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CLIMATE-SMART AGRICULTURE (CSA) THROUGH EXTENSION AND ADVISORY SERVICES THAT DELIVERS FOR PEOPLE, CLIMATE AND NATURE IN AFRICA: POLICY AND INSTITUTIONAL REFORMS

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EXECUTIVE SUMMARY

Target Audience

- Farmers, policymakers, government ministries, departments and agencies, private sector, academia, donors, civil society organizations (CSOs), non-governmental organizations (NGOs).

Objectives: This policy brief informs decisions and actions to:

- 1) Strengthen the capacity of AEAS networks and public and private institutions to scale up and out technologies, innovations, and management practices (TIMPs), effectively disseminate and deliver climate-smart agriculture (CSA).
- 2) Develop and implement legal frameworks to regulate production, use, and sustainable management of natural resources.
- 3) Increase private and public investment to accelerate the adoption of the CSA products and services.
- 4) Establish reference infrastructures and facilities for promotion, scaling up and out, market-oriented production, dissemination, and marketing of CSA products and services.

BACKGROUND AND CONTEXT

Climate change is having a devastating impact on Africa, with extreme weather events costing the continent an estimated **\$50 billion** annually by 2050. However, climate-smart agriculture (CSA) offers low-cost, eco-friendly, and integrated solutions to transform and reorient African agriculture production systems in the face of climate change. The CSA action will help to i) boost agricultural production and productivity, ii) increase farmers' incomes, iii) promote sustainable development, and iv) adapt to build resilience to climate change at all levels (regional, national, and farm

levels). The CSA is a win-win solution that can help address the challenges of climate change while improving food security and livelihoods in Africa.

This policy brief provides four specific recommendations and strategic action areas for institutional and policy reforms that are required to translate the information and knowledge into relevant combinations of climate-smart agriculture (CSA) options for agricultural education and advisory services (AEAS) pathways in Africa.

POLICY OPTIONS AND RECOMMENDATIONS

The first recommendation is to build and strengthen the capacities of the AEAS networks, as well as public and private institutions, to scale up the CSA technologies, innovations, and management practices (TIMPs). AEAS networks shall effectively tailor context-specific CSA messaging and actions for last-mile delivery.

The second recommendation emphasizes developing and implementing laws that enable the regulation of food production, use, and sustainable management of natural resources. The inclusive legal frameworks will foster collaborations and support last-mile equitable access to the CSA intellectual property and benefit sharing amongst the agrotechnology promoters and stakeholders in Africa.

The third recommendation is to increase private and public investment in AEAS networks to improve access funding and capacity building as well as accelerate the adoption of CSA products and services. Integrating CSA options in adaptation plans and nationally determined contributions (NDCs) to ensure monitoring of progress.

The fourth recommendation is to establish reference infrastructure and facilities and develop, popularize, and roll out tailored curricula, training, monitoring, evaluation, and learning programs and protocols in public and private agricultural training institutions across Africa. The training will stimulate market-oriented production, dissemination, and marketing of new CSA products and services and train the next generation of CSA professionals along the nodes of the agricultural value chains.



The actions will also strengthen the capacity of AEAS networks in providing linkages between administrative tiers and policy spheres for promotion, scaling up, and effective delivery of the CSA to the last mile in Africa.



1. INTRODUCTION

In Africa, over 85% of the population (about 1.4 billion) fully depend on rain-fed, subsistence agriculture for livelihood, making farming systems vulnerable to climate change. The traditional agri-food system is off-track, yet the climate is changing rapidly, making food insecurity, poverty, and climate change the leading development challenges for Africa. By 2020, over 35% of the African population (1.3 billion people) faced hunger, and 282 million were undernourished [1].

Climate change hits Africa hard, and extreme weather could cost the continent US\$50 billion annually by 2050 [2]. In the past 50 years, droughts have claimed the lives of more than half a million people and led to economic losses of over US\$70 billion on the African continent. Over this period, 1,000 flood episodes were reported, involving more than 20,000 deaths in Africa [3].

