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Adoption of climate-smart agriculture in smallholder agri-food systems in Kara, Togo: Trade-offs and synergies.

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Abstract

Climate change threatens food production systems and smallholder farmers' livelihoods, particularly in developing countries. Farmers' exposure to weather changes such as prolonged drought, late start of rains, and shifting rainfall patterns cause income loss and threaten their households' food security. Climate-smart agriculture has been heralded as a sustainable approach to increasing agricultural productivity while adapting to and mitigating climate change. There is a need to understand the full range of benefits derived from the climate-smart agricultural practices and technologies promoted to farmers in areas already exposed to several agricultural intervention projects. This requires an evaluation of agricultural production, farmers' responses and their farm management practices at the household level. Our study closes this gap by employing cross-sectional studies to identify the drivers of farmers' adopted climate-smart agricultural practices and their impact on the households' food production. We also assess factors affecting climate-smart practices in transforming agri-food systems to increase farm households' food security. We used a mixed-method approach to collect primary data in the Kozah prefecture of Togo. Quantitative data was collected through multistage sampling to select over 500 farm households. Qualitative data were obtained from focus group discussions with farmers, expert interviews with government officials from the Togolese Ministry of Agriculture, non-governmental organizations and regional research scientists. The data were collected between January and April 2023 and analyzed using descriptive and inferential statistics. The results show that farmers mainly adopt soil management climate-smart practices; over 85 per cent of farmers do not use improved seeds, mainly due to the costs associated with their adoption. The results also show that farmers already know most of the promoted farming practices from traditional knowledge. They combine climate-smart practices on the same plot and find the impact of this combination on their food production to be more, yet risky. The findings from this study can provide information to guide policymakers in designing agricultural programs and policies that can better address the constraints of low food productivity and high food insecurity plaguing the country.

Keywords: climate-smart agricultural practices, smallholder farmers, household, food security

Introduction

Ecosystems in the West African savannah are considered most vulnerable to climate change, mainly due to the climatic and geographical characteristics of the region (IPCC [AR5](#)). In addition to the persisting climatic and geographic challenges in this region for agriculture, farmers experience low soil fertility, variability in water availability, limited infrastructure and institutional weakness (Callo-Concha et al. [2019](#)). Floods, droughts, rainfall variability and strong winds are the main climate risks affecting the agricultural, water resources and healthcare sectors (Togo NAPA, [2009](#)). Sixty-four per cent of the over eight million people in Togo are considered food insecure¹. The number of people facing acute food insecurity rose sharply in the last three years to 142%. In the Kara region, extreme climatic shocks were to be blamed (WFP [2023](#)). Agriculture is the primary source of income in many subsistence farm households. The challenges imposed by climate change and variability worsen the situation and affect their food security (Issahaku, Abdulai [2019](#)) and income, leading to below-threshold levels of survival (Essossinam, [2019](#)).

Climate-smart agriculture (CSA) is an integrated approach to achieving food security in the face of climate change while mitigating climate change and contributing to other development goals, Verhagen et al. ([2014](#)). Ever since the launch of the concept in 2009 by the FAO, CSA has been heralded in many African countries and included in their nationally determined contributions in the wake of the Paris Agreement (Richards et al., [2015](#); Barasa et al., [2021](#)) and the UNSDGs (Nwewll et al. [2019](#)). Agricultural interventions are instrumental in promoting good practices to augment food security (Bodna' et al. [2011](#); Adu et al. [2018](#)). The Togolese Ministry of Agriculture, Livestock and Rural Development (MAEDR) is the focal point of agricultural intervention projects. They also review and validate projects carried out by civil society organizations and collaborate on some projects. The Kara region has benefited from numerous agricultural intervention projects since the green revolution era. However, agriculture remains marginally productive (ADB, [2018](#)). Acknowledging that smallholder farmers in rural communities have been adjusting to climatic changes through their indigenous knowledge, there is a need to understand the full range of benefits derived from the climate-smart agricultural practices and technologies promoted to farmers in areas already exposed to several agricultural intervention projects. Therefore, this study aims to analyze the impact of the various knowledge sources of CSA practices on farm household food production and security.

