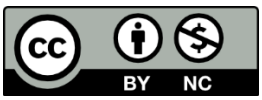
THE AFRICAN CAPACITY BUILDING FOUNDATION | FONDATION POUR LE RENFORCEMENT DES CAPACITES EN AFRIQUE

POLICY BRIEF

Coordination Challenges and Opportunities for Climate Adaptation in African Agriculture



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ISBN: 978-1-77933-273-8

EAN: 9781779332738

Abstract

Climate change poses a major global threat, particularly for agriculture, and this knowledge product delves into the context of climate adaptation in African agriculture. It emphasizes the critical role of climate adaptation in safeguarding the sustainability of food systems and rural communities. African agriculture, predominantly comprised of smallholder farmers, bears the brunt of climate change's adverse impacts, including erratic rainfall, droughts, and heatwaves, which disrupt crop yields and food availability. Climate adaptation is indispensable to ensure food security and resilient livelihoods. Substantial investments are now being directed towards enhancing climate adaptation capacities across the continent. Collaborative efforts involving governments, NGOs, donors, and local communities aim to promote climate-smart agriculture, improve water management, and enhance access to climate information services. Nevertheless, coordination challenges persist, impeding the effectiveness of adaptation endeavors. Africa's diverse geography, climates, and socioeconomic conditions make coordination of climate interventions and policy at the international, regional, national, and local levels a complex task. In the Sahel, climate adaptation coordination encounters challenges due to varying priorities and capacities among nations. Aligning international climate policies with regional and national strategies remains a daunting task. Conversely, the Southern African region grapples with the impacts of extreme weather events on agriculture, such as floods and cyclones, necessitating coordinated disaster preparedness, response, and recovery efforts. Ethiopia's National Adaptation Plan (NAP) is a model of effective multi-stakeholder collaboration. Government agencies, civil society, research institutions, and local communities collaborate to increase adaptive capacity, focusing on locally tailored solutions derived from farmers' specific needs and indigenous knowledge. Finally, this policy brief illuminates climate adaptation in African agriculture, recognizing the continent's vulnerability and the need for coordinated action. It shares valuable insights from diverse regions and initiatives, providing insights into the challenges and opportunities of coordinating climate adaptation. Collaboration, knowledge sharing, and coordinated efforts hold the key to ensuring a resilient and sustainable future for African agriculture in a changing climate.

Contents

1. Introduction

Climate change poses a significant threat to global agricultural systems, necessitating the immediate implementation of effective adaptation measures [1] . In adapting to climate change, the agricultural sector, which is both a contributor and a victim, faces various coordination challenges and opportunities. Coordination of adaptation efforts among diverse stakeholders is critical for building resilience of small holders farmers in Africa, the majority of whom are women and have low adaptive capacity, and ensuring agricultural practices' long-term sustainability[2].

Climate change adaptation in Africa entails a variety of strategies and actions aimed at reducing communities', ecosystems', and economies' vulnerability to the effects of climate change[3]. Given the continent's reliance on climate-sensitive sectors such as agriculture, water resources, and natural ecosystems, effective adaptation is critical for ensuring long-term development and resilience in the face of climate change [4]. Successful implementation of climate-smart agricultural practices such as **improved irrigation techniques, agroforestry, crop diversification, and the use of drought-resistant and heat-tolerant crop varieties** are among the key challenges that must be addressed in the sector [5]. Overcoming this challenge is crucial to ensuring the sector's resilience and sustainability in the face of climate. Soil conservation, water management approaches, and sustainable land management practices, actions are also pivotal for enhancing agricultural resilience. Indigenous knowledge can offer insights into climate adaptation strategies that are contextually appropriate and

environmentally sustainable. This can include knowledge about crop varieties that are more resilient to changing weather patterns, water management techniques during periods of drought, and effective methods for natural resource conservation[6], [7].

