CHAPTER 7

Adaptation Actions to Climate Change in African Agriculture: Effectiveness and Challenges

Getaw Tadesse and Ndeye Yacine Barry

Introduction

Climate change poses a significant burden to African development and economic growth, impacting households at both national and regional levels. While accounting for only 3–4 percent of global emissions, Africa is most vulnerable to climate change due to low levels of socioeconomic growth (Kikstra et al. 2022). Africa's vulnerability to climate change is exacerbated by its reliance on rain-fed agriculture, environmental degradation, inadequate infrastructure, widespread poverty, and increased frequency and intensity of climate-related disasters. These factors make Africa highly susceptible to climate-related disruptions such as droughts and floods and can amplify the impact of climate-related disasters on communities, economies, and ecosystems (UNECA 2013; WMO 2020). Effective adaptation strategies and risk financing mechanisms are crucial for building regional adaptive capacity and resilience.

Many African governments have recognized the urgent need for climate action and responses (Babatunde 2019; Damptey and Zakieldeen 2020), and many of them have developed national adaptation plans (NAPs) to combat the adverse effects of climate change. Adaptation actions are also proposed in almost all plans for nationally determined contributions (NDCs), with a particular emphasis on meeting socioeconomic priorities such as food security, income and enterprise opportunities for youth, and economic expansion. Climate change disproportionately affects the world's poorest people, particularly in developing countries, due to their limited resources and infrastructure to cope with extreme weather events and disasters (Signé and Mbaye 2022).

At the continental level, several strategies and programs have been developed to address the increasing frequency and intensity of climate hazards. These include the African Green Stimulus Programme (2022), the African Union (AU) Climate Change and Resilient Development Strategy and Action Plan (2022–2032), the Comprehensive Africa Agriculture Development Program (CAADP), and the AU's Agenda 2063: The Africa We Want. These policies emphasize the need for systematic integration of climate change responses and adaptation actions into planning and agricultural policies (Al-Zu'bi et al. 2022).

However, the implementation, adoption, and impacts of these adaptation actions have not yet reached a significant level. This is due to several factors, including the limited finance being allocated to adaptation actions compared to mitigation actions; weak institutional and human capacity to coordinate and implement proposed actions effectively; and lack of timely, relevant, and affordable climate information services that can guide not only adaptation actions but also behavioral changes (ACBF 2023). In fact, climate services can influence behavior by providing relevant information, identifying impactful actions, designing effective programs, tracking progress, and engaging communities in the process. By delivering localized data on climate risks, analyzing emissions data, and involving stakeholders in decision-making, climate services can help individuals and communities understand and address the impacts of climate change (Kelleher and Mirpuri 2023; USAID 2019). Africa urgently requires more climate finance to bridge a substantial gap. In 2020, both domestic and international climate finance flows in Africa amounted to only US$30 billion, which is far below the $250 billion needed annually from 2020 to 2030 to meet the continent's climate goals, representing just 12 percent of the required amount (Guzmán et al. 2022).[1] The majority (91 percent) of this finance came from international sources such as multilateral development institutions, bilateral partners, and international governments, while only 9 percent came from domestic sources within Africa.

This chapter aims to review and examine African climate adaptation policies and actions in terms of the typologies of actions, their state of implementation, and their effectiveness. It also examines key priority challenges facing African countries in the design and implementation of their adaptation plans, aiming to shed light on priority areas for policy actions and implications for the post-Malabo African agriculture development agenda. The chapter aims to summarize the conceptual and empirical discourses surrounding adaptation actions, with a special focus on building resilient and adaptive agriculture in Africa.

The chapter is organized as follows. The next section provides an overview of the conceptual framework that explains the differences and linkages between adaptation, resilience, and vulnerability. This is followed by a review of the African adaptation policies and plans that have led to the development of a typology of adaptation pathways to help policymakers and practitioners prioritize their options. The fourth section examines the adoption and effectiveness of

1 In this chapter, all dollars are US dollars.

selected agricultural adaptation options and reviews the state of agricultural households' resilience to climate change in Africa. The fifth section highlights key priority challenges that deserve urgent policy attention to combat the adverse effects of climate change. The final section presents concluding remarks and recommendations for the post-Malabo adaptation agenda.

