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POLICY BRIEF

Rural communities' adaptation to climate change impacts through best technologies and practices of Climate Smart Agriculture Experiences from GCCA Tanzania.

This policy brief describes experience from five Global Climate Change Adaptation (GCCA) Tanzania projects that had as objective to strengthen the resilience of vulnerable Tanzanian communities to the adverse effects of climate change and contribute to poverty reduction. This policy brief is directed to policy and decision makers in agricultural related sectors such as agriculture, livestock and fisheries, water and natural resources. The GCCA Tanzania Projects located in different agro-ecological zones, each with its own climatic parameters have provided guidance for promoting best practices for Climate Smart Agriculture (CSA) in the country.

The five GCCA Tanzania projects:

- **CF Pemba** - Scalable Resilience: Outspreading Islands of Adaptation (Wete, Pemba island)
- **EcoAct**- Eco-Village Adaptation to Climate Change in Central Tanzania (Dodoma)
- **EcoBoma** - A Climate Resilient Model for Maasai Steppe Pastoralists (Arusha)
- **Igunga** Eco-village (Igunga)
- **East Usambara** - Integrated Approaches for Climate Change Adaptation in the East Usambara Mountains (Muheza)

Key Messages

- Most of rural communities' livelihood and income in Tanzania depends on rainfed agriculture, yet rain-fed agriculture in Tanzania is the sector most severely affected by climate change impacts.
- The incidences of climate extremes are likely to occur more frequently in future; therefore, adaptation measures need to be designed and strengthened to support the vulnerable rural communities who depend on rain-fed agriculture.
- Targeting CSA interventions should consider the cultural, socio-economic and development context of an area, and not only biophysical factors.
- Most CSA interventions require time and resource investments which are not easily accessible to poor households who are the most vulnerable to climate change impacts.
- Limited access to high quality drought tolerant seeds is one of the main challenges that need to be addressed under CSA policies and programmes.
- Limited resources (human, financial and technical) at District level restrict Local Government Authorities (LGAs) support to CSA activities.
- CSA interventions are not a panacea to all climate change impacts and may fail to produce yields in years with extreme droughts.

Policy Recommendations

- CSA interventions need to be promoted through bundled packages that are appropriate for the biophysical and socio-economic and cultural context where they are introduced.
- Good weather forecasts and early warning systems and related awareness raising for rural communities are essential in improving preparedness for adaptation to climate change impacts and should complement CSA measures.
- Pro-poor policy approaches are essential to promote CSA technologies and practices to support adaptation by households that are the most vulnerable to impacts of climate change. This should include reducing financial and labour barriers for adoption of CSA measures.
- Local production of Quality Declared Seeds, as based on the experience of the EcoAct project, should be promoted throughout rural Tanzania.
- Proven successful CSA measures should be included in district development plans and related budgets, with funding to be provided by Government through dedicated budget lines and codes.
- Support to rural communities with access to financial services is important to increase capacity to engage with non-farm enterprises that diversify sources of income and reduce dependency in rainfed agriculture.

1 Introduction

Climate Change is affecting the economy of United Republic Tanzania with agriculture being the most vulnerable and severely affected sector (URT, 2012). Given the country's diverse agro-ecological conditions and landscapes, smallholder farmers have sought different ways to build resilience of the food system under increased change and variability in climate.

In Tanzanian context, the adopted definition of CSA is *"agriculture that sustainably increases productivity and income, increases the ability to adapt and build resilience to climate change and enhances food and nutrition security while achieving mitigation co-benefits in line with national development priorities"* (URT, 2017)

Country CSA initiatives are aligned with National policies including Tanzania Vision 2025, Five Year National Development Plan, National Agriculture Policy 2013, Agriculture Climate Resilient Plan (ACRP) 2014 and Agriculture Sector Development Program - Phase 2 (ASDP2). The Tanzania CSA Guideline (2015) provides guidance to stakeholders especially smallholder farmers on a wide range of technologies and practices that are climate smart with intention to provide an opportunity for scaling up the best ones in the country.