Methodology

A multistage random sampling was used to select 539 farm households in the Kozah Prefecture in the Kara region, and information on their crops grown and adopted practices was requested. Data was collected using structured questionnaires, observations, expert interviews and focus group discussions. Expert interviews were conducted with government officials at the Togolese Ministry of Agriculture: regional director of MAED, regional director of the Institute of Consulting and Technical Support (ICAT) and the regional head of the legumes program at the Togolese Institute of Agronomic Research (ITRA), NGOs (PADES, AJT, GIZ ProSecAl, and GIZ ProCiv) and research scientists who have carried out studies in the research area. Focus group discussions were conducted with 25 farmers in three cantons of the prefecture.

Results and Discussion

Findings showed that farmers in this study have small plots averaging 1 ha and plant an average of 4 crops, mainly maize, soy, sorghum and beans, on the same plot. Farmers combine an average of 6 CSA practices on the same plot and find the impact of this combination on their food production to be increased compared to periods of non-adoption, yet risky. Over 75% of farm

¹ Worldhunger.io accessed October [2023](#)

households barely have enough food all year round, with household food shortage highest between May and September. Over 80% of farmers lose their crops before harvest due to dry spells. However, as shown in Fig 1, less than 15% of farmers adopted water management practices. 25% of farmers adopted livestock management practices, with animal breeding and vaccination the leading practices.

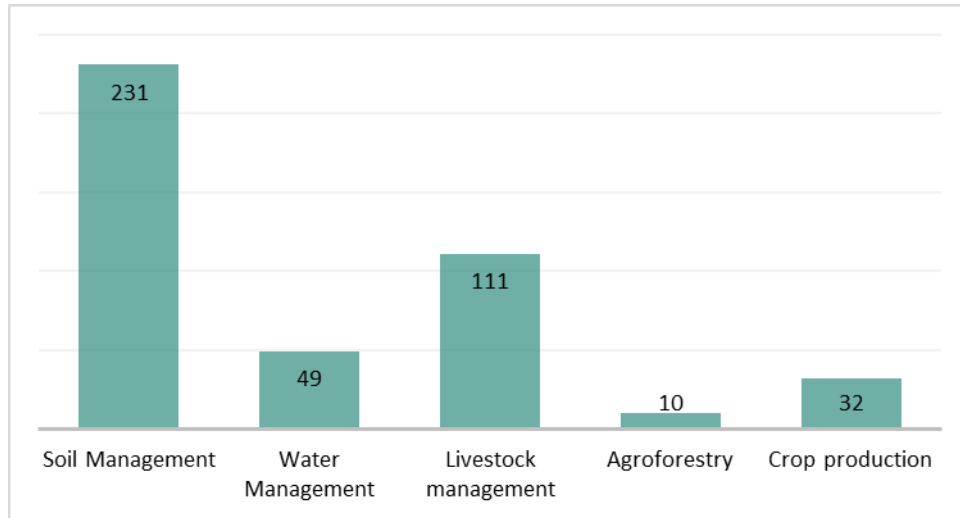


Fig. 1: Farmers' adoption of CSA practices in various groups

As seen in Fig 2, organizations interviewed mostly promote CSA practices that farmers already know from traditional knowledge, except for improved seeds. However, improved seeds have a low adoption rate by farmers (13%) mainly because they believe that traditional seeds are more resilient and the high costs associated with their adoption.

