

# Economics of Climate Change for Agriculture Sector in Tanzania

## Adaptation Options and their Costs

### Executive summary

This report is a summary of a study that assessed the impacts of climate change on crop production in Tanzania, adaptation options and their costs. The study recommends additional investments in: 1) Irrigation 2) Soil and water conservation 3) Agricultural research, 4) Agricultural extension, and 5) Rural roads. It is estimated that an extra of 107 M USD per year over the current development spending is required to cover adaptation costs in agriculture.

### Introduction

The agriculture sector is the mainstay of Tanzania's economy. However, the sector is underdeveloped on many fronts including technology, markets, and support services. Furthermore, the agriculture sector is riskier because of its dependency on highly variable weather.

Future climate change is anticipated to exacerbate production risks in agriculture by shifting averages of already volatile long-term weather conditions. This has called for mainstreaming of climate change adaptation and mitigation in the development and investment processes.

### Approach

The study assessed the adaptation costs in the Tanzanian agriculture sector. This involved the analysis of climate change and quantification of the projected cereal yield losses and analysis of adaptation options. Some case studies were included in the assessment to give it a "bottom up" flavour. The livestock sub-sector was not fully addressed in this study.

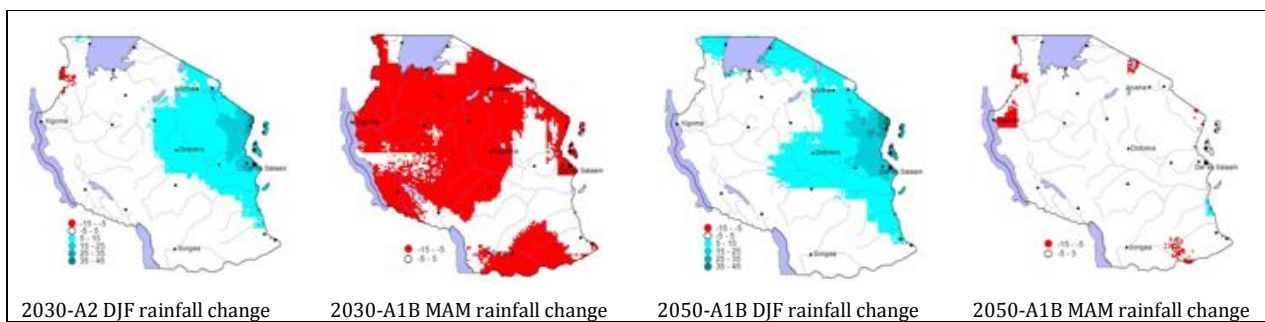
Costing was done in five identified major investment areas for the development and adaptation of agriculture sector in a changing climate. The areas include: 1) Irrigation expansion, 2) Soil and Water Conservation (SWC), 3) Agricultural research, 4) Extension, and 5) Rural roads. These are among the major adaptation options identified in the policy and strategies. The costs were discounted based on the Stern's social interest rate.

### Results

#### Climate change projections by 2030 and 2050

Climate projections under pessimistic emission scenarios (A1B and A2) indicate that Tanzania will be warmer with an increment in minimum temperatures of between 1.0 and 1.5°C by 2030 with respect to 2000 baseline year. Maximum temperatures are projected to increase in some areas of the country by 3°C and decrease in other areas on the same magnitude. By 2050, minimum temperatures are projected to increase by 2°C.

With regards to rainfall, the country is going to be impacted differently over space and time. During the March-April-May period, rainfall is projected to decrease by up to 15%, with an exception of the Eastern Arc Mountains, South-Eastern Tanzania and portions around Lake Victoria. This implies a shortening of the season and shifting of the planting dates. Therefore, current agronomic management practices will need to be adjusted by changing planting dates and crop types and varieties.