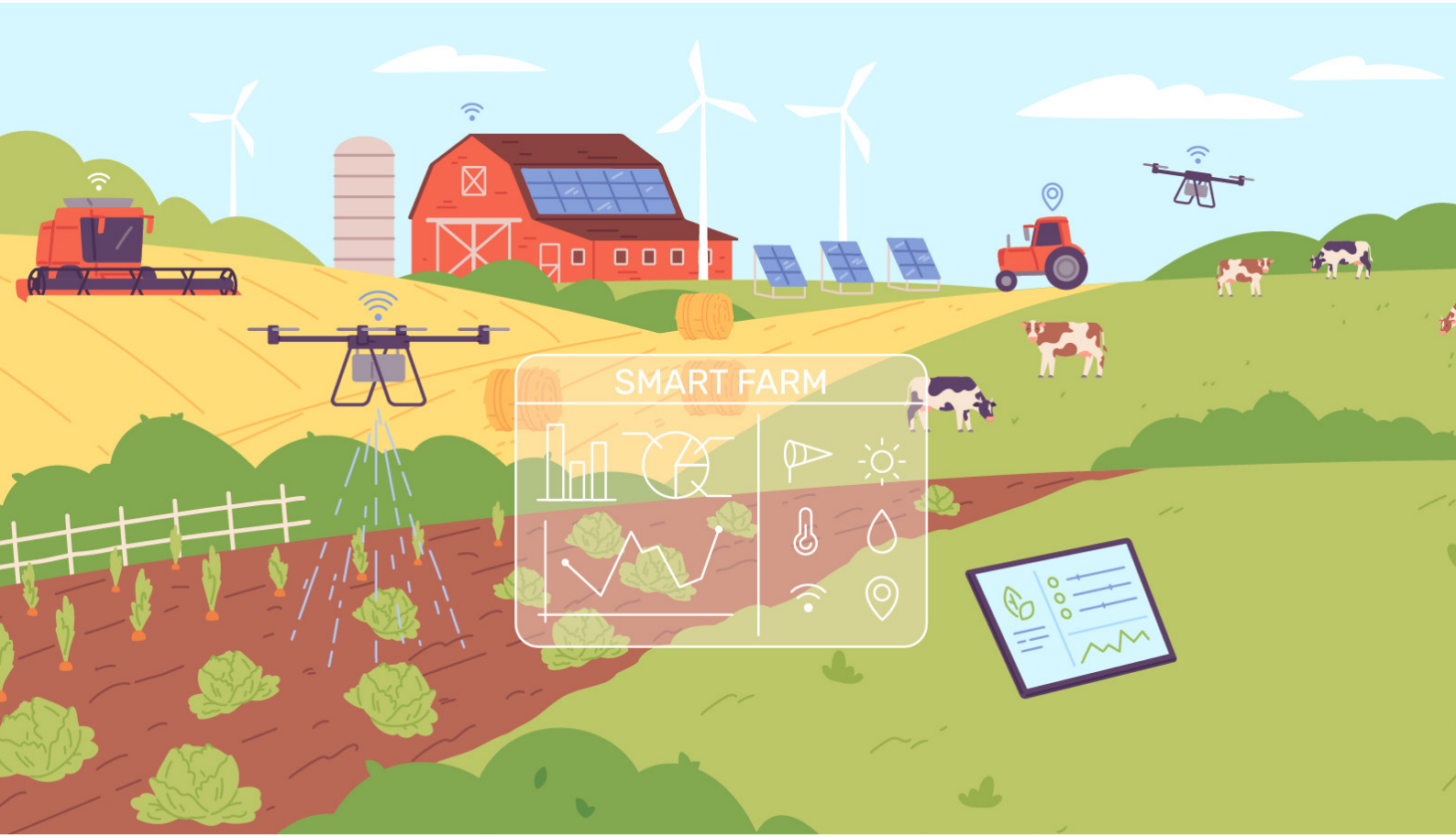
Given the increasing scarcity of water, efficient water management and irrigation practices are another critical area[8]. Countries may be required to build small-scale irrigation infrastructure, promote water-saving techniques like drip irrigation and soil moisture sensors, and implement water harvesting and conservation measures. Furthermore, effective strategies that promote soil conservation and management practices are critical for adapting to the effects of climate change. These are critical for mitigating the effects of erosion, nutrient depletion, and decreased soil fertility[9]. **Contour plowing, terracing, agroforestry, and conservation agriculture can all help to reduce soil erosion, increase water retention, and improve soil health, all of which contribute to increased productivity and resilience** [10]. Climate information services, such as weather forecasts, seasonal outlooks, and climate risk assessments, can help farmers plan their activities and allocate resources more efficiently [11].

Insurance schemes can compensate farmers for crop losses, livestock mortality, and other climate-related damages, reducing farmers' economic vulnerability and increasing their adaptive capacity[12]. Extension workers play a vital role in delivering essential services to farmers, and it is crucial to enhance the capacity of farmers, extension workers, and other stakeholders to facilitate effective climate change adaptation[5], [13]. Capacity-building initiatives, such as training programs are instrumental in this regard. These programs focus on equipping individuals with knowledge and skills related to climate-smart agricultural practices, sustainable land management, and the adoption of innovative technologies. Platforms for knowledge transfer facilitate the sharing of best practices and lessons learned among various actors, fostering collective learning and collaboration. Overall, putting all these adaptation mechanisms in place necessitates supportive policies and institutional and regulatory frameworks.

This policy brief examines the key challenges and opportunities in coordinating climate adaptation in agriculture, emphasizing the importance of collaborative approaches and innovative solutions. It investigates how coordinating climate adaptation in agriculture involves addressing various challenges such as stakeholder fragmentation, knowledge gaps, and limited financial resources. However, there are opportunities for collaborative governance, technological innovations, and knowledge exchange that can improve coordination efforts. By overcoming these challenges and seizing opportunities, the agricultural sector can strengthen its resilience and ensure sustainable food production in the face of climate change.

The rest of the paper is organized as follows: We begin by exploring strategies for effective coordination in climate adaptation efforts within the agricultural sector. These strategies delve into multi-level coordination, sectoral integration, stakeholder engagement, enhancing information sharing and knowledge management, empowering local communities, and farmers, mobilizing financial resources, and building capacity in climate adaptation. Each strategy is explored further to reveal its challenges and potential solutions. Subsequently, we present a set of policy recommendations designed to facilitate effective coordination in agricultural climate adaptation. These recommendations encompass policy coherence, the establishment of multi-stakeholder platforms, investment in research and data, fostering partnerships and networks, mainstreaming climate adaptation in development agendas and international cooperation frameworks, monitoring, evaluation, and learning, and the integration of indigenous knowledge systems. Lastly, we conclude by reiterating the significance of coordinated efforts in the agricultural sector to bolster resilience and ensure sustainable agrifood systems amidst the challenges posed by climate change. We underscore the crucial role of these coordinated endeavors in safeguarding food security on the African continent, as well as the pressing need for their implementation in the face of climate uncertainty.

2. Understanding climate adaptation in Africa



The process of adjusting and preparing systems, practices, and policies to cope with and respond to and minimize the effects of climate change is referred to as climate adaptation. In the context of agriculture, climate adaptation entails putting in place measures that allow smallholder farmers and agricultural systems to withstand climate-related challenges and uncertainties while maintaining productivity, sustainability, and livelihoods. Climate adaptation includes a wide range of strategies, such as crop and livestock management changes, water use, land practices, new seed varieties and the adoption of climate-resilient technologies[14]. Climate adaptation is important in agriculture because it increases the sector's resilience and capacity to withstand climate shocks such as droughts, floods, heatwaves, and changing precipitation patterns. Agri-food systems (i.e., the entire value chain including production, processing, distribution, and consumption of food) can mitigate risks, ensure food security, protect livelihoods, and contribute to sustainable development by adapting to climate change [15].

