POLICY BRIEF

Sustainable Scaling of Climate Smart Agricultural Technologies and Practices in Africa: The Case of Kenya, Nigeria and Malawi

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Highlights of findings

- Climate change (CC) is among the major challenges globally affecting all areas of life.
- It has made agricultural production and productivity unstable hence negatively affecting income and food security.
- In addressing this challenge in agricultural production, it is important to shift to more sustainable practices such as Climate Smart Agriculture (CSA) which

has a three-pronged goal of increasing productivity, enhancing climate change adaptation and resilience as well as reducing greenhouse gas emission.

- Findings have shown that similarity exists in the geographical conditions across the three countries and in most of the Climate Smart Agricultural Practices (CSAPs) adopted

- In Nigeria, farmers were affected by high incidences of floods, heavy rains and drought, while farmers in Kenya and Malawi experienced high incidences of drought, late onset of rains, early stoppage of rains, pest and disease outbreaks.

- Most adopted practices include the planting of early maturing varieties, green manure, mulching, refuse retention into the soil instead of burning, zero/minimum tillage and crop rotation

- Some key factors driving the adoption of CSAPs include incidences of drought, flood, access to credit, membership of a social group and extension contact which are important sources of information among others.

- Although CSA adoption was low, gender played a significant role in the adoption of some selected CSA across countries.

- The pathways for sustainable scaling of gender inclusive climate-smart agricultural technologies and practices in Kenya, Nigeria and Malawi include the incorporation of women in policy formulation and grassroot programmes and targeting the promotion of CSAPs among small scale farmers according to the technological preference by gender category.

Introduction

Climate change (CC) is among the major challenges globally affecting all areas of life. It has destabilized agricultural production with negative production trends projected to increase in regions with limited capacity to adapt to CC. In addressing this challenge in agricultural production, it is important to shift to more sustainable practices such as the Climate Smart Agriculture (CSA) which has a three-pronged goal of increasing productivity, enhancing climate change adaptation and resilience and reducing greenhouse gas emission.

Although CSA technologies and practices hold such promise in terms of improving the well-being of farmers, social, economic and institutional factors hinder some farmers from adopting the techniques (Liu et al., 2018). Notably, gender constraints hinder women farmers from utilizing some of the technologies and

practices (Khatr-Chhetri et al., 2020). Identifying common and available gender inclusive CSA by agro-ecological zone within each country and per livelihood activities (crop production, livestock rearing and agro-processing) will greatly help in developing well-targeted programmes and projects with the aim of upscaling these CSA practices.

The brief is aimed at identifying gender-responsive CSA technologies and practices, identifying social-economic and cultural dynamics that impede adoption, and developing sustainable pathways for the scaling of CSA interventions.

Summary of research

The study made use of both secondary data from articles, relevant data from databases and primary data obtained through field survey, key informant interviews and focus group discussions across countries.

Summary of finding

Findings have shown that the three countries experience almost similar climatic conditions ranging from sub-tropical to tropical with varying wet and dry periods. Literature indicates that Nigeria was the highest emitter of greenhouse gases amongst the three countries likely due to the size of Nigeria in terms of land and population. Common crops grown under CSA across countries include maize, potatoes, beans, and rice. Across the three countries, the majority of the farming households perceived that there has been an increase in temperature change, length of dry season / prevalence of drought and the incidence of crop pests and diseases. Farmers in Kenya and Malawi reported an increase in the average volume of rainfall, length of rainfall, and the incidences of flood and river overflowing beyond its bank as compared to farmers in Nigeria who reported a decrease. Interestingly, farmers across the three countries reported a decrease in the frequency and/or intensity of storms and other wind related weather conditions.