On the one hand, the African continent faces increasing air temperatures, changing rainfall patterns, intensifying dry spells and water scarcity, and growing pests and disease outbreaks, compromising food productivity and increasing food insecurity and poverty. Conversely, traditional agriculture systems struggle with mounting pressures to alter farming systems to sustain food production and mitigate

greenhouse gases (GHGs).

Recent studies on climate projections suggest that air temperature will increase by 2–3°C (in 2050) and 2–5°C (in 2100). Therefore, climate change is a main threat, as Africa is one of the most vulnerable continents to the effects of climate change (Figure 1). Yet, agricultural emissions increased by 14% (from 2000 levels), while projections indicate that they increase to 58% by 2050 without the climate actions [4]. By 2023, the water stress will likely affect 250 million people across Africa and displace about 700 million. Nearly 120 million Africans are also expected to be exposed to the risk of sea level rise [3]. By 2050, Africa will struggle to feed over 2 billion people whilst coping with the increasing climate change vagaries, poverty, and energy insecurity [5].



Figure 1: Photos showing the vulnerability of dry land, wetland, and watershed ecosystems to climate change

Africa's vulnerability to climate change is driven by (i) weak adaptive capacity of poor communities, (ii) high dependence on fragile ecosystems for livelihoods, and

(iii) underdeveloped, rain-fed agriculture production systems. Therefore, climate change risks to agricultural production, food/nutrition security, water resources, and ecosystem services will most likely severely affect Africa's most vulnerable livelihoods and sustainable development prospects [6]. Consequently, managing the climate risk requires integrating mitigation and adaptation strategies in managing fragile ecosystem goods and services.

Accordingly, the term 'climate-smart agriculture (CSA)' is coined to describe new technologies, innovations, and

management practices (TIMPs) and policies that could be deployed to mitigate and build resilience to climate change while ensuring sustainable food production and supply systems [7]. Thus, the CSA presents at least 60 TIMPs for policymakers to sustainably boost crop productivity and increase income and food security while mitigating and building resilience to climate change [7]. Despite a wealth of TIMPs alternatives, CSA in Africa has yet to be adopted to a scale where smallholder farmers get lucrative benefits [9].



2. CONTEXT AND SITUATION ANALYSIS

The farmers in Africa, who are facing climatic and non-climatic stress, have limited capacity to access and adopt TIMPs because of the deficiency of natural resources, information, infrastructure, and finance. While AEAS networks have improved incomes, food, and nutritional security through the dissemination of technologies [10], the AEAS is yet to be at the forefront of promoting CSA in Africa. The lack of adequate capacities for the AEAS networks to promote the CSA is identified as a weakness of the AEAS systems, which impedes the up-scaling of CSA options. The lack of progress in CSA is evident in data showing increasing levels of GHG emissions and climate effects from agriculture (Figure 2).



Figure 2: Photos showing the vulnerability of the dry and wetland ecosystems to climate change

Another factor limiting the uptake of the CSA in Africa is the lack of understanding and uptake by farmers. For instance, in East and Southern Africa, a few CSA interventions have focused on increasing productivity at 82%, with 18% on climate change adaptation and 1% on mitigation [8]. Additional evidence in

Kenya suggests that scaling out the CSA adoption rate is limited to 45% among smallholder farmers [11].

The African countries are party to international treaties, United Nations (UN) conventions, and frameworks for sustainable development and climate change, including Sustainable

Development Goals (SDG), Kyoto Protocol for the United Nations Framework for Climate Change (UNFCCC), and Paris Climate Accord [12].

Other related indicators of limited uptake of the CSA focus on institutions and high-level policy statements to guide adoptions. Nationally Determined Contributions (NDCs) that the African countries have pledged under UNFCCC to contribute to the Paris Agreement [13] are a case in point. While there is also modest progress in how many NDCs refer to the CSA-related adaptation and mitigation options, they account for less than 20% of the NDCs for agriculture [13].

Besides, there are institutional and policy bottlenecks in the wider enabling environment that limit the AEAS networks from playing a significant role in promoting CSA [14]. Recent studies on transforming food systems suggest policies and institutional reforms coupled with the integration of technical information and experiential knowledge could help overcome these barriers [15]. As such, the AEAS networks provide platforms to address institutional bottlenecks and policy matters, but their capacities need to be enhanced to play these roles. This policy brief offers recommendations both in policy and institutional reforms to translate the AEAS information and knowledge into relevant CSA options.