There are several investments in Africa seeking to improve the agricultural sector's adaptive capacities. Table 1 highlights some key initiatives aimed at supporting climate adaptation in African agriculture:

- Increased investment in irrigation, supported by the African Development Bank (AfDB) committing $1 billion, can help farmers maintain yields despite unfavorable weather conditions, particularly in drought-prone areas[16].
- The development of improved seed varieties, with a focus on drought-tolerance and pest resistance, is being funded by the Bill & Melinda Gates Foundation with an investment of $100 million [17].

These are just a few examples of specific investments that have been made to help the agriculture sector adapt to climate change in Africa. Several other organizations and governments are also investing in this area through working with farmers to help them understand and adopt new practices and developing the policies and infrastructure needed to support climate-smart agriculture.

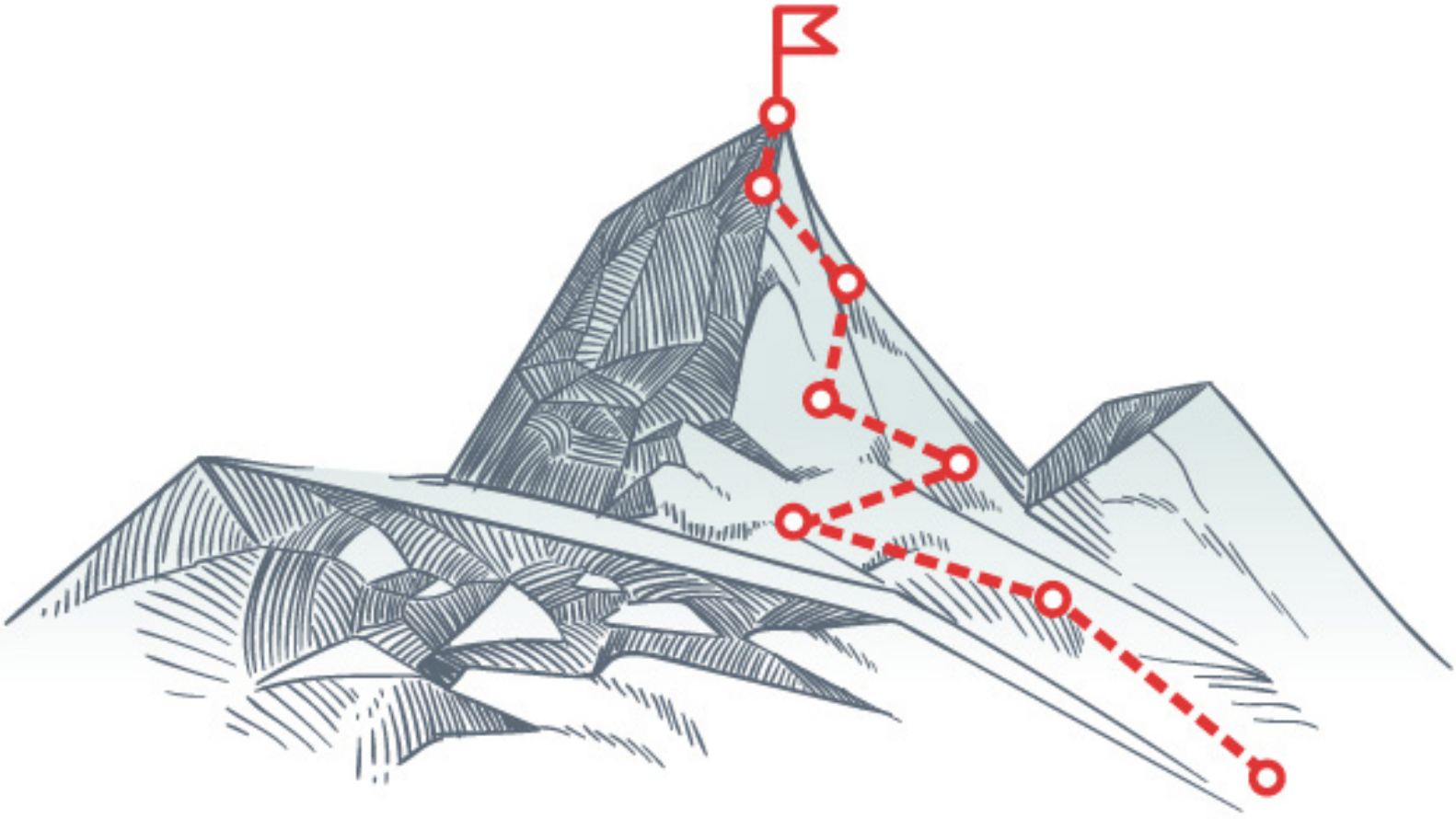
Table 1: Key investments in agriculture sector to enhance adaptation.