Conceptual Framework

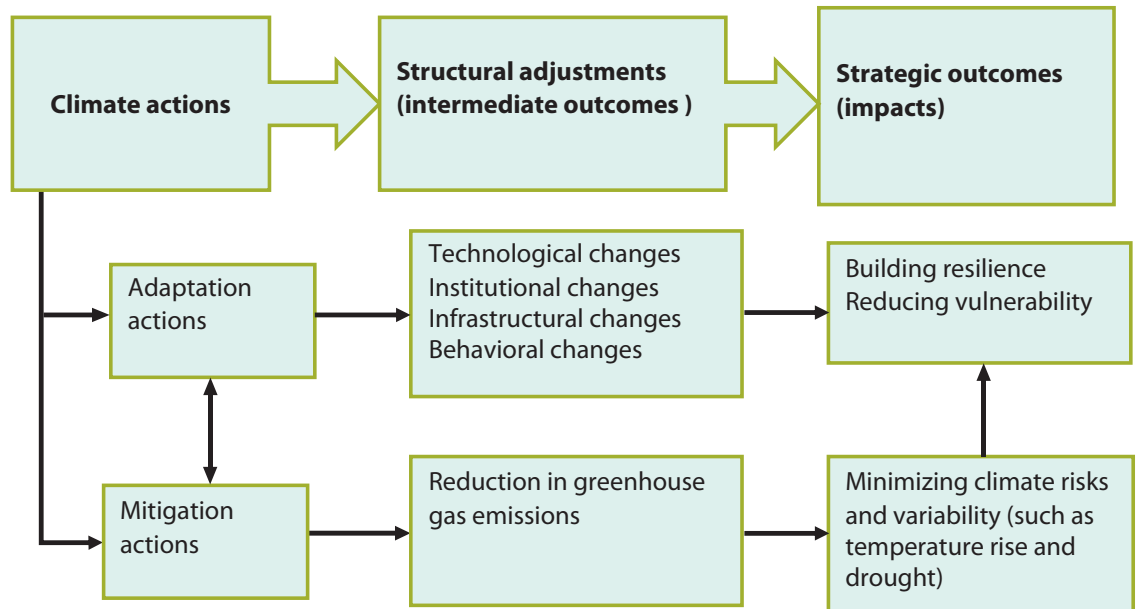
Many policy discussions and strategic documents repeatedly and interchangeably refer to adaptation, resilience, and vulnerability. Though these terms commonly refer to responses, actions, outcomes, and damages associated with a shock, they are conceptually and metrologically different, and it is important to clearly understand such differences to avoid confusion among development practitioners and actors and to guide practical analyses and actions. Therefore, in this section, we define the terms separately before going on to discuss their functional relationships.

Adaptation refers to a process that changes the natural or human system or capacity to a state that is better able to survive in a new environment (Leggett 2021). Climate actions involve adjusting policies, practices, and systems to reduce vulnerability and build resilience to climate change impacts, including sustainable land management, water conservation, and early warning systems, with the ultimate objective of minimizing the negative impacts of climate change on societies, economies, and the environment (Zolnikov 2019). One concise definition comes from the Intergovernmental Panel on Climate Change (IPCC), which states: "Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts" (IPCC 2014, 151). The ultimate aim of adaptation is to foster resilience, minimize vulnerability, and reduce the impacts of climate hazards.

Based on these definitions, adaptation involves at least three issues: (1) adaptation actions, (2) structural changes or adjustments, and (3) adaptation outcomes such as reducing vulnerability and building resilience. This means that adaptation is a process of adjustment that encompasses not only adaptation actions but also structural changes and outcomes. Figure 7.1 illustrates actions, structural changes (adjustment), and outcome indicators for adaptation as well as mitigation. The mitigation example is presented to help readers understand the counterparts. It also helps to show that adaptation and mitigations are not separable in agriculture, as shown by the double arrows between actions and strategic outcomes. Adaptation and mitigation are distinctly different only at the intermediate outcome level.