3. CLIMATE-SMART AGRICULTURE (CSA): TECHNOLOGY, INNOVATIONS, AND MANAGEMENT PRACTICES (TIMPS)

There are over 60 TIMPs to be fronted by the AEAS networks as entry points for CSA in Africa (Figure 1). Some of the examples of the TIMPs are switching to improved (thus, early-maturing, high-yielding, drought-resilient crop varieties and the elite breeds for livestock), agroforestry, organic agriculture actions, integrated pest management (IPM), soil-water conservation, pre-and post-harvest handling, food processing, value addition, and agribusiness actions [16]. Other CSA options are (i) investment in resilient infrastructures/ facilities for water management, such as water-saving irrigation systems and flood protection, (ii) use of bio-inputs (e.g., compost and green manure, (iii) minimum/zero tillage, (iv) live fencing of farms and crop-livestock integration systems (Figure 3).

reduction in agricultural GHG emissions and/ or carbon sequestration). Positive values represent an increase in GHG emissions.

The second cluster of the CSA options concentrates on mitigating GHG from the agri-food systems. The key element is enhancing the capacity of the soil ecosystem as a sink to sequester more carbon through conservation tillage, use of on-farm irrigation, green manure, live fencing, crop rotation, mixed cropping, soil nutrient cycling, and agroforestry [17]. Among the CSA options, agroforestry presents the greatest potential for offsetting GHG fluxes. An effective combination of CSA options enhances the capacity of soils to sequester carbon, boost soil and water quality, and improve productivity (Figure 4).

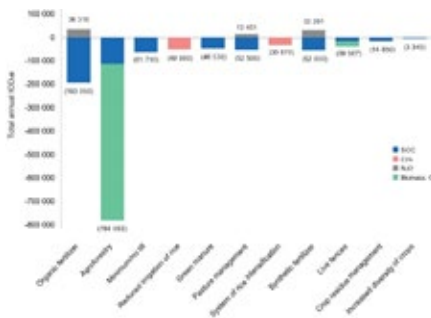


Figure 3: Total effect on greenhouse gas (GHG) fluxes from the CSA options (2011-2014).



Figure 4: Profile of the major CSA options fronted

Image adapted from Richard et al. (2019), where the Negative values represent the

4. METHODOLOGY

This policy brief highlights the key recommendations for strengthening the agricultural extension advisory services (AEAS) in Africa. The brief significantly draws inspiration from insights collected during the Policy Dialogue, jointly organized by the Africa Agricultural Advisory Services (AFAAS) and the Nigerian Forum for Agricultural Advisory Services (NIFAAS) from November 28 to December 5, 2022.

This policy dialogue, organized under a multi-stakeholder platform (MSP) format, brought together over 1500 stakeholders: policymakers, donors, regional economic communities (RECS), national agricultural research for development organizations, and key agricultural extension advisory services professionals. The policy dialogue on climate-smart agriculture (CSA) in Africa was organized to discuss how the agricultural extension and advisory services support the scaling up of CSA in Africa, the challenges faced in promoting CSA, and how the role of AEAS networks in scaling up CSA interventions could be enhanced [18].

Primary data was collected from the dialogue using set questionnaires and holding key informant interviews (KIIs) by CSA themes and by the stakeholder clusters. Secondary data was collected using the desk review of peer-reviewed literature, including related CSA project reports, publications, manuscripts, and databases. The CSA data on the social and economic status of the farmers and key actors at all nodes of the agri-food system value chain, as well as the performance of farmer institutions and farming systems, were collected and analyzed using the GenStat tool.

In addition, crop-livestock production statistics and the agroecology data from the climate information systems, AEAS platforms, and databases were obtained from the local climate change mitigation and adaptation actions (thus, projects and programs) for the farmer institutions. The field observations, pilot surveys, and case study reports were deployed to collect data on data collection and review of existing literature [19-20].