Investment	Description	Done by
Irrigation	Increased investment in irrigation can help farmers maintain yields even when the weather is unfavorable. This is particularly important in areas that are prone to drought.	The African Development Bank (AfDB) has committed to investing $1 billion in irrigation in Africa by 2025 [16].
Improved seed varieties	New varieties of seed that are suited to new conditions can help farmers adapt to climate change. These seeds should be drought-tolerant, pest-resistant, and high-yielding.	The Bill & Melinda Gates Foundation has invested $100 million in the development of drought-tolerant maize varieties in Africa [17].
Improved soil management	Sustainable soil management practices can help to improve soil fertility and water retention. This can help farmers to cope with more variable rainfall patterns.	The United Nations Environment Programme (UNEP) has launched a program to help African countries improve soil management.
Climate-smart agricultural practices	These practices can help farmers to reduce their vulnerability to climate change. They include things like crop diversification, agroforestry, and rainwater harvesting.	The World Bank has invested in climate-smart agriculture in Africa to increase productivity, resilience and reduced emissions [18].
Extension services	Extension services can help farmers to learn about and adopt new climate-smart agricultural practices. This is important for ensuring that the benefits of these investments reach farmers.	The International Fund for Agricultural Development (IFAD) has invested $100 million in extension services in Africa[19].
Research and development	Investment in research and development is essential for developing new climate-smart agricultural technologies. This includes technologies for breeding new varieties of seed, developing drought-resistant crops, and finding ways to improve soil management.	The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) has received $200 million from the Global Environment Facility (GEF) to support research on climate-smart agriculture in Africa.[20]

NB: This list is not exhaustive as other donors (public and private sector) are also investing in different types of climate adaptation and innovation.

Given these multiple interventions in the climate adaption sector, coordination is important at all levels [21]. Coordinating adaptation measures works at multiple scales starting at the international level, coordination can help to ensure that countries are working together to address the common challenges.

3. Coordination challenges in climate adaptation



In this section, we focus on the coordination mechanisms for climate change adaptation at various levels, from international to local. International coordination involves collaborating with global organizations like the United Nations Framework Convention on Climate Change (UNFCCC) to shape and implement overarching climate adaptation policies and programs. Moving to regional coordination, we explore the role of organizations like the African Union (AU) in advocating for collective interests and facilitating knowledge exchange among farmers across broader geographical scales. At the regional level, coordination can help to ensure that countries are sharing information and resources. At the national level, coordination can help to ensure that different government agencies are working together effectively. And at the local level, coordination can help to ensure that different communities are working together to address the challenges they face. Each of the coordination mechanisms is discussed briefly below.

Each of the coordination mechanisms is discussed briefly below:

International coordination

This involves working with international organizations, such as the United Nations Framework Convention on Climate Change (UNFCCC), to develop and implement global climate adaptation policies and programs.

Regional coordination

This involves working with regional organizations, such as the African Union (AU), to develop and implement regional climate adaptation policies and programs. These organizations serve as powerful advocacy platforms, representing the collective interests and needs of farmers across larger geographical scales. They can also enable information-sharing and knowledge exchange among farmers from different countries, allowing them to learn from each other's experiences and best practices in climate adaptation.

National coordination

This involves working with national governments to develop and implement national climate adaptation policies and programs. National farmer associations and organizations can act as vital conduits for knowledge sharing, capacity-building, and collective action among farmers. By bringing together local farmers, they facilitate the exchange of traditional and experiential knowledge on climate-related challenges and adaptive practices.

Local coordination

This involves working with local and decentralized governments, communities, and other stakeholders to develop and implement local climate adaptation interventions. In most of rural Africa, extension workers and traditional leaders play a pivotal role in disseminating climate-smart agricultural practices, sustainable land management techniques, and innovative technologies that enhance resilience to climate change.

However, given these multiple interventions and levels of coordination, there are several challenges such as lack of policy coherence, weak institutional frameworks, and limited information sharing, sharing, knowledge and gaps in technical areas. For example, in countries with weak governance and limited institutional capacity, it can be particularly difficult to coordinate climate adaptation efforts at multiple levels [22]. The next section discusses some of the missed opportunities on the African continent to effectively coordinate climate change adaptation interventions due to several reasons.

Some of the challenges in **coordinating climate change interventions include fragmentation and lack of coherence, limited information sharing, knowledge, and capacity gaps.** For example, one of the key challenges includes multiple forms of technical support provided to government by different agencies with no clear frameworks for coordinating investment in the climate change adaptation sector. For example, one government department might receive support for building climate-resilient infrastructure from an international organization, while another department is working with a different NGO on a similar project. This lack of coordination can result in overlapping efforts and inefficient resource allocation. While climate change interventions are expected to work at a larger scale, the countries in Africa have different levels of development, resources, and priorities [23]. Hence it is difficult to develop and implement a single, coherent climate change mitigation strategy that will work for everyone for example, such areas as clean energy transition for the agricultural sector.

At the national level, coordination gaps exist between various tiers of government and across diverse sectors and stakeholders, such as Civil Society Organizations (CSOs), resulting in **redundant efforts, incomplete coverage, and a general lack of efficiency.** There tends to be weak collaboration between the government and the private sector in promoting innovation in the climate change sector [24]. In addition, the weak governance structures, limited institutional capacity, and fragmented policymaking processes can make it difficult to implement coherent and coordinated adaptation interventions in some countries[25]–[27].

Low income countries such as Uganda, Tanzania and Zimbabwe for example face various knowledge and capacity gaps when it comes to climate change mitigation[27]. These include **lack of emission inventories, technical skills in renewable energy, climate modeling and forecasting, limited access to climate finance.** These gaps can hinder effective policymaking, planning, and implementation of mitigation strategies. Lack of data and information on climate change impacts and vulnerabilities in Africa [28] is also major challenge faced by most low income African countries who have to rely on international cooperation and partnerships to build the knowledge and capacity for climate change mitigation.