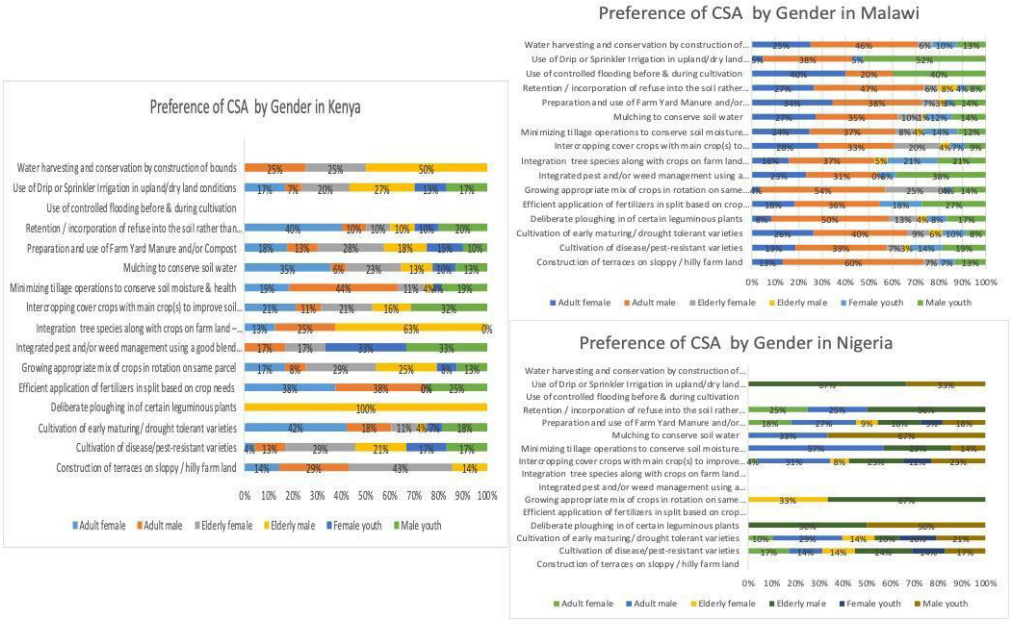
In Kenya, farmers perceived that the key factors affecting their adoption of CSA include limited knowledge (28%); limited access to training (18%); limited access to resources (21%) and high cost of inputs (14%). In Malawi, some of the perceived factors include limited knowledge (21%), limited access to training (14%), limited access to resources (21%), and high cost of inputs (18%) while in Nigeria, the perceived factors include limited knowledge (36%), limited access to training (20%) and limited access to resources (26%). Apparently, across the 3 countries it appears that age and gender affect adoption of CSA at a low level.

In Kenya, it was observed that gender and age group determined the preference for specific CSA technologies adopted. Youth and adult male and females invested in irrigation for high value crops. The youth were able to diversify in greenhouse farming for quick returns while adult women are responsible for food security at the household level and are keen on early maturing varieties. Adult men are responsible for making long term development decisions on the farm, they are responsible for agroforestry and integrated soil and water conservation. Adult Men also design terraces and dig them, while elderly men and women have little energy for digging hence comfortable with shallow weeder. Adult men felt that youth shun hard, tiresome work on the farms, and this causes limited participation of youths in the farm activities because of the land tenure system.

In Malawi, adult females prefer controlled flooding before and during cultivation, preparation and use of farmyard manure and intercropping cover crops with main crops. Adult males prefer construction of terraces on sloping farmlands, deliberate ploughing of certain crops and retention or incorporation of refuse into the soil to enhance the soil nutrients. Elderly females preferred mixed cropping and crop rotation, intercropping of cover crops with the main crops and deliberate ploughing of crops into the soil. The elderly males prefer construction of terraces on sloping farmland, retention of refuse into the soil, and cultivation of early maturing crops. Female youth prefer to minimize tillage operations to conserve soil moisture, cultivation of disease and pest resistant crop varieties and mulching of the crops. The male youth prefer the use of drip or sprinkler irrigation in drylands, use of controlled flooding before and during cultivation and integrated pest and disease management.

In Nigeria, adult females prefer retention or incorporation of refuse into the soil, preparation and use of farmyard manure and cultivation of disease or pest resistant varieties. The adult males prefer minimum tillage operations and mulching to conserve soil moisture coupled with intercropping of cover crops and main crops. Elderly females prefer crop rotation, cultivation of early maturing and drought tolerant crops and cultivation of disease or pest resistant varieties. Elderly males prefer use of drip or sprinkler irrigation in dry lands, crop rotation, retention or incorporation of refuse, and deliberate ploughing in of certain leguminous crops into the soil. The female youths prefer cultivation of early maturing or drought tolerant varieties, construction of terraces on sloping land and intercropping cover crops with main crops. The male youths prefer mulching, deliberate ploughing in of certain leguminous crops and the use of drip or sprinkler irrigation in dry areas.

Figure 1: CSA technologies preferred by different gender in Kenya, Malawi and Nigeria



Source: Author's Computation from Field Survey, 2022.