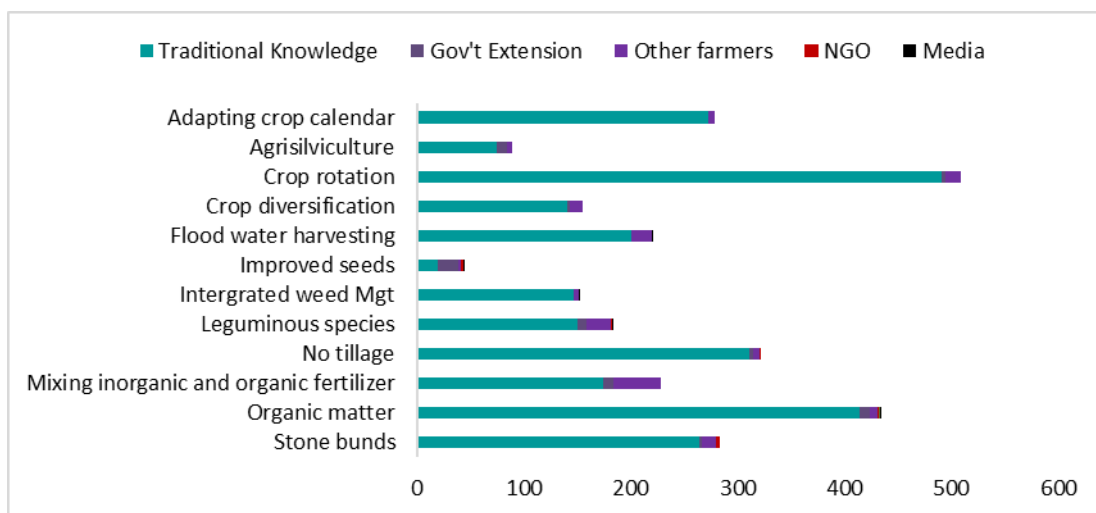


Fig. 2: Sources of knowledge of promoted farming practices

Interviewed experts and farmers unanimously believe that adopting soil management practices such as planting leguminous plants and using organic and inorganic fertilizers would optimize farmers' food production. Non-farmer experts believe adopting water management practices such as adapting cropping calendar, irrigation, and flood water harvesting would increase farm production. Farmers believe adjusting cropping calendar, crop diversification, and improved seeds would increase farm production. However, they are convinced that if costs associated with adopting improved seed (using more fertilizers and procurement costs) were minimal, improved seed adoption would increase.

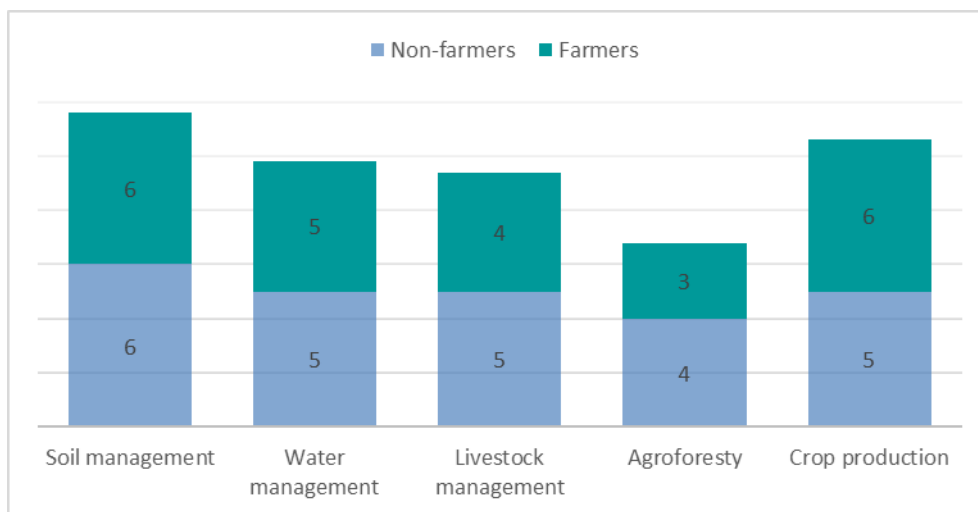


Fig. 3: Experts valuation of CSA groups

Highlight

This research showed that farmers' traditional practices amount to CSA practices, and they know the complementary benefits of most practices. If water management practices such as irrigation and water harvesting are added to the list of CSA practices promoted through intervention projects, farmers' food production and security will increase, thereby reducing the risk of livelihood and financial loss.

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