3.1 CASE STUDIES AND EXAMPLES

Climate change poses serious challenges to various African regions, affecting agriculture, livelihoods, and overall resilience. This section will look at specific examples of vulnerable African regions, such as the Sahel, Kenya, Malawi, the Lake Chad Basin, the Horn of Africa, and Southern Africa. These examples were chosen to highlight the challenges that African governments face in coordinating climate change adaptation efforts and to address knowledge and capacity gaps that impede effective adaptation strategies.

The Sahel region of Africa is a semi-arid geographic zone located in North-Central Africa between the Sahara Desert and the savanna lands that covers 10 countries (Burkina Faso, Chad, Eritea, Gambia, Mali, Mauritania, Niger, Nigeria, Senegal, and Sudan. The region is especially vulnerable to climate change due to its high dependence on rain-fed agriculture and livestock [29] and is expected to experience 3-4 °C increase[30] . Droughts have become more frequent and severe in the region in recent years, wreaking havoc on agriculture[31], [32]. The World Bank 2022 report estimates that up to 13.5 million people could fall into poverty due to climate change induced shocks unless climate adaptation measures are put in place [33]. Given these challenges, countries in the region have implemented the following climate adaptation strategies: diversification of livelihoods to improve community incomes beyond agriculture, improved water storage and management, as well as establishing early warning systems [34]. Climate adaptation efforts in the Sahel involve multiple stakeholders (Sahel Climate Change Adaptation Framework (SCCAF)[35], including governments, international organizations, non-governmental organizations (NGOs), and regional bodies (Africa Union Development Agency (AUDA-NEPAD, Economic Community of West African States (ECOWAS) and the Community of Sahel-Saharan States (CEN-SAD). The involvement of multiple actors, each with its own priorities and approaches, can lead to fragmentation and lack of synergy in adaptation efforts. Limited Capacity: Many Sahel countries face capacity constraints in terms of technical expertise and institutional capacity to implement effective adaptation strategies. A lack of trust between the various countries in the region as well as political instability can disrupt long term plan as well as the scarcity of financial resources to support these efforts [31], [36], [37].

Kenya is yet another country affected by climate change. According to the IPCC, Kenya's average temperature has increased by about 1.5o c since the pre-industrial era and by another 2-3 o c by the end of century. Kenya has experienced more erratic rainfall patterns in recent years, making crop planning difficult for farmers [1]. Climate change is leading to an increase in heat stress-related illnesses, such as malaria[38] and dengue fever as well as socio-economic losses estimated at 2-4% of the Gross Domestic Product annually (2020) [39]. Since 2016, Kenya was one of the countries to enact the Climate Change Act (2016) and the National Climate Change Action Plan (NCCAP) 2018–2022 whose focus is on low carbon and climate resilient pathways To adapt to these challenges, the Government has supported communities to participate in sustainable land management, implementing rain water harvesting, and promoting climate smart agriculture through crop diversification, conservation agriculture and agroforestry [40]. Attempts in Kenya to coordinate climate change adaptation face challenges of effective coordination because of the various government agencies involved in climate change adaptation. At local level, some of the challenges arise because the farmers are unaware of climate change phenomenon and its eminent impacts.

Malawi is an especially vulnerable country to the effects of climate change. The average temperatures are projected to increase by 1.4-3.0°C by the 2060s, and by 1.5-5.0°C by the 2090s. Malawi has experienced more frequent and severe floods in recent years, destroying crops and displacing people . With regards to climate adaptation, the country is guided by its National Adaptation Programmes of Action (NAPA) which focuses on enhancing agricultural productivity, protecting the environment, and ensuring sustainable development [41]. There various government and non-governmental agencies involved in climate change adaptation are largely uncoordinated and do not have adequate resources to support these efforts. In addition, Malawi's focus is on food and water security. Interventions in other areas are hampered by lack of funding and lack of climate change data [42].

The Lake Chad Basin is an African region with a population of over 30 million people that covers the regions of Chad, Nigeria, Niger, Cameroon, the Central African Republic, and Libya. For more than two decades, the basin has been suffering from severe drought [43], which has had a devastating impact on agriculture. Lake Chad has shrunk 90% in 60 years, due to climate change, irrigation, the construction of dams, and population increase. The area is managed by the Lake Chad Basin Commission (LCBC) which deals with transboundary issues and climate change impacts on integrated water management [44]. Some of the key successes for the LCBC has been developing the capacity of its members to implement climate change strategies and measures to adapt traditional and modern agricultural practices[44].

Southern Africa is another African region that is vulnerable to climate change whose geographic areas covers Angola, Botswana, the Comoros, the Democratic Republic of the Congo (DRC), Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, the Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe. In recent years, the region has seen more erratic rainfall patterns, making crop planning difficult for farmers[46], [47].. The Southern African Development Community (SADC) members are committed to integrated and sustainable development, and climate change adaptation and mitigation[48]. Issues of environment and climate change are implemented under SADC's Environment and Climate Change Programme, under the Food, Agriculture and Natural Resources Directorate To implement most its work, SADC relies on the resources and support from cooperating partners. While there is focus on these climate related risks, SADC lacks a policy or action plan to address climate-related security risks as well an action plan to coordinate the different sectors [46].

The Great Green Wall Initiative is a large-scale African-led effort to restore degraded land in the Sahel and Sahara Desert regions. It was launched in 2007 by the African Union and has since been endorsed by over 20 countries. The GGWI aims to restore 100 million hectares of degraded land by 2030, and to create 10 million green jobs [49]. Some of the key interventions includes planting trees, restoring grasslands, improving soil fertility to combat desertification and land degradation throughout Africa's Sahel region. Several countries, governments, international organizations, non-governmental organizations (NGOs), local communities, and private sectors collaborated on the initiative. This collaborative approach ensured that resources, expertise, and experiences were pooled, resulting in more effective and comprehensive climate adaptation strategies. [50]. However, given the widespread coverage of the project (about 20 countries), coordination of actions is always not effective and requires significant resources to do so[51].

