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UPSCALING CLIMATE-SMART AGRICULTURE IN SUB-SAHARAN AFRICA

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EXECUTIVE SUMMARY

Climate change is threatening food systems and agriculture in sub-Saharan Africa. Smallholder farmers are struggling to adapt to extreme weather events associated with climate variability and need substantial support to feed rapidly growing populations. Climate-smart agriculture (CSA) has the potential to play a significant part in achieving climate resilience, adaptation and sustainable agriculture. Nevertheless, there are various social, institutional, environmental and economic barriers impeding the widespread adoption of CSA practices and approaches in the African region. A nuanced understanding of these barriers and their impact on the adoption of CSA practices is crucial for transforming Africa's agriculture. This paper seeks to explore the most common and most significant barriers impeding the upscaling of CSA practices in sub-Saharan Africa and to highlight the actions needed to remove these impediments and promote the introduction of widespread CSA practices across the region.

INTRODUCTION

Agriculture is the backbone of economic growth for many sub-Saharan African countries. It employs about 60% of the region's labour force and accounts for 25% or more of gross domestic product[1]. This notwithstanding, in recent times, agricultural productivity in the region has declined and food insecurity and hunger remain a major concern. According to the UN Food and Agriculture

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Organization (FAO), by 2050 food production will have to increase by 70% to meet the demands of a rapidly growing global population and changing diets.[2] However, boosting agricultural productivity and ensuring food security is no easy task, particularly when considering the far-reaching impact of climate change on the sector. Evidence suggests that smallholder farmers, hunters and fishermen in Africa are the hardest hit by the consequences of weather variability and climate change. As such, there is a need to build resilience and to adapt to the changing climate in a way that ensures that a growing population can be fed sustainably without further depleting natural resources.

There are significant efforts underway to develop, deploy and scale up CSA practices and technologies as an effective response to the climate change challenges faced by the agriculture sector. As with other sustainability transitions and technological innovations, the widespread adoption of CSA approaches in sub-Saharan Africa is slow. Sub-Saharan African countries need to invest in agricultural research and development, institutional support and infrastructural development to benefit from CSA, achieve adaptation and mitigation and meet their food security objectives.

AGRICULTURE AND CLIMATE CHANGE

A growing population, rising incomes and changing diets are driving up the demand for food. Agricultural production, on the other hand, is struggling to keep up with this demand as crop yields are declining and natural resources are depleting in many parts of the world.[3] A recent assessment of food insecurity in sub-Saharan Africa shows that about 26% of the population aged 15 years or older, (some 153 million people) suffered from severe food insecurity in 2014/15.[4] This is the highest prevalence of severe food insecurity in the world. The food security challenge in this region will only become greater given that food demand is projected to rise substantially by 2050.[5] The challenges are expected to intensify over time given agriculture's extreme vulnerability to climate change and weather variability. Reduced rainfall, more frequent extreme weather events and hotter and shorter growing seasons are affecting the productivity of crops, livestock, fisheries and forestry across sub-Saharan Africa. Productivity declines will have serious implications for food and nutrition security in the region.

There are significant efforts underway to develop, deploy and scale up climate-smart agricultural practices and technologies as an effective response to the climate change challenges faced by the agriculture sector

Agriculture is not only affected by climate change but also contributes to it in a variety of ways. The sector is responsible for a significant share of the anthropogenic emissions of the three major greenhouse gases: carbon dioxide, methane and nitrous oxide. Research shows that 30% of the total greenhouse gas emissions are generated by various activities and practices in the sector.[6] This makes agriculture the second largest emitter in the world after the energy sector, which includes emissions from power generation and transport.

These figures and trends underline the significance of the challenges facing sub-Saharan Africa in meeting the UN's Sustainable Development Goals (SDGs), in particular target 2, which calls on nations to 'end hunger, achieve food security and improved nutrition, and promote sustainable agriculture'.[7] The SDGs also highlight the need for substantial sustainable support for food security and nutrition policies and programmes at all levels.