CSA practices potentially suitable for different agro-ecological zones and socioeconomic environments already exist, including conservation agriculture, soil and water conservation, resilient crop varieties, crop and grazing land management, livestock management, soil fertility management and agro-forestry (FAO, 2015).

Farming practices in Tanzania are variable due to existing variable agro-ecological characteristics. as well as socio-cultural aspects associated with the particular > 120 ethnic societies, shape them. Under such circumstances it is not easy to choose a particular CSA technology or practice as the most appropriate intervention in a particular area within a short need to be based on site-specific agro ecological, cultural and socio-economic conditions. Adaptation to CSA can occur in many ways;

from the individual field, where a crop is grown, varieties selected and management decisions such as tillage, fertilization, and pesticide application are made, through the farm level.

2 CSA technologies and Practices Promoted by GCCA Tanzania

The GCCA Tanzania projects followed an integrated eco-village approach with activities in Agriculture, Water, Forests, and Energy. All projects worked on promoting CSA with promoted technologies depending on the agro-ecological zone where the project was implemented. Table 1 gives an overview of the promoted technologies.

Table 1 - Overview of CSA technologies promoted by GCCA projects

Intervention type	How it is expected to build climate resilience	Main CSA technologies promoted by the GCCA projects	Main agro-ecological zones where applied
Improved access to drought tolerant seeds	With increasing rainfall variability, drought tolerant seeds will increase yield prospects in years with low rainfall and in case of long drought spells within the rainy season.	Local production of drought tolerant Quality Declared Seeds	Semi-arid
		Promote use of drought tolerant crops and seed	Semi-arid / Plateau
Improved crop production practices	The practices are generally focused on improving water availability and bio-fertility for crops (direct CCA) through soil/water conservation measures. In addition they increase fertility and/or control pests (indirect CC, although pests are likely to increase with rising average temperatures so pest control interventions like push-pull could also be considered direct CCA)	Land forming: terraces (<i>fanya juu</i>) / contouring / ridges / berms / swales / bunds / vetiver grass	All
		Mulching and use of manure / composting	Isolated mountains of Northern Highlands / Plateau
		Agro-forestry, mixing annual crops with perennial crops like spices.	Isolated mountains of Northern Highlands / Coastal
		Drip irrigation	Coastal
		Push-pull	Plateau
Improved livestock practices	Improved breeds allow for increased income i.e. increased food security. Rangeland monitoring allows for better management of the rangeland through optimising stocking rates vis-à-vis carrying capacity (the latter likely reducing due to climate change).	Improved livestock breeds (cattle, goats, poultry)	Semi-arid and arid / Plateau
		Improved husbandry	Semi-arid and arid / Plateau
		Rangeland monitoring	Semi-arid and arid
Water for agriculture	Increase water storage and water availability for crop production and livestock to adapt to more frequent droughts and to overall increase in rainfall unpredictability.	Small dams rehabilitation / construction	Semi-arid and arid / Plateau
		Wells	Plateau
		Grey water use	Coastal

3 Challenges

3.1 Climate Smart Agriculture is not a panacea for all climate change impacts

Climate change is expected to increase the severity, duration and frequencies of weather-related extreme events such as drought and floods, thus affecting agricultural production and threatening lives and livelihoods of millions of poor people (URT, 2017). Adaptation measures should focus on boosting productivity of crops and livestock, especially building capacity of smallholder farmers to

increase yields, and better understanding the impact of temperature rise and rainfall variability on key crops.

Adoption of good CSA practices has shown to increase average yields in years with below average rainfall. However, experience from the GCCA projects shows that in years with extreme droughts (as in the semi-arid and plateau zones in the 2016/2017 rainy season), even correctly implemented CSA practices cannot prevent crop failure. It means that CSA alone is not sufficient to build climate resilience of small scale farmers in such areas and there will always be a need to complement it with other adaptation strategies such as alternative income generating activities.

Much of the focus on promoting CSA interventions is, understandably, on increasing resilience against droughts. Climate change can however also manifest itself through an increase in rainfall and in particular an increase in heavy rainfall events. In a worst case scenario a CSA measure like in-situ contouring or terracing may in fact reduce yields when heavy rains lead to prolonged water logging that can lead to rotting of the crop.