At the outcome level, adaptation aims to bring about structural changes that can suit the new circumstances and environment, while mitigation aims to reduce greenhouse gas emissions. At the impact level (sometimes called *strategic*

FIGURE 7.1—THE IMPACT PATHWAY OF ADAPTATION AND MITIGATION ACTIONS



Source: Authors' construction.

outcomes), adaptation aims to reduce vulnerability or build resilience while mitigation aims to reduce climate risks and variability. However, the impacts of both are conceptually and fundamentally interrelated. The same is true at the action level, where some actions help to achieve both mitigation and adaptation objectives.

Resilience refers to the ability of a system (ecology, economy, household, or community) to anticipate and cope with shock and bounce back from challenges, setbacks, or adversity. It involves the capacity for anticipating and coping with shocks as well as maintaining or regaining ecological, economic, social, and mental well-being in the face of climate shocks. According to Miller and colleagues (2010), resilience has been used in two ways: "one focusing on recovery and return time following a disturbance, the other focusing on how much a system can be disturbed and persist without changing function" (272). While adaptation is a process focused on adjusting to change, resilience emphasizes recovering from and overcoming hardships. This means that the purpose of adjustment to emerging new circumstances (adaptation) is to maintain the well-being caused by a shock, which is resilience.

Within the context of climate change, the IPCC defines *vulnerability* as "the extent to which a natural or social system is likely to be damaged by the impacts of climate change, and is a function of exposure, sensitivity, and adaptive capacity" (IPCC 2014, 151). Therefore, vulnerability refers to the susceptibility of a system (household, community, economy) to a shock and depends on exposure, sensitivity, and adaptive capacity.

Resilience and vulnerability are conceptually closely related and seem to be opposites of each other. However, they are metrologically and epistemologically different. While resilience measures the degree of coping and recovery (bouncing back) of a system after a shock to its original state, vulnerability measures the degree of damage caused by the shock to a system. Epistemologically, the two concepts emerge from different scientific origins. Resilience originates from ecological theory, whereas vulnerability originates from social theory (Miller et al. 2010). Nowadays, both concepts are equally applicable to social and natural systems. In terms of measurement, vulnerability depends not only on adaptive capacity but also on the impact of the shock measured by exposure and sensitivity (IPCC 2014, 151), while the measurement of resilience depends mainly on adaptive capacity as well as other public interventions at the community level (FAO 2015). The measurement of resilience should also be linked with the stability of development outcomes such as food security, household income, consumption expenditure, and the like. Weighting the adaptive capacity and other indicators based on their contribution to the development outcome usually helps to link observed indicators with development outcomes (FAO 2015).

Empirically, three analytical issues are critically important to better understand the process of adaptation and be able to guide policy actions:

1. How to measure and quantify adaptation to climate change to monitor and track performance in implementing adaptation actions
2. How to prioritize and strategize adaptation actions (this requires an understanding of the typology and characteristics of the adaptation actions)
3. Whether adaptation actions are effective in bringing impacts (this is about the empirical linkage between adaptation action and impacts, such as building resilience and reduction of vulnerability)

The latter two will be covered in subsequent sections. But when it comes to measurement, just like mitigation, adaptation is usually measured using the intermediate outcomes, such as the adoption of climate-smart agriculture (CSA) practices, for example. However, while mitigation is measured using a single indicator of reduction in greenhouse gas emissions, adaptation cannot be easily measured by a single indicator. In fact, this single indicator measurement has several weaknesses. First, it does not capture all aspects of structural adjustments. Second, since the practices are very much context-specific, it is very difficult to make comparisons across sectors and countries using one indicator; a practice that is relevant in one context may not be relevant in another context. So far, there is no standardized and comprehensive measurement for adaptation. Scholars measure adaptation using single indicators that only approximate certain dimensions of adaptation. A comprehensive and composite measurement of adaptation should include all four structural adjustments (intermediate outcomes) of adaptation (Figure 7.1). The ideal composite measurement of adaptation should also consider the relationships between these structural adjustments. One can develop a composite adaptation indicator using carefully selected indicators from each area of structural adjustment.

