Validating Climate Smart Water Harvesting Technologies to Increase Food and Nutrition Security in Semi-arid Kenya Project

Summary

This study seeks to increase agricultural productivity and resilience of farmers in Machakos, Baringo, Kajiado and Taita Taveta Counties by validating gender-responsive climate smart water harvesting technologies, innovations and management practices, and strengthening innovation and knowledge exchange systems to increase access to information on the best fit climate-smart water harvesting technologies, innovations and management practices. The project will be implemented for two years at an estimated cost of 22 million Kenya shillings. About 10,000 farmers are expected to benefit directly from the project, with a spillover effect of up to 100,000 farmers. The World Bank through the Kenya Climate Smart Agriculture Program (KCSAP) is supporting the research.

Background

Achieving an accelerated agricultural growth rate is key if Kenya is to fight widespread poverty, malnutrition and food insecurity. With most of the high agricultural potential areas already over-populated, much of the required growth has to come from intensive cultivation of arid and semi-arid areas (ASAL) which constitute over 70 % of her total area (GoK, 2016). However, cultivation of these areas is widely viewed as difficult due to water scarcity and other biotic and abiotic constraints that undermine agricultural productivity and resilience (Kwena *et al*., 2018a; Gichangi *et al*.,2015; Recha *et al*., 2012). According to the National Water Masterplan of 2013, Kenya will experience serious water scarcity by 2030 due to climate change and the poor and vulnerable ASAL populations will suffer most. There is overwhelming evidence that investment in sustainable and efficient water harvesting and management systems can contribute to agricultural growth and reduce poverty by encouraging intensification and diversification in addition to increasing agricultural-based wage employment, thereby mitigating the situation (Kwena *et al*., 2018b; Ngugi *et al*., 2015; Critchley *et al*., 2012). Efforts must therefore be made to capture and effectively use the available water for micro-and supplemental irrigation to boost agricultural productivity and guarantee food security and nutrition in the Country.

Problem statement and justification

Kenyan drylands cover over 70% of the country and support thousands of people and their livestock. Unfortunately, these people are poor and face frequent acute food shortages resulting from recurrent crop failures due to low and erratic rainfall. Cereal production is low and most families depend on food aid (Kwena *et al*., 2018a; GoK, 2016; Recha *et al*., 2015). Drylands also experience severe land degradation (Kwena *et al*., 2018a). Without proper land management practices and water conservation, communities in these regions will remain trapped in the vicious cycle of poverty and land degradation (Critchley *et al*., 2012).

Despite many years of research in soil, water and nutrient conservation by several research organizations in these areas, adoption of these technologies has been low due to lack of technologies that match the farmers' socio-economic conditions, limited access to useful information locked up in research institutions, low resource endowments, and lack of incentives (Kwena *et al*., 2018a; Matere *et al*., 2016; Critchley *et al*., 2012). This situation has to change.

Combining water harvesting techniques such as zai pits, tied ridges, terracing and farm ponds with the improvement of soil fertility through micro-dosing, Integrated Soil Fertility Management (ISFM), fertigation and biofertilizers has been noted to result in higher efficiency of resource use and increases the profitability of investment in water harvesting. Various success stories have been reported on the potential of water harvesting in increasing land productivity (Kwena *et al*., 2018b; Mwende *et al*., 2018, 2017, 2016; Alwanga *et al*., 2016; Ngie *et al*., 2014).

These stories offer a good learning experience which if adapted to these areas will undoubtedly increase crop yields, improve living standards and better management of the natural resource base by farmers and the rural communities across semi-arid Kenya.

Project goal and objectives

The goal of this project is to improve smallholder food security and income, and enhance ecosystem health.
Specific objectives are:

(i) To validate gender responsive climate smart water harvesting technologies, innovations and management practices among smallholder farmers
(ii) To strengthen innovation and knowledge exchange systems for promoting and sharing information on best fit

Expected outputs and outcomes

Expected outputs will include: (i) Climate-smart water harvesting technologies, innovations and management practices **validated**, and (ii) Communication, information and knowledge management on best fit climate-smart water harvesting technologies, innovations and management practices **improved**.

Expected outcomes will include improved productivity and yield stability of priority value chains; a 100% increase in per capita food production resulting in significant increase in food security for the smallholder farmers and increased returns on investments, improved soil health and water quantities and quality. In addition, the project will facilitate an increase in farmer's knowledge on innovative value addition and open up farmers to produce for the market. Local communities will acquire skills and tools that will improve their capacities to deliver services and accelerate adoption of improved water harvesting and management technologies.

Collaboration and partnerships

KALRO-AMRI will coordinate the project and provide technical backstopping and monitoring and evaluation necessary to ensure success of the project. Egerton University and KALRO-Food Crops Research Institute (FCRI) will coordinate research activities in Baringo, Kajiado and Taita Taveta Counties. Embu University will conduct a stakeholder analysis and prepare a communication plan, and carryout economic analysis of the best-fit water harvesting technologies, innovations and management practices (TIMPs). Kenya Meteorological Department, through AMRI, will provide downscaled seasonal forecasts for better targeting of water harvesting TIMPs. East Africa Farmers Federation, through the University of Embu will bring on board skills for mobilizing farmers and promoting the proposed agricultural productivity enhancement innovations. Water Resources Authority (WRA), through Egerton University, will mobilize and organize Water Resources Users' Associations (WRUA) for action. Finally, County Ministry of Agriculture, Livestock & Fisheries staff will aid in mobilizing farmers to participate in the study and adopt the best-fit water harvesting TIMPs.

Project team

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