Weather variability and climate change are just some of the drivers shaping trends in Africa's agri-food system. Substantial investments in adaptation are required to boost and maintain agricultural production and help farmers become more resilient in the long term. Given the crucial importance of food globally, a further reduction in greenhouse gas emissions from the farming sector remains challenging. Nonetheless, there is still the potential to further reduce greenhouse gas emissions if there is better integration of agricultural innovations and techniques into agricultural production methods. CSA is an approach that addresses both the adaptation and the mitigation imperatives of climate change in the agricultural sector.

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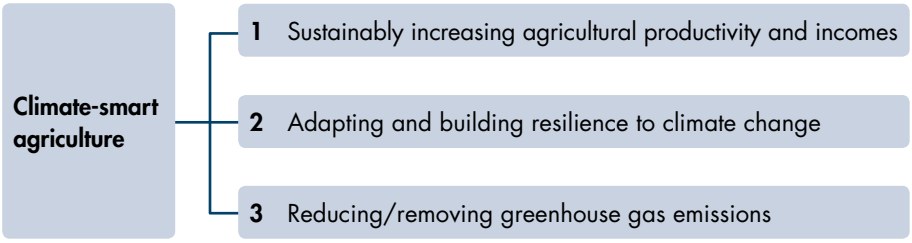
CLIMATE-SMART AGRICULTURE IN AFRICA

CSA, a concept developed by the FAO, is an approach to improving food security that is aimed at helping communities adapt to climate change and contribute to climate change mitigation by adopting appropriate practices, developing enabling policies and institutions, and mobilising the necessary financial resources to do so.[8] The concept combines the economic, social and ecological dimensions of sustainable development by addressing challenges related to food security, ecosystems management and climate change, as shown in Figure 1.

FIGURE 1 THE THREE MAIN PILLARS OF CSA



Adapted from: FAO (Food and Agriculture Organization), *Climate-smart Agriculture Sourcebook*. Rome: FAO, 2013, p. ix

CSA is not a prescribed system or practice, nor is it a specific technology that can be universally applied. Rather, it is an approach that necessitates context-specific assessments of social, economic and ecological conditions in order to identify appropriate farming technologies and practices. At the individual farm level, CSA seeks to enhance the livelihoods and food security of farmers, including smallholder farmers, by improving access to natural resources, their use and management, and adopting appropriate approaches and technologies for agricultural production and productivity. At the national and regional level, the aim of CSA is to support a country's ability to mainstream climate change adaptation and mitigation into the agricultural sector by putting in place appropriate policy, technical and financing mechanisms.

There have been a variety of efforts and initiatives aimed at promoting and scaling up CSA in the African region, reflecting the recognition of the importance of agriculture to African economies and livelihoods, as well as the fact that the continent is particularly vulnerable to climate change impacts. At the 23rd Ordinary Session of the AU held in June 2014 in Malabo, Equatorial Guinea, heads of state and government endorsed the inclusion of CSA in the agriculture and climate change programme of the New Partnership for Africa's Development.[9] The session also laid the foundation for launching the African CSA Alliance, a strategic framework for fostering and facilitating the sharing of experiences and learning, as well as galvanising action in local systems, to attain the goal of reaching 25 million farm households by 2025.[10]

As a follow-up action at the subregional level, Eastern Africa countries (through the East African Community and the Intergovernmental Authority on Development) have put in place a new sub-regional CSA platform that will facilitate the upscaling of CSA practices in the region.[11] In Eastern and Southern Africa, the CSA partnership of the Common Market for Eastern and Southern Africa has been actively collaborating with relevant government authorities in Botswana, Kenya, Namibia, Tanzania and Uganda to develop and implement country-specific CSA programmes. These regional and subregional initiatives offer strong coordination mechanisms for exploring policy options, innovative approaches and opportunities to enhance the integration of CSA into national development plans, as well as providing support for on-the-ground scaling up of CSA practices.