Review of Climate Adaptation Policies and Actions

Review of Adaptation Policies and Plans

Almost all African countries (except Libya) have developed and submitted their NDCs to the United Nations Framework Convention on Climate Change. All NDCs include two major sections on mitigation and adaptation, articulating the country's ambitions and actions. In addition to the adaptation actions set out in the NDCs, 17 African countries have also developed and adopted separate NAPs. Other countries have also developed their own national climate change and green growth strategies to foster and integrate adaptation actions in their national economic development plans. All these plans play a pivotal role in addressing the unique challenges posed by climate change on the continent. The plans serve as strategic frameworks that outline specific measures and interventions to enhance resilience and adapt to the adverse effects of climate change across various sectors. Given Africa's vulnerability to climate variability and extreme weather events, NAPs serve as essential tools for guiding policy, mobilizing resources, and coordinating adaptation efforts at national and subnational levels.

African countries face diverse climate change impacts, including droughts, floods, heat waves, and rising sea levels. These impacts threaten food security, water resources, human health, and ecosystems. NAPs are tailored to address these specific challenges by identifying priority areas for intervention, setting adaptation goals and targets, and outlining strategies for implementation. The plans often incorporate a mix of measures, such as CSA, sustainable water management, ecosystem-based adaptation, disaster risk reduction, and climate-resilient infrastructure development, all designed to build adaptive capacity and reduce vulnerability to climate-related risks. Furthermore, NAPs for African countries emphasize the importance of mainstreaming climate change adaptation into national development planning processes to ensure coherence and integration across sectors. By integrating adaptation considerations into policies, plans, and programs, countries can enhance synergies, maximize co-benefits, and minimize trade-offs between climate resilience and socioeconomic development objectives. Additionally, NAPs promote stakeholder engagement, capacity building, and knowledge sharing to foster ownership, participation, and collaboration among government agencies, civil society organizations, the private sector, academia, and local communities as part of the advancement of adaptation efforts. Overall, NAPs are instrumental in guiding Africa's response to climate change and building a sustainable and resilient future for its people and ecosystems.

At the continental level, in February 2022 the AU launched its Climate Change and Resilience Development Strategy and Action Plan following its adoption by the AU Assembly. The AU Climate Strategy is a key instrument for supporting regional collaboration on climate change and more effective international partnerships, joint actions, and the expression of collective needs and priorities. It is expected to unlock Africa's potential in building climate-resilient communities and economies, which are an integral component of the continental vision (the Agenda 2063) for "an integrated, prosperous and peaceful Africa, driven by its citizens, representing a dynamic force in the international arena" (AU 2023a). The Climate Strategy runs from 2022 to 2030 and envisions "a sustainable, prosperous, equitable and climate-resilient Africa" with a goal of "enhanced cooperation in addressing climate change issues that improves livelihoods and well-being, promotes adaptation capacity, and achieves low-emission, sustainable economic growth." Its overall objective is "building the resilience of African communities, ecosystems, and economies, and supporting regional adaptation" (AU 2023b, 121). The AU intends to reduce emissions, build resilience, and enhance green growth with nine prioritized sectoral climate actions. Despite an unclear implementation strategy and the challenges of alignment with global and national initiatives, this is an important step forward to try to address the challenges of climate change collaboratively and cooperatively at regional and continental levels. The Climate Strategy will help to mobilize joint voices, resources, and actions as well as to create mutual accountability and learning.

Although the NAPs are crucial and include significant commitments, their implementation and coordination are currently off track. This is partly because the NAPs have not yet been fully integrated into the national development plans and embraced by all stakeholders including government agencies and the private sector. Though most governments in Africa are aware of the threat posed by climate change, many still think that climate actions compete with development goals and programs.