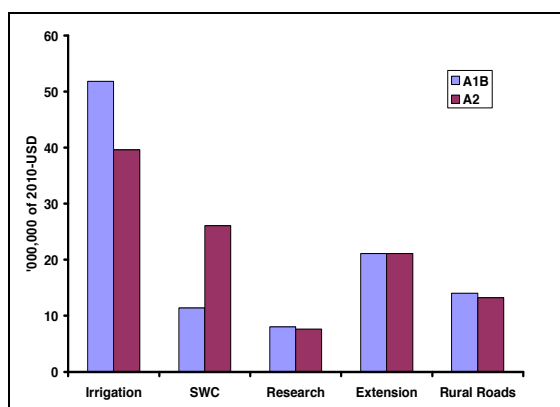
## Projected rainfed maize production change by 2030 & 2050

The cultivation of maize is going to be particularly hard hit. Simulation of maize yields under the business-as-usual, i.e. current management practice, using crop simulation model DSSAT, showed that the yields are likely to decrease by 14% by 2030 and 23% by 2050 compared to the baseline year 2000. This implies a decline of about 1.1 M tonnes and 2.9 M tonnes (using an average simulated yield of 1.3 t/ha) by 2030 and 2050, respectively.

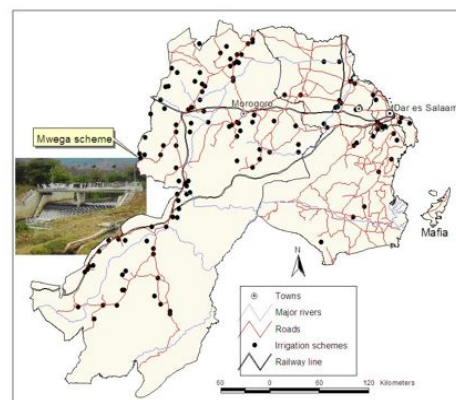
## Climate change adaptation costs

Based on the empirical results of this study the following policy-relevant recommendations are presented:

1. **Increase investments in smallholder farmers' irrigation development beyond that in the National Irrigation Master Plan.** In order to forge adaptive capacity in agriculture through irrigation, the government should continuously strive to increase the investment in irrigation development over the National Irrigation Master Plan target of 5.4% to reach at least 15% area growth rate per annum.



Projected adaptation costs per annum



Irrigation schemes in the Eastern Zone

2. **Special programmes should be started in soil and water conservation in order to maintain the productivity in the highlands.** Investments in soil and water conservation (SWC) are extremely low compared to investments in other areas (0.3% of the total funds allocated to DADPs). This study recommends increased spending to between 11.4 and 26.1 M 2010-USD per annum.
3. **Strengthen the capacity of agricultural research institutes to conduct basic and applied research.** The government should reverse the recent trend of declining funding of agricultural research. With regard to climate change, Tanzania needs additional funds between 7.6 and 8.0 M USD annually until 2030 for research in climate change adaptation.
4. **Institutionalize climate information data collection, analysis and dissemination in the District Agricultural Development Plans.** Timely and focused dissemination of weather forecasts to end users is extremely important because of high dependence on rainfed agriculture. This study recommends additional spending in agricultural extension of about 18.7 M USD on annually.
5. **Additional investment is required in rural road infrastructure to address development deficit and future climate change.** Better roads, agro-processing and improved markets are critical in improving market access and maintaining reasonable prices for agricultural goods. This study estimates an investment of around 14.0 M USD per annum up to 2030 for adapting to climate change.
6. **Up-scale potential mitigation strategies.** There are a number of potential mitigation strategies in the country that are currently not fully exploited indicated above. The adaptation and scaling-up of these innovations are still very low. The utilization pattern of these strategies has remained patchy and localized for many years without wider adaptation and scaling-up. These need to be identified, incorporated into regular farm operations and practices, and scaled up so that GHG can be displaced at a relatively low cost.

This briefing note emanates from a study that was commissioned by Global Climate Adaptation Partnership (GCAP) of the UK to Soil and Water Management Research Group (SWMRG) of the Sokoine University of Agriculture. It was implemented from July to October 2010.