Therefore, the use of CSA techniques should go hand in hand with availability of early warning systems that allow smallholder farmers to prepare and apply the most appropriate CSA technology.

3.2 Resource intensive CSA technologies remain unaffordable to many farmers

Some of the promoted CSA interventions are very demanding in terms of inputs as they are either labour intensive or financially demanding. At farmers' level, inadequate financial resources has been identified as a limiting factor to the acquisition of farm inputs and materials needed for successful practice of CSA. Some adaptation technologies and practices require substantial financial investments that need to be made upfront including for example for promotion of drip irrigation and building sheds for improved goat and chicken breeds. The financial inputs required for these interventions are not affordable for poor smallholder farmers. Such investments are generally more profitable in the long-term than in the short-run and smallholder farmers would need financial and technical assistance to enable them practice such kind of CSA. Considering that, adoption is more likely when benefits are observed in the short-run.

Additionally, some of the CSA interventions like terracing are very labour intensive. Poorer households often cannot afford to dedicate significant time to such long term investments, nor can they employ someone else to do the work for them.

3.3 Mismatch of introduced CSA and the context of local socio-economic conditions

The success of the CSA intervention is contributed by many factors including the socio-economic contexts of the landscape where the technology intends to be deployed. Matching community needs and priorities is crucial in the design and promotion of the CSA interventions. For instance, in 2017 while Eco-Boma project strived to promote drought tolerant crop varieties in the project site, the excessive drought that year forced the pastoralists to relocate to distant areas in search for pasture. This left the farm plots unattended and the whole intervention became obsolete. The important lesson here is that promoted CSA interventions need to be aligned with the socio-economic context of the area.

3.4 Limited access to appropriate improved seeds

The majority of smallholder farmers have limited access to improved seeds i.e. seeds that are high yielding, fast maturing, drought tolerant, salinity tolerant and/or flood tolerant. This is one of the main reasons for the low crop productivity in the country. In semi-arid areas of Central Tanzania, access to improved seeds is singled out as a major limiting factor to crop production.

The EcoAct Project attempted to overcome this problem through the introduction of Quality Declared Seeds, that is, high quality seeds produced locally with oversight and quality certification by the Tanzania Official Seed Certification Institute. Although the approach was in general very successful, it did face some challenges including the location of fields meant for seed production, since these seeds need to be produced in fields that are isolated from other fields to avoid seed contamination. Land scarcity may mean that farmers engaged in QDS production may not achieve the recommended isolation distance recommended. Due to this constraint, some farmers have not been able to get their seeds certified by Tanzania Official Seed Certification Institute (TOSCI).

3.5 Limited resources of districts to implement and up-scale CSA

Although CSA has been accepted widely at country level, climate change issues have not been effectively incorporated into the LGAs development planning (District Agriculture Development Plans – DADPs) and budgeting. Resources (Human, Financial and Technical) at district level are also too limited to allow district staff to play their role effectively in supporting development activities in their district. This means that the prospects of district staff providing effective post-project support to the interventions initiated by most projects are not very good. Currently, the employment of more extension officers to the village level is very limited, but where they exist extension officers are assigned with other duties and they are often not aware of and trained in CSA.

4 Policy Recommendations

4.1 Promotion of adoption of appropriate CSA packages

Most current national policies are promoting CSA related technologies and practices but critical to successful initiatives is an often complex, integrated approach, matching each intervention to local conditions and involving farmers in design and implementation.

Given that climatic uncertainties vary radically across agro-ecological zones and with agricultural seasons, it is important to put and integrate CSA solutions together as a bundled package. This provides robust, multiple layers of protection that help farmers face the vagaries of climate change, in contrast to a single solution that could become ineffective depending on the swing and intensity of the weather within seasons.

4.2 Improved provision and use of weather forecasts

Adaptation will require building capacity of smallholder farmers to better understand the impact of temperature rise and rainfall variability on key crops so they can make informed choices. The promotion and capacity building for CSA should be complemented with reliable short, medium and long term weather forecasts to support the farmer in optimising the timing for planting and in choosing the right mixture of CSA measures to adopt. E.g. when the forecasts are for a relatively dry

rainy season, a farmer can decide to plant more sorghum or millet whereas a forecast for relatively high rainfall may lead a farmer to plant more maize.