The African Climate Change Policy Performance Index (ACCPPI) assesses the climate change policy performance of countries and regions in Africa. The index evaluates four key scores: greenhouse gas emissions (30 percent),

renewable energy (25 percent), climate policy (25 percent), and corruption perception (20 percent) (Epule et al. 2021). The initial results show that Angola, Cabo Verde, Ghana, Morocco, Senegal, Tanzania, and Zambia are the best performers at the country level, while North Africa and Southern Africa are the best performers at the regional level.

The ACCPPI aims to move the climate change policy performance debate in Africa from emotional and rhetorical evaluations to more data- and evidence-based actions that facilitate policy tracking and accounting. The index will be updated every five years to incorporate new data and track developments, influencing climate change policy across Africa. It is important to highlight the excellent performance of Morocco and South Africa. Morocco is recognized as a top performer in climate change policy in Africa, with notable initiatives in place to address climate change and promote sustainable development, including the National Climate Plan 2030, the Exemplary Administration Pact, the Strategic Committee on Sustainable Development, the National Strategy for Sustainable Development 2030, the NDC and the National Climate Policy and Framework Law No. 99–12. The Mohammed VI Foundation for Environmental Protection has also launched initiatives such as the Air Climate program, which focuses on carbon compensation projects, renewable energy installations, and sustainable transportation projects. Despite not appearing among the top performing countries on the ACCPPI, South Africa is also known for its strong climate policies. The country is investing in renewable energy despite its high greenhouse gas emissions, implementing various policies and strategies such as its Biofuels Regulatory Framework, Green Fund, Low Emissions Development Strategy 2050, Integrated Resource Plan, carbon tax, Green Transport Strategy, and Climate Change Bill to improve its overall climate policy performance (Epule et al. 2021).

Regionally, North Africa and Southern Africa are leading in renewable energy and climate policies due to better governance and investments. West Africa and East Africa have moderate performance but struggle with corruption and poor climate policy environments. Central Africa has the lowest scores due to poor governance and corruption. High levels of corruption hinder the effective implementation of climate policies in many African countries. Economic disparities impact climate policy performance, with wealthier regions performing better. A comprehensive approach is needed to address climate change, including reducing greenhouse gas emissions, investing in renewable energy, and reducing corruption. The ACCPPI helps evaluate and compare climate policy performance in African countries and regions.

In contrast to the ACCPPI, the *Africa Climate Action Performance Report* evaluates Africa's climate policy through the lens of "common but differentiated responsibilities," focusing on the differences in development levels of countries (D'Souza, Jaspal, and Sengupta 2022). The report highlights that some African nations, such as Seychelles and South Africa, have high per capita carbon dioxide emissions and energy use, while others, such as the Central African Republic, Chad, and the Democratic Republic of Congo, have lower emissions levels due to their lower levels of human development.

Generally, all the assessments and evaluations indicate that countries in Africa have progressed well in terms of developing policies and strategies, but their implementation performances have remained very poor.

Typology of Adaptation Actions

A systematic assessment of observed climate adaptation responses in scientific literature covering 827 adaptation actions in 553 studies between 2013 and 2021 by Williams and others (2021) identified 24 categories of adaptation responses in Africa. Most studies were on adaptation actions in the food sector. The five adaptation response categories with the highest number of reported actions were sustainable water management (food sector), resilient infrastructure and technologies (health sector), agricultural intensification (food sector), human migration (including but not limited to poverty and livelihoods), and crop management (food sector). Urban areas reported the fewest actions. Notably, 53 percent of these actions were recorded in just six countries: Ghana, Ethiopia, Kenya, Tanzania, Nigeria, and South Africa. This indicates that these countries are prioritizing climate adaptation efforts and have made significant progress in implementing adaptation strategies.