Six (6) main Climate Smart Agricultural Practices and Technologies (CSA T&P) were selected from an array of 16 CSA P&T commonly adopted amongst farmers in the three countries and fitted in the econometric model. Eight of the fifteen correlation coefficients have shown that negative correlation exists between the CSA P&T thus implying that the practices are substitutes for the farmers. Thus, crop rotation can be substituted for the cultivation of early maturing varieties, green manure for cultivation of early maturing varieties, minimum tillage for refuse retention, crop rotation for refuse retention, mulching for refuse retention, crop rotation for minimum tillage, mulching for green manure and mulching for crop rotation and vice versa.

The factors affecting different CSA T&P are not uniform across practices. Based on gender categorization (male youth, female youth, adult male, adult female, elderly male and elderly female), being an adult male, an elderly female and a male youth positively influenced the adoption of early maturing varieties amongst farmers as compared to being an elderly male. Although, the reverse was noticed because being an adult male negatively influenced the adoption of crop rotation. Gender had no significant influence on the adoption of the remaining four practices (refuse retention, minimum tillage, green manure and mulching). The implication of this is that despite the existence of gender disparities, the adoption of CSA T&P is often because of other factors.

The age of the farmers had a negative influence on the adoption of minimum tillage. This seems hardly surprising given that theoretically older farmers find it very difficult to change their farming habits as compared to younger farmers. Also, the educational level of the farmers significantly influenced the adoption of green manure. The more educated a farmer, the higher the ability to process information and the higher the likelihood of adopting technologies that will be beneficial to their productivity as compared to less educated farmers. However, the assumption that households with large household size will increase the adoption of technologies was negated as the number of persons in the household reduced the likelihood of a farmer adopting mulching.

Similarly, farmers who are native of the rural communities in which they stay are more likely to adopt the retention of refuse which is a very simple practice as compared to long term practices such as agro-forestry if they do not have secure land tenure. Furthermore, the incidence of flood affecting farmers had a significant and positive influence on the adoption of early maturing varieties, refuse retention, minimum tillage, and mulching. This is not so surprising as all these practices are targeted at reducing erosion, conserving soil moisture, and reducing the period between planting and harvest.

The occurrence of drought influenced the adoption of the conscious incorporation of leguminous crops into the soil by farmers was influenced by the occurrence of drought. Access to credit increased the adoption of minimum tillage and green manure while it reduced the likelihood of the adoption of mulching. Social capital (membership of a farmer association) positively influenced the likelihood of adopting green manure and negatively influenced the adoption of minimum tillage and mulching. An increase in the farm size of farmers positively influenced the adoption of minimum tillage amongst farmers. Furthermore, the likelihood of green manure and mulching increased with walking distance to the cultivated plots.

Similarly, farmers that cultivated lowlands had a higher likelihood of adopting green manure and crop rotation. Crop rotation is an adaptation strategy that farmers use by cultivating different crops on the same plot during different planting seasons to increase fertility. Land ownership negatively influenced the adoption of green manure. This is contrary to apriori expectation as secure land is expected to serve as an incentive for farmers to consider investing in the adoption of long-term practices. Furthermore, the importance of agricultural extension in diffusion and continued use of technologies among farmers was observed, as the results showed that frequency of contact with extension agents positively influenced early maturing varieties and mulching adoption. Similarly, farmers who engage in off-farm activities have a higher likelihood of adopting minimum tillage and green manure. This is not surprising since the practices require a considerable financial commitment from adopters.

Policy recommendation

- Feasible development pathways will include proper attention to policy, institutions, knowledge, and innovation as well as technical issues in the countries. The development of CSA in Kenya, Nigeria and Malawi is constrained by minimal public-sector investment and poorly coordinated support services. This situation is attributed to a lack of consistent strategy for CSA up-scaling.

- Effective knowledge systems are required to ensure that timely and accurate information on the availability and quality of input is accessible. The public sector has important roles to play in this regard, and in promoting the uptake of these technologies and services.

- Development of targeted outreach programmes on CSA to promote CSA T&P according to farmers' preference by gender.

- Priority investment options to guide investor to make better informed investment decisions about CSA up-scaling should include:

    - Governments can assist in making more resources available for the establishment of field stations in research institutes and universities in the country that are appropriate for specific crop/livestock species and various agro-ecological zones in the country (ies)

    - Investment is required to produce nutritionally safe food and the production of economically viable products while maintaining the environment
    - Ministries of Agriculture across countries needs to be empowered through the extension agents to serve as agent of change in technology dissemination

    - Governments should support policies aimed at improving access to credit by smallholder farmers since access to credit is an important factor driving adoption.

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