4.3 Using pro-poor policy approaches to promote CSA

It is clear from the experience of the five GCCA projects that targeting the poorer and more vulnerable households in communities is not easy. For more effective pro-poor approaches, it is important to mainstream this element in all aspects of planning and designing of projects and programs. This means for example:

- Ensuring poor and vulnerable households are represented when using participatory approaches to design interventions.
- ensuring barriers for poor households for participation in and adoption of proposed interventions are identified
- Reduce such barriers by giving preferential treatment for poor households (e.g. highly subsidised or free inputs) and using low-cost technology where possible.
- if needed, set minimum criteria for percentage of poor households in activities

To overcome low financial capacity at farmers' level, farm inputs and materials can be made affordable to farmers in various ways including:

- Facilitating access to finance, such assistance can be in the form of provision of credit at low interest rates, for example through community micro-credit finance institutions.
- Provision of subsidies that are phased out gradually over time.
- Removal of or reduction in import duties on farm equipment, tools and other inputs.
- Reducing transport costs, particularly for farmers located in enclaved rural areas.
- Educating farmers about the benefits of CSA and ways to improve its profitability.

These actions will enable farmers to procure improved seeds and breeds, inorganic fertilizers, pesticides and herbicides, and other inputs such as labour and machinery that allow them to practice CSA effectively.

4.4 Promote production of Quality Declared Seeds (QDS) at local levels

The introduction of the QDS Production Model by EcoAct has been successful and appropriate for a majority of farmers who could not afford to purchase certified seeds. Most farmers were able to adhere to the seed regulations and successfully produce QDS seeds. The Project distributed the seeds to over 2,500 farmers, majority being female farmers and has led to improved household food security in the targeted communities. EcoAct networked with national plant breeders and agronomists for the supply of foundation seeds to QDS producers such as for sorghum, which cannot be accessed from seed companies.

National Policies should promote production of QDS at local level and government can support this through training of seed producers and educating non-seed producers to understand the reasons for seed production in their jurisdiction. It is important that non-seed producing farmers agree not to plant the same crop variety in their field surrounding the QDS seed plots.

4.5 Mainstreaming of CSA Interventions in LGAs plans

Mainstreaming of CSA into District Agricultural Development Plans (DADPs) is important to access government funding for implementing and monitoring CSA interventions, in line with National Programs such as Agriculture Sector Development Plan - 2 (ASDP2). For this to be successful, it needs to go hand in hand with enhancing capacity of extension staff at local level for implementation and upscaling of CSA. The GCCA projects have supported the incorporation of successful CSA interventions in district plans, based on their experience in piloting different CSA interventions in the target communities. They have also involved district staff closely in the implementation of these activities thereby building their capacity and increasing prospects for good post-project support to the CSA interventions and for replicating the most successful ones to other communities.

National agriculture policies should promote implementation of CSA at all levels to the point of making it mandatory. The Government should also provide specific budget lines and codes for CSA activities.

4.6 Promotion of alternative livelihood strategies

Climate Smart Agriculture strategies as a measure to build climate resilience are important but not a panacea for all climate change related impacts. The GCCA experience has shown that with extreme droughts even drought tolerant seeds and other CSA practices will not be able to produce a yield. In this case, other interventions are required to allow HHs to diversify away from the dependency on rainfed agriculture. Examples of this type of “indirect” climate change adaptation interventions promoted by GCCA Tanzania include Savings & Loans groups (very successful), promoting eco-tourism, beekeeping and butterfly keeping. It is important that climate change adaptation policies and programmes recognise the need to mix direct CCA measures like CSA with indirect measures that reduced overall dependency on rainfed agriculture.

5 References

- GCCA Tanzania (2018) Annual Reports and Case Studies
- URT (2007). National Climate Change Strategy
- URT (2013). National Agriculture Policy
- URT (2014). Agriculture Climate Resilience Plan
- URT (2017). Climate Smart Agriculture Guideline