Alongside the adaptation responses reported in these different studies, countries have also proposed numerous adaptation actions in their NDCs and NAPs. Though the proposed and reported actions all aim to build resilience and adaptation to climate shocks, there are differences in their feasibility, the required public intervention actions, and the sustainability outcomes. To help identify the priority constraints and specify the interventions needed by public policy actions, we broadly classify the adaptation actions into six different adaptation pathways depending on their impact pathways toward building adaptive capacity and associated co-benefits (Table 7.1). The first five are ex ante adaptation actions while the last is the ex-post pathway. However, even the ex-post actions require ex-ante preparation. The pathways are defined mainly based on impact

management pathways. Adaptive capacity is created in four ways: (1) by absorbing the impacts of the shocks, (2) by protecting against the impacts of the shock, (3) by avoiding the shock or reducing exposure to the impacts of the shock, or (4) by transferring the adverse impacts of the shock to another party. The first two build adaptive capacity by absorbing shocks so that the shocks will not cause significant economic or social damage. However, the first pathway also helps to mitigate shocks by reducing greenhouse gas emissions in the form of carbon sequestration and methane emission reduction. The third pathway builds adaptive capacity by protecting a household or a system from shock. The fourth helps to skip the impacts of the shock by moving it from a vulnerable economic sector to a sector less exposed to climate shock. The last two build adaptive capacity by transferring the risk to a second party through market and nonmarket mechanisms.

Although the primary objective of adaptation actions is to build the adaptive capacity of households, communities, or economies, it is important to note that these actions have a wide range of co-benefits. As shown in Table 7.1, the six adaptation pathways generate varying co-benefits. Most of the co-benefits are related to economic benefits in the form of increasing productivity, economic transformation, wealth accumulation, and agribusiness development. The first and last pathways generate additional social benefits in the form of mitigating climate change and enhancing human dignity, solidarity, and nutrition for socially marginalized people. Cash transfers and emergency responses are widely recognized as good opportunities to combat malnutrition prevalence in chronically food-insecure and climate-vulnerable communities (Tiwari et al. 2016). Understanding these co-benefits helps to justify public interventions and investments in adaptation actions and to align adaptation actions with the priorities of public policymakers.

When defining adaptation pathways, it is also important to highlight constraints affecting the adoption and strategizing of public intervention actions, as shown in Table 7.2. The table shows how the adaptation pathways face different constraints, ranging from externalities to the exorbitant costs of adoption, to behavioral

TABLE 7.1—TYPOLOGY OF ADAPTATION ACTIONS

Adaptation actions	Examples	Impact pathways	Co-benefits
Climate-smart actions	Climate-smart agriculture, ecosystem restoration, efficient water management, energy transition	Reduction of shocks and absorption of shock impacts	Sustainably increased productivity, resilience capacity, mitigation
Intensification actions	Drought-tolerant crops, irrigation	Absorption of shock impacts	Increased productivity and triggering transformation
Asset-building actions	Infrastructure construction, food reserves, savings	Protection from the impacts of shocks	Wealth accumulation
Diversification actions	Value chain development, employment generation schemes, nonfarm activities	Avoidance of impacts of shocks	Economic transformation
Risk transfer actions	Weather-based insurance	Market-based transfer of risks	Agribusiness development
Ex post response actions	Cash transfers, emergency responses	Social transfer of risks	Enhanced human dignity, solidarity, nutrition

Source: Authors' compilation.

TABLE 7.2—CONSTRAINTS TO ADOPTION AND NECESSARY INTERVENTIONS ACROSS ADAPTATION PATHWAYS

Adaptation actions	Constraints to adoption	Strategic options to enhance adoption
Climate-smart actions	Adopters don't experience full benefits	Carbon trade, payment for environment services
Intensification actions	High sunk cost for research, extension, and development	Public–private partnership
Asset-building actions	High cost of public investment and behavioral resistance	Awareness campaign and political commitment
Diversification actions	Access to finance and markets; new skills for new activities	Focus on local and regional value chains and incubating micro, small, and medium enterprises
Risk transfer actions	Challenges of enforcement and high transaction costs	Empowerment of producers' organizations to participate in insurance intermediation
Ex post response actions	Burden on public finance and competition with long-term development activities	Linkage of transfers with productive activities; effective targeting

Source: Authors' compilation.

and capacity challenges among consumers, producers, and entrepreneurs. The adoption of adaptation options by smallholder producers and entrepreneurs is also strongly dependent on the functioning of social services and markets. Table 7.2 also outlines the strategic interventions needed to enhance the adoption of adaptation pathways by different actors. For example, the promotion of carbon trade and payment for environmental services are important strategic interventions for enhancing the adoption of climate-smart actions by smallholder producers. Unless farmers can feel the full benefits of their climate-smart actions, wider adoption of these options is very unlikely.

