture and Livestock production</b>	<b>Cross cutting</b>	<b>Manufacturing</b>
<b>Cultivation within wetland</b>	Cultivations within wetland as a coping strategy to drought cause biodiversity loss			
<b>Government policy and support (Political will)</b>		There is less political supports	Lack of political will/ support and conflicting policy	
<b>High staff turnover</b>		There is high staff turnover		
<b>Budgetary constraints</b>		There is a budgetary constraints		
<b>Finance</b>			Insufficient fund and personnel	
<b>Willingness of farmers to apply new system</b>		Responsiveness of stakeholders	Lack of commitment and readiness of farmers and other agricultural stakeholders to apply the system	

## Appendix 4 How would stakeholders like to be involved in improving agricultural innovation systems?

Detailed feedback from each stakeholder consulted of how they would like to be involved.

S/NO	STAKEHOLDER	INVOLVEMENT IN IMPROVING AGRICULTURAL
1	Ministry of Water	Assessment of water resources, infrastructures construction and involve in provision of education, training, sensitization and mobilization on environmental conservation
2	Meteorological Agency (TMA)	Involve in the implementation of action research project
3	Forest and Beekeeping Division	Involve in training on adaptation to climate change (lean more on climate change)
4	TGNP	
5	Wildlife Division	Through attending workshops, information dissemination to stakeholders and preparation of training materials
6	Livestock Division	
7	JET	Awareness creation to all stakeholders and public regarding climate change findings, Like to be involved in all stages of the projects
8	Disaster management Department	Share early warning information and mitigation measures being applied
9	PADEP	Collaborate with other stakeholders in awareness creation on climate change and variability and capacity building to stakeholder to adapt to climate change and variability
10	Plant Health Services Section	- Involved in information and training -Be involved in initiatives for preventing, responding, mitigation/ adaptation and/ or control of effects of climate change and variability
11	Ministry of Agriculture Food Security and Cooperatives	Coordination, Monitoring and Early warning signaling
12	Minjingu Mines and Fertilizer LTD	To be connected to national and international programs, dealing with marketing of feeder institutes

### Appendix 5 Contact details for stakeholders consulted (Q1)

S/NO	STAKEHOLDER	CONTACT
1	Ministry of Water	WATER RESOURCES DIVISION Contact Person: Jerome Dukuduku Mobile: +255 754 446 234
2	Meteorological Agency (TMA)	Tanzania Meteorological Agency, Ubungo Plaza, P.O. Box 3056 Dar es Salaam, Tanzania
3	Forest and Beekeeping Division	Dr. A. Tango (Ph.D) Assisstant Director (Forest Development) Forest and Beekeeping Division Ministry of Natural Resources and Tourism Mipango House P.O. Box 426 Dar es Salaam Tel: +255 022 212 6844 Fax: +255 022 213 0091 Cell: +255 (0) 754 839 596 E- Mail: <a href="mailto:aloystango@yahoo.com">aloystango@yahoo.com</a>
4	TGNP	
5	Wildlife Division	Nebbo J.M. Mwina Assistant Director – Research, Training and Statistics P.O. Box 1994 Dar es Salaam Tel: +255 22 2866408/ 375/ 418 Mobile: +255 754833229, 0786018958 Fax: +255 22 2865836 Email: <a href="mailto:neborita@yahoo.com">neborita@yahoo.com</a>
6	Livestock Division	
7	JET	Flora Nzema Journalists Environmental Association of Tanzania (JET) P.O.Box 15674, Lumumba Street, Dar es Salaam Tel: 2182240 Mobile: 0786 695014 E-mail: <a href="mailto:fanzema@hotmail.com">fanzema@hotmail.com</a>
8	Disaster management Department	Director P. O. Box 3021 Dar es Salaam Tele - Fax: +255 22 2117266
9	PADEP	Musabila K. Nyanda Participatory Agriculture Development and Empowerment Project (PADEP) P.O. Box 13798 Dar es Salaam E-mail: <a href="mailto:padep@raha.com">padep@raha.com</a>
10	Plant Health Services Section	Cornelius Fabian Mkondo Ministry of Agriculture Food Security and Crops Plant Health Services P.O. Box 9071 Dar es Salaam Tell: +255 754 561 341 E-mail: <a href="mailto:mkofabi@yahoo.co.uk">mkofabi@yahoo.co.uk</a>

11	Ministry of Agriculture Food Security and Cooperatives	Mr. Onasimbo A. Ntikha Box 9192 Dar es Salaam Tel: +255 22 2865950 FAX: +255 22 2865951 Mobile: +255 784 526 729
12	Minjingu Mines and Fertilizer LTD	Contact Person: Fill Lard P.O. Box 912, Arusha Tanzania Tel: +255 27 250 37 65/ +255 27 250 63 68 Fax: +255 27 254 50 13 Mobile: +255 784 655 000 E-mail: <a href="mailto:ccilar@bol.co.tz">ccilar@bol.co.tz</a> or <a href="mailto:minjingu@bol.co.tz">minjingu@bol.co.tz</a>