3.2 CHALLENGES TO EFFECTIVE COORDINATION OF CLIMATE ADAPTAION INTERVENTIONS IN AFRICAN AGRICULTURE

Some of the key factors affecting effective coordination in this sector include:

Lack of trust and coordination between countries and government agencies. Effective coordination requires strong collaboration, information sharing, and mutual trust among stakeholders. Without proper coordination mechanisms, it becomes challenging to implement coherent and integrated adaptation strategies.

The coordination of government agencies and institutions involved in climate change adaptation plays a crucial role in effective implementation. Fragmented efforts and lack of coordination among agencies hinder the development and implementation of comprehensive and integrated adaptation strategies.

Insufficient resources, which pose a significant challenge to climate change adaptation efforts. Limited funding and inadequate allocation of resources hinder the implementation of necessary measures to build resilience and adapt to climate change. Adequate financial support and resource mobilization are crucial for successful coordination initiatives.

The severity and persistence of climate change impacts require long-term planning and sustained efforts. Coordinated adaptation initiatives need to be designed with a long-term perspective, considering the evolving nature of climate change and its impacts on agriculture.

Lack of awareness and knowledge about climate change among farmers and communities is another barrier to effective coordination. Building awareness and providing information about climate change impacts, adaptation strategies, and available support mechanisms are essential for empowering farmers and facilitating their active participation in coordinated efforts.

Building strong regional collaboration among countries facing similar climate change challenges can enhance the effectiveness of adaptation efforts. Sharing experiences, best practices, and lessons learned can facilitate mutual learning and support the development of coordinated approaches that are tailored to regional contexts.

In summary, the main lessons learned highlight the importance of trust, coordination, resource availability, awareness, knowledge dissemination, institutional coordination, long-term planning, and regional collaboration for successful climate change adaptation efforts in Africa.

3.3 LESSONS LEARNED FOR SUCCESSFUL COORDINATION INITIATIVES IN AFRICAN AGRICULTURE

The implementation of effective climate change adaptation measures in Africa has been fraught with difficulties, as evidenced by experiences in the Sahel, Kenya, Malawi, the Lake Chad Basin, the Horn of Africa, Great Wall Initiative, and Southern Africa. These regions have taught us valuable lessons about the factors that contribute to the success or failure of climate change adaptation efforts. The importance of trust and coordination between countries and government agencies, the critical role of adequate resources, the importance of raising awareness and knowledge among farmers and communities, the need for coordinated government institutions, the need for long-term planning, and the benefits of regional collaboration are among the lessons learned. Understanding these lessons allows policymakers and stakeholders to better navigate the complexities of climate change adaptation and increase the effectiveness of coordinated efforts to build resilience and mitigate the effects of climate change in Africa.

Several cases can be cited as successes on the African continent. The following section focuses on **Ethiopia's National Adaptation Plan** to illustrate the importance of multi-stakeholder collaboration in the successful implementation of climate change adaptation initiatives.

Ethiopia's Climate Resilient Green Economy National Adaptation Plan is a 15-year plan addressing climate change impact and resilient development for the country. The goals of the NAP among others are to reduce Ethiopia's vulnerability to climate change by improving the resilience of its agricultural sector, water management system, human health system, forests and biodiversity, and urban areas. Second, it seeks to promote sustainable development and economic growth through the adoption of climate-smart practices. Third, it seeks to ensure that all Ethiopians have access to the resources and services they need to adapt to climate change[52].This ambition action plan is implemented in collaboration with international partners, demonstrates effective coordination and has achieved significant outcomes in building resilience to climate change. The success of the Climate Change Adaptation Program in Ethiopia can be attributed to several key factors:

Strong Government Leadership

The Ethiopian government demonstrated a strong commitment to and leadership in dealing with climate change adaptation. They established dedicated institutions to coordinate and oversee adaptation efforts at the national level, such as the Climate Resilient Green Economy (CRGE) strategy and the Ethiopian Climate Change Directorate [53].

Coordination of Multi-Stakeholder Engagement

The program involved a diverse group of stakeholders, including government agencies, local communities, civil society organizations, and international partners. This collaboration ensures that different points of view were considered, and that local knowledge was incorporated into adaptation planning and implementation[54].

Participatory Approach

The program emphasized community involvement and ownership in adaptation efforts. Because local communities are actively involved in decision-making processes, adaptation interventions are more relevant and effective. This participatory approach instills a sense of ownership in communities and empowers them to implement and sustain adaptation measures.

Integrated and Holistic Approach

The program adopts an integrated approach by addressing multiple sectors affected by climate change. It combines measures such as sustainable land management, afforestation, water resource management, and climate-resilient agriculture. This holistic approach ensures that adaptation efforts are comprehensive and synergistic, maximizing their impact and minimizing trade-offs[55].

Adequate Financial Support

International partners, including multilateral development banks, bilateral donors, and climate finance mechanisms, provided significant financial support to the program. The availability of sufficient resources has allowed for the large-scale implementation of adaptation projects, facilitating the transformation of vulnerable sectors and communities.

Long-Term Vision and Planning

The program's long-term goals are in line with Ethiopia's national development plans. It recognizes that climate change is a long-term challenge that will necessitate ongoing efforts. Long-term planning allows for proactive and iterative adaptation actions to adapt to changing climate dynamics and ensure long-term resilience.[55].

Because of its effective governance, multi-stakeholder engagement, participatory approach, sector integration, financial support, and long-term planning, Ethiopia's Climate Change Adaptation Program stands out as a successful case of coordination. This case demonstrates the significance of comprehensive coordination mechanisms, stakeholder participation, and long-term commitment to achieving climate resilience and mitigating the effects of climate change.