The Adoption and Effectiveness of Selected Adaptation Options

In this section, we explore the adoption and effectiveness of climate adaptation actions to build resilient agriculture. We aim to attract the attention of policymakers to areas where African countries are progressing well or where they are struggling. Owing to space and time constraints, we have focused on agriculture. Agriculture is the dominant sector in many countries and is severely affected by climate change, but at the same time, it contributes both to climate adaptation and to mitigation through carbon sinking and sequestration. Agriculture is also a priority sector in the NAPs of most African countries.

Climate adaptation in agriculture can be built either through enhancing the uptake of improved and sustainable agricultural practices or by transferring climate risk to financial institutions through weather-based agricultural insurance. Of the six adaptation pathways, the most dominant in agriculture are (1) climate-smart actions, (2) intensification actions, and (3) risk transfer actions. In this section, we track and examine selected agricultural adaptation interventions from within these categories:

- CSA and sustainable land management practices
- Expansion of irrigation
- Weather-based agricultural insurance

However, before we track the adoption and effectiveness of these adaptation actions, we review the resilience of agricultural households in Africa using data from the Comprehensive African Agriculture Development Program (CAADP) Biennial Review (BR) reports.

Resilience of African Agricultural Households

Comprehensive studies estimating the resilience of agricultural households to climate and weather-related shocks are scarce, with only a few vulnerability assessments conducted in select countries, as outlined in this chapter of the ATOR. Seeking to illuminate the extent of adaptation and resilience in African agriculture, we calculated the average number of farm households reportedly resilient to climate shocks in 2023 using CAADP BR data for the year 2022, encompassing 31 countries with reliable data, and representing approximately 919 million people on the continent.