5. POLICY RECOMMENDATIONS

Promoting CSA involves several shifts for agricultural extension and advisory services. Compared to its traditional role of promoting the dissemination of new agricultural information and knowledge, AEAS needs to aid in the framework to provide long-term tailored support to farmers to adopt CSA practices. Without a robust enabling framework that promotes cooperation among different stakeholders in the public, private, and civil society sectors, AEAS will not be able to optimize its potential contributions to CSA.

This policy brief presents the following measures as policy options and related institutional reforms that are needed to enhance the adoption of CSA in Africa.

Action area 1: Capacity building of the AEAS networks, public and private institutions to scale up and out the TIMPs, and effectively disseminate and deliver the CSA information, products, and services

The AEAS networks and physical and virtual multi-stakeholder platforms (MSPs) at regional, country, and field school levels should engage and strengthen the capacity of state and non-state actors and institutions to offer CSA products and services. Train and re-tool AEAS personnel on strategic collaboration frameworks and inter-agency coordination, climate financing, and policy advocacy. Strengthen knowledge through open-source databases, experience-sharing events, and learning platforms on climate-smart AEAS technologies, innovations, and management practices (TIMPs).

Action area 2: Develop and implement inclusive legal frameworks to regulate the production, use, and sustainable management of natural resources.

African governments, state and non-state institutions, and actors ought to profile natural resources and fragile ecosystems and develop up-to-date inventories. This will inform decisions on the protected areas gazette, sustainable management of fragile ecosystems, and the development of CSA products and services.

African governments, state and non-state institutional actors, and regional bodies ought to review and harmonize related legal frameworks to support CSA interventions. The CSA frameworks should promote equitable access to and sharing of benefits from CSA products and services amongst farmers, technology developers, intellectual property rights holders, promoters, and state and non-state stakeholders.

African government should develop a knowledge-based Research and Development Act to advance the science, technology, and innovations (STI) for CSA as a vehicle for in-country and in-region development of agriculture for sustainable agro-industrialization, green growth, and import substitution in agriculture. Incorporating the STI into strategic CSA interventions will further inform and guide investment decisions and strengthen regulatory mechanisms to scale out commercial food production and marketing of the AEAS products and services.

Action area 3: Increase private and public investment to accelerate adoption of the CSA products and services

African governments ought to invest in AEAS services to promote CSA products and services. This can be operationalized through public climate actions and enabling policies. Identified high-level CSA options ought to be integrated with the national adaptation plans and NDCs. African governments aim to establish dedicated CSA development funds, provide favorable taxation leverages to stimulate private sector investment in CSA products and services, and enable AEAS networks at continental, regional, and country levels to thrive.

Action area 4: Establish reference infrastructure and facilities for promotion, scaling up market-oriented production, dissemination, and marketing of the CSA

Both public and private sector actors and institutions ought to establish infrastructure and facilities (such as field schools, model technology farm sites, and interactive physical and virtual MSIPs) for reference, support, and uptake of climate-smart agriculture (CSA) pathways at sub-national, national, region and Africa continent levels. They should review, update, and promote successful case studies, products, and services as well as roll out CSA curriculum, training programs, and MEL protocols in schools, agricultural training institutions, universities, and research institutes to train the next generation of professionals along all the nodes of the agri-food system value chain.

6. CONCLUSION

This policy brief recognizes that the effects of climate change negatively affect agricultural productivity. It calls for sustainable management of fragile natural resources and greening industrialization investments.

Climate change and resultant adverse weather episodes, mainly more flooding, erratic rainfalls, and dry spells, threaten agriculture by compromising the productivity of farmlands, soil, fisheries, livestock, crops, and forestry ecosystems. Strengthened AEAS networks at the country, regional,

and African continent levels can help redress the situation through innovative knowledge and skills transfer.

Traditional agriculture misuses resources, emits GHGs, and amplifies climate change. Implementing the CSA practices presents the unique, innovative, underutilized potential for mitigation and adaptation. Policymakers need to engage both the state and non-state actors and institution stakeholders at regional, national, and sub-national levels) across Africa to align policies with CSA tenets.



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