4. Strategies for effective coordination

4.1 STRENGTHENING INSTITUTIONAL FRAMEWORKS AND COORDINATION MECHANISMS

Multi-level Coordination: Coordinating climate adaptation efforts in agriculture requires collaboration and coordination at multiple levels, including national, regional, and local levels. Ensuring effective communication and coordination among different levels of governance, institutions, and stakeholders can be challenging due to differences in priorities, capacities, and decision-making processes.

Sectoral Integration: Agriculture is a multi-sectoral issue that intersects with various sectors such as climate services, water management, land use planning, and rural development. Coordinating climate adaptation efforts across these sectors can be complex, as it requires integrating diverse perspectives, policies, and strategies. Overcoming sectoral silos and fostering cross-sectoral collaboration is crucial for holistic and integrated climate adaptation in agriculture.

Stakeholder Engagement: Engaging a wide range of stakeholders, including farmers, local communities, research institutions, non-governmental organizations, and government agencies, is essential for successful climate adaptation in agriculture. However, coordinating these diverse stakeholders with different interests, knowledge levels, and capacities can be a challenge. Ensuring meaningful participation, effective communication, and inclusive decision-making processes is crucial for building ownership and sustainability.

4.2 ENHANCING INFORMATION SHARING AND KNOWLEDGE MANAGEMENT PLATFORMS

Coordinating knowledge management, sharing best practices, and capacity building initiatives is crucial for enhancing climate resilience in agriculture. Ensuring effective coordination among research institutions, extension services, and training providers can be challenging, particularly in resource-constrained environments. Promoting knowledge exchange platforms, providing training and technical support, and facilitating information dissemination are important to overcome coordination challenges.

Climate adaptation in agriculture relies on **accurate and timely data and information, including climate projections, agro-meteorological data, and knowledge about local farming practices**. However, data availability, quality, and accessibility can vary across regions and institutions. Coordinating data collection, analysis, and sharing mechanisms among different stakeholders can be a challenge, hindering evidence-based decision-making and adaptive planning.

4.3 ENGAGING AND EMPOWERING LOCAL COMMUNITIES AND FARMERS

Local communities and farmers have valuable knowledge about their environment, including weather patterns, soil conditions, and traditional farming practices. This knowledge can contribute to the development of effective climate change adaptation strategies that are specific to the local context. **By engaging and empowering local communities and farmers, their expertise can be harnessed to implement climate-resilient practices.**

Involving local communities and farmers in decision-making processes and adaptation initiatives creates a sense of ownership and increases their commitment to the actions taken. When people feel that their voices are heard and that they have a stake in the outcomes, they are more likely to actively participate in and support climate change adaptation efforts.

4.4 MOBILIZING FINANCIAL RESOURCES FOR COORDINATED CLIMATE ADAPTATION PROGRAMS

Adequate financial resources and investments are essential for implementing climate adaptation measures in agriculture. Coordinating efforts to mobilize funding from diverse sources, including international climate finance mechanisms, national budgets, and private sector investments, can be challenging. Ensuring **effective coordination and alignment of funding strategies, leveraging resources, and promoting innovative financing mechanisms** are key coordination challenges in climate adaptation.

4.5 BUILDING CAPACITY AND PROMOTING TECHNICAL EXPERTISE IN CLIMATE ADAPTATION

Building capacity and promoting technical expertise in climate adaptation are critical for Africa's unique climate challenges. African countries can effectively respond to climate change impacts, protect vulnerable communities, and ensure sustainable development in the face of a changing climate by strengthening knowledge, skills, and institutional capacity.

In Africa, **indigenous knowledge and traditional practices provide valuable insights into climate adaptation strategies** that have been passed down through generations. Sustainable land management, water conservation techniques, and agricultural practices tailored to local conditions are frequently included in these practices. The importance of incorporating and preserving indigenous knowledge alongside modern scientific approaches should not be overlooked when promoting technical expertise in climate adaptation.

5. Policy Recommendations

To achieve effective coordination efforts in climate change adaptation for the agricultural sector, these policy recommendations emphasize the importance of policy coherence, stakeholder engagement, research and data, partnerships, and mainstreaming climate adaptation.

5.1.1 Promoting policy coherence and integration of climate adaptation in agricultural policies

To improve the effectiveness of climate change adaptation in agriculture, policy coherence and the incorporation of climate adaptation considerations into agricultural policies are critical. This can be accomplished by aligning national and regional agricultural strategies with the goals and objectives of climate change adaptation. Climate change vulnerabilities and risks should be factored into agricultural policies and plans, according to policymakers. Incorporating climate-smart practices, promoting sustainable land and water management, and incorporating climate information services into decision-making processes are all part of this. Governments can create an enabling environment for coordinated climate adaptation efforts in the agricultural sector by fostering policy coherence and integration.

5.1.2 Establishing multi-stakeholder platforms for coordination and collaboration

Effective stakeholder coordination and collaboration are critical for successful climate change adaptation in agriculture. Strengthening the existing multi-stakeholder platforms or

creating more inclusive and representative platforms can help to facilitate dialogue, information sharing, and collaborative decision-making. Representatives from government agencies, farmer organizations, research institutions, civil society, private sector entities, and international organizations should be present on these platforms. Multi-stakeholder platforms can foster coordination, build trust, and promote the exchange of knowledge and best practices by bringing together diverse perspectives and expertise. Such collaborative mechanisms allow stakeholders to identify priorities collectively, develop joint action plans, and track the implementation of climate adaptation measures.