Over the past five years, various CSA projects have been launched and implemented in different African countries. The FAO has been collaborating with national and local partners in the region to help design and implement locally tested CSA solutions. In Kenya and Tanzania some 2 500 farmers have been empowered to undertake site-specific assessments of the adaptation, mitigation and food security benefits of a range of agricultural practices. These practices are identified based on the specific agro-ecological and socio-economic situation of each project site. In Malawi and Zambia, technical assistance has been given to policymakers in developing agricultural and climate change policies and the mapping of relevant stakeholders and institutions.[12]

In most cases, the CSA practices and initiatives that have been implemented have shown great promise for boosting Africa's agricultural productivity in a sustainable way. In areas where there is effective uptake, the agricultural sector has become more adaptive and resilient to climate variability and farmers are protected against changes in weather patterns, pests and diseases.[13] A study of food security and environmental resilience in Zambia, for example, reveals that maize production tripled when grown under an indigenous African acacia, *Faidherbia albida*. In Malawi, smallholder farmers who have adopted evergreen agriculture are enjoying remarkable results without having to pay large sums for inorganic fertilisers. The study shows that this type of CSA practice increases soil fertility and enables farmers to double or triple their crop yields.[14] Despite the promise of CSA and existing successes, the widespread adoption of CSA interventions in sub-Saharan Africa is low for a number of reasons, which are discussed later in this paper.[15]

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IMPEDIMENTS TO UPSCALING CLIMATE-SMART AGRICULTURE

Even minor climatic variations can have a considerable impact on agricultural productivity[16] and all four dimensions of food security: food availability, food accessibility, food utilisation and food systems stability. Agriculture will have to adapt to ongoing climate change, but it can also help mitigate climate change. Adaptation to extreme weather or climate events is a characteristic of all human communities. Smallholder farmers in Africa have been making use of their traditional knowledge, past experience and available resources to cope with the challenges presented by adverse climatic events. To some extent, plants can also cope with climatic variations without external intervention due to their natural adaptive capacity, with rice cultivars being one such example. Nonetheless, given recent trends in the region, these adaptation and mitigation mechanisms are insufficient to mitigate vulnerability to shocks and risks.

Owing to rapid population growth in the poorest areas of sub-Saharan Africa, coupled with the imperative of attaining better-quality diets for the poor and the need for tangible positive local environmental impact, agricultural innovations such as CSA have never been more important.[17]

As with any technological innovation or new systemic approach, the widespread adoption of CSA practices is influenced by context-specific biophysical and socio-economic realities. Studies conducted in sub-Saharan Africa show that the impediments to adopting CSA could be classified into two broad categories.[18] The first relates to the physical inputs that are required to implement CSA. These include resources such as land, labour supply, farming tools, infrastructure and finances. In a seminal work on agrarian development Frank Ellis emphasised that the adoption of new technologies, innovations and practices, including these physical inputs, takes place within a particular socio-cultural environment.[19] For example, even when new climate-smart technologies are designed and prove to be appropriate for local socio-economic conditions, it can be difficult for smallholder farmers to adopt them. With small, fragmented landholdings and limited access to credit systems, these farmers may have neither the ability nor the inclination to adopt and/or invest in these new CSA technologies and practices. In the same way, lack of access to high-yielding, disease-resistant seed varieties is a crucial barrier to the adoption and upscaling of CSA. Most CSA practices require special seeds for cover crops or intercrops and it may be difficult to obtain these if they have not commonly been grown in a given locality.[20] Unless efficient and reliable agricultural input supply mechanisms are in place, lack of access to inputs will continue to be an important barrier to smallholder farmers' adopting CSA.

The second constraint relates to factors that impinge on the enabling environment needed to adopt and implement CSA practices. These include appropriate institutions, policy and regulatory frameworks, information and skills. In principle, the successful adoption and scaling up of CSA practices depends on the extent to which adaptation and mitigation are integrated into policy and practice, and climate change issues are mainstreamed into national agricultural strategies.[21] Over the past decades, unstable and often inconsistent agrarian transformation policies have increased the vulnerability of the farming sector in sub-Saharan Africa. Linked to this, political and institutional inefficiencies have resulted in the economic deterioration of societies,[22] thereby compromising the resilience and adaptive

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capacity of smallholder farmers. This is the main obstacle to the widespread adoption of CSA techniques.