5.1.3 Investing in research and data collection to inform coordinated decision-making

To effectively adapt to climate change in agriculture, informed decision-making is essential. Governments and relevant stakeholders should invest in research and data collection to improve understanding of the agricultural sector's climate change impacts, vulnerabilities, and adaptation options. In addition to supporting effective data collection for effective decision making, there is need to invest in bridging the research-policy divide, e.g., by developing the capacity of policymakers to demand and use research evidence. Robust data collection systems can focus on climate modeling, meteorological data collection, and assessing the socioeconomic implications of climate change on agriculture. In addition, research should focus on identifying novel climate-smart agricultural practices and technologies. Policymakers and stakeholders can make informed decisions, prioritize adaptation actions, and allocate resources effectively within coordinated efforts by generating reliable and context-specific data.

5.1.4 Encouraging partnerships and networks to leverage resources and expertise

Partnerships and networks are critical in improving the coordination of agricultural climate change adaptation. Partnerships should be actively sought by governments, international organizations, research institutions, civil society groups, farmers' organizations, and private sector entities to leverage resources, expertise, and technical assistance. Collaborative initiatives can pool financial resources, share knowledge and experiences, and provide support for capacity-building activities. Public-private partnerships can foster innovation and the spread of climate-smart technologies and practices. Stakeholders can overcome resource constraints, increase the scalability of adaptation efforts, and have a greater impact in addressing climate change challenges in agriculture by fostering partnerships and networks. Overall, encourage dialogue, information sharing, and joint decision-making to leverage collective expertise and resources.

5.1.5 Mainstreaming climate adaptation in development agendas and international cooperation

To ensure sustained and coordinated efforts in the agricultural sector, climate change adaptation must be integrated into development agendas and international cooperation frameworks. Climate adaptation should be prioritized in national and decentralized-level development plans and strategies, in line with international commitments such as the Paris Agreement. International cooperation should assist developing countries in developing adaptive capacity and gaining access to

financial resources for agricultural climate adaptation. Climate adaptation should also be incorporated into agricultural development projects, programs, and financing mechanisms. Countries can strengthen the resilience of their agricultural systems, promote sustainable development, and contribute to global climate goals by mainstreaming climate adaptation.

5.1.6 Monitoring, Evaluation and Learning

To improve the agricultural sector's adaptive capacity, a robust monitoring, evaluation, and knowledge exchange system is required. A system like this will enable evidence-based decision-making, make identifying successful adaptation practices easier, and foster a culture of learning and continuous improvement. Finally, it will help to build resilience and ensure the long-term effectiveness of agricultural climate change adaptation efforts.

INDIGENOUS KNOWLEDGE SYSTEMS

Policymakers can tap into valuable insights, adaptability, and innovative solutions that have been refined over generations by integrating local and indigenous knowledge systems in climate change adaptation. This approach not only improves the effectiveness and cultural relevance of agricultural climate change adaptation efforts, but it also respects local and indigenous communities' rights, traditions, and contributions. Some of the key actions to take include fostering collaboration with local communities, preservation and transmission of traditional knowledge as well as upholding the principle of Free Prior and Informed Consent (FPIC) to protect the knowledge and rights of local communities.

5.1.7 Resource Mobilization

African governments can increase resource mobilization efforts, attract financial support, and effectively channel funds toward agricultural climate change adaptation. For example, Governments can prioritize climate adaptation in national budgets, allocating sufficient funds to finance adaptation projects and initiatives. This may involve reallocating existing budgets or creating dedicated funds for climate change adaptation. In addition, African governments can also actively engage with international climate finance mechanisms, such as the Green Climate Fund (GCF) and the Adaptation Fund, to access additional funding for adaptation interventions. A third alternative is to focus on exploring and developing innovative financing instruments tailored to their unique circumstances. These may include climate insurance mechanisms, microfinance solutions, or results-based financing approaches that link funding to specific adaptation outcomes and achievements. Improved coordination and management of financial resources will allow for the implementation of climate-resilient agricultural practices, the support of smallholder farmers, the improvement of food security, and the development of a sustainable and climate-resilient agricultural sector in Africa.

6. Conclusion

In conclusion, climate change poses a significant threat to global agricultural systems, and effective adaptation measures are urgently needed. Coordinating climate adaptation in agriculture is crucial for building resilience and ensuring long-term sustainability.

However, there are various coordination challenges that need to be addressed, such as stakeholder fragmentation, limited financial resources, and knowledge gaps. Despite these challenges, there are opportunities for collaborative governance, technological innovations, and knowledge exchange that can improve coordination efforts. By overcoming these challenges and seizing these opportunities, the agricultural sector can strengthen its resilience and ensure sustainable agrifood systems in the face of climate change.

In African agriculture, climate change adaptation is of utmost importance due to the continent's reliance on climate-sensitive sectors. Investments in irrigation, improved seed varieties, soil management, climate-smart agricultural practices, extension services, and research and development are key initiatives to enhance adaptation. However, coordination efforts in Africa have faced challenges in various regions, including a lack of trust, limited resources, and lack of awareness. Lessons learned from successful coordination initiatives highlight the importance of trust, coordination, resource availability, awareness, institutional coordination, long-term planning, and regional collaboration. Strategies for effective coordination include strengthening institutional frameworks, enhancing information sharing and knowledge management platforms, engaging and empowering local communities and farmers, mobilizing financial resources, and building capacity in climate adaptation. Policy coherence, stakeholder engagement, research and data, partnerships, and mainstreaming climate adaptation in agricultural policies are crucial for achieving effective coordination in climate change adaptation. By implementing these recommendations, governments and stakeholders can enhance the resilience of agricultural systems and safeguard food security in the face of climate change.

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