TOWARDS A SUSTAINABLE UPSCALING OF CLIMATE-SMART AGRICULTURE

The major impediments to the widespread adoption of CSA practices in sub-Saharan Africa (especially among smallholder farmers) can be overcome through a combination of targeted scientific research, policy and institutional reforms, and changes in technology dissemination strategies. For CSA to have the desired impact on Africa's agricultural system, it must be applied across political, socio-economic and agro-ecological contexts.

Four major policy areas can help the widespread adoption of CSA in sub-Saharan Africa.[23] The first is tenure security: improving tenure security can have a significant effect on smallholder farmers' willingness to invest in their land and improve crop productivity. Research suggests that investments in crop diversity, improved livestock and fodder crops, agroforestry and soil conservation are substantially higher on more securely tenured land.[24]

The second intervention area is improving access to farm implements and capital. Smallholder farmers are risk averse in their farming operations. There should be sufficient financial guarantees to secure their livelihoods. For example, payments for carbon sequestration could be an appropriate way of covering the time lag between investing in CSA practices and achieving the environmental and economic benefits associated with these practices. Other financial instruments that provide the necessary funds to minimise risk include crop insurance and micro-credit facilities. In the absence of these kinds of financial support, farmers can hedge against possible financial risks by adopting CSA piecemeal or on a small piece of their land.[25]

The third intervention to enhance the scaling up of CSA is to provide an enabling environment at all levels. The successful upscaling of CSA requires locally suitable practices and technologies within conducive, enabling environments. This requires a functional and effective governance system where rules, institutions and policies function properly to build climate resilience. In addition, there has to be a supportive institutional arrangement that promotes the generation and dissemination of CSA-related information, innovations and technologies. Greater emphasis should also be placed on building the capacity and skills of poor and vulnerable farmers.

A further crucial element is sustainable financial investment at all levels that protects lives, livelihoods and potential development gains from CSA against climate-related and other risks. More broadly, there should be greater coordination and integration of adaptation and mitigation efforts and CSA should be incorporated into broader policy and strategy processes. Most importantly, local institutions should be strengthened to improve CSA policy coherence and effective implementation at sub-national levels.[26]

The final priority for policymakers is strengthening scientific research, technical training and technology dissemination. A strong scientific research programme is crucial in identifying the best CSA options available that are aligned with societal and cultural values and norms. Equally, a well-targeted technical training and

dissemination programme for locally-tested technologies will have a significant effect on the willingness of smallholder farmers to adopt new CSA practices. This highlights the need for a better understanding of local contexts and the seasonal decision-making processes that underpin smallholder farmers' livelihood and CSA choices.

CONCLUSION

By fostering the sustainable management of natural resources, enhancing ecosystem services and building climate resilience, CSA offers unique opportunities to tackle adaptation, mitigation and food security objectives. Sub-Saharan African countries will benefit from CSA practices and technologies given the pivotal role of agriculture in reducing hunger, poverty and food insecurity in the region. However, the successful adoption and scaling up of CSA practices requires a good understanding of the political, socio-economic and agro-ecological contexts of proposed CSA-intervention areas. It also demands a functional, enabling environment (built through a multi-stakeholder process) that addresses systematic impediments and facilitates the successful adoption of CSA practices. In particular, considerable work needs to be undertaken to improve policy coherence and effectiveness across sectors and at all levels. Strengthening local institutions and mainstreaming CSA into national policies and programmes can be an important step forward for fostering coherence between existing climate and agricultural policies in the region.

Sub-Saharan African countries will benefit from CSA practices and technologies given the pivotal role of agriculture in reducing hunger, poverty and food insecurity in the region

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