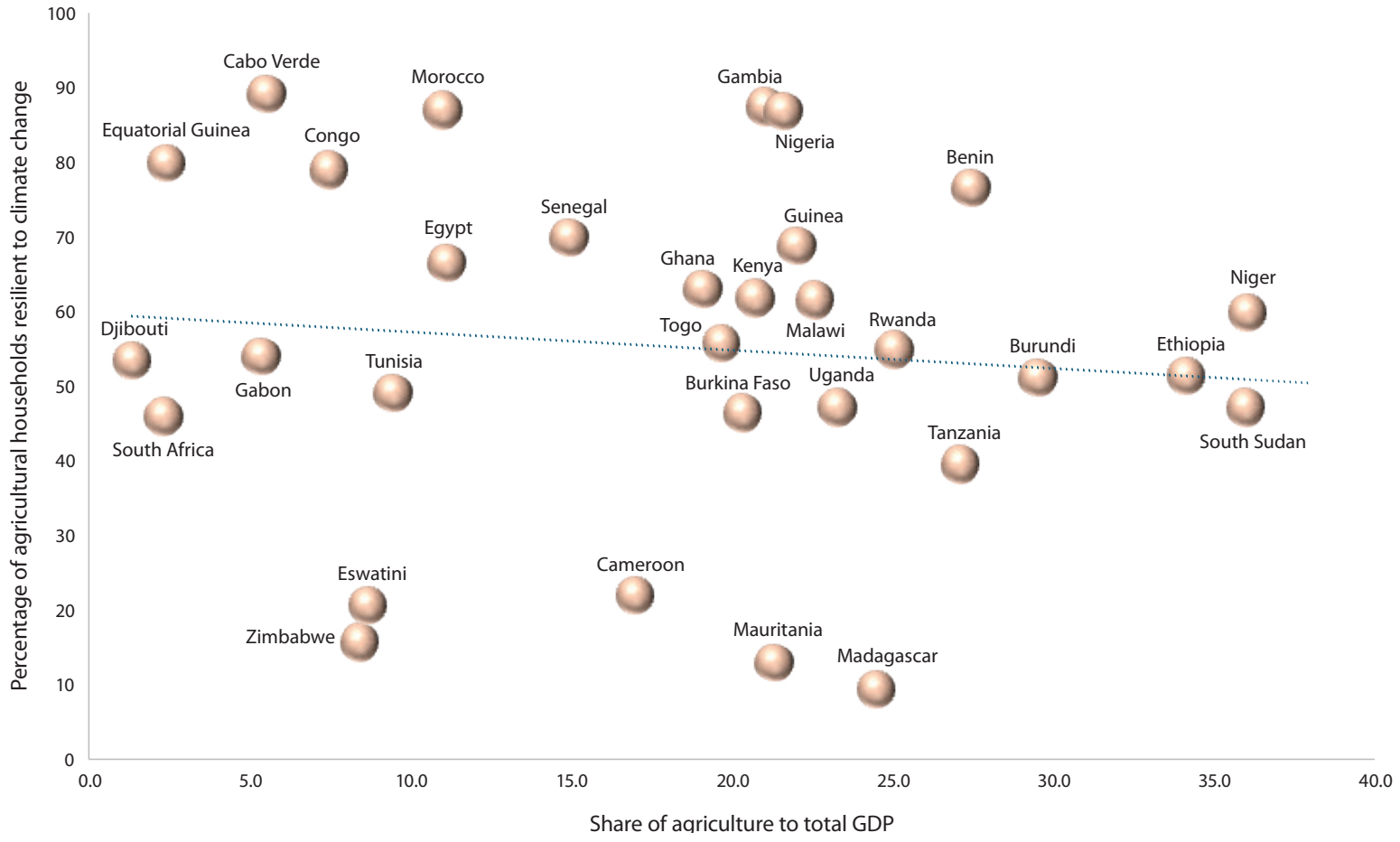
From this sample of 31 countries and a population-weighted average, it emerged that 60 percent of African agricultural households are resilient to climate change. This implies that 40 percent of such households are vulnerable to climate shocks. The resilience rate varies across countries: in the median country, 55 percent of agricultural households can be considered resilient, while in some nations, this figure plummets to as low as 10 percent. Among the 31 countries surveyed, 11 reported agricultural resilience levels of 50 percent or less, indicating that over half of their rural households remain vulnerable to climate shocks, jeopardizing their livelihoods.

It is pertinent to consider whether transitioning away from agriculture enhances the resilience of agricultural households. Figure 7.2 below illustrates the percentage of agricultural households resilient to shocks alongside the share of agriculture in total GDP. It suggests a weak correlation between agricultural resilience to climate shocks and the agricultural sector's contribution to the economy. In countries where agriculture makes up a large proportion of GDP, the sector appears less resilient, and vice versa, as evidenced by the downward-sloping trend line. This correlation could be linked to economic diversification toward nonagricultural sectors, enabling agricultural households to diversify their income streams through nonfarm activities. Climate change inflicts varying degrees of damage across sectors and economic activities, with agricultural incomes susceptible to drought while nonfarm incomes face market shocks stemming from extreme weather events. Nonetheless, nonfarm incomes and mining sectors exhibit greater resilience than other sectors to climate shocks. Thus, household and national-level economic diversification helps mitigate climate change–induced damage and fosters shock resilience.

However, the correlation depicted in Figure 7.2 is not robust. Some countries demonstrate significant levels of resilience despite the reliance of their GDP on agriculture. These countries prioritize the enhancement of agricultural resilience over transitioning away from agriculture, underscoring the necessity for countries to tailor their adaptation strategies to their specific contexts. While economic diversification may be economically viable for certain countries, for others the preferred strategy may be agricultural intensification through the adoption of climate-smart and intensification measures, as discussed earlier. In summary, transitioning away from agriculture is not a universal solution for all African countries.

We delved deeper into the relationship between the proportion of public expenditure allocated to agriculture within the total public budget and the percentage of agricultural households reportedly resilient to climate- and weather-related shocks. This analysis aimed to gauge the efficacy of public spending in fortifying agricultural resilience, utilizing cross-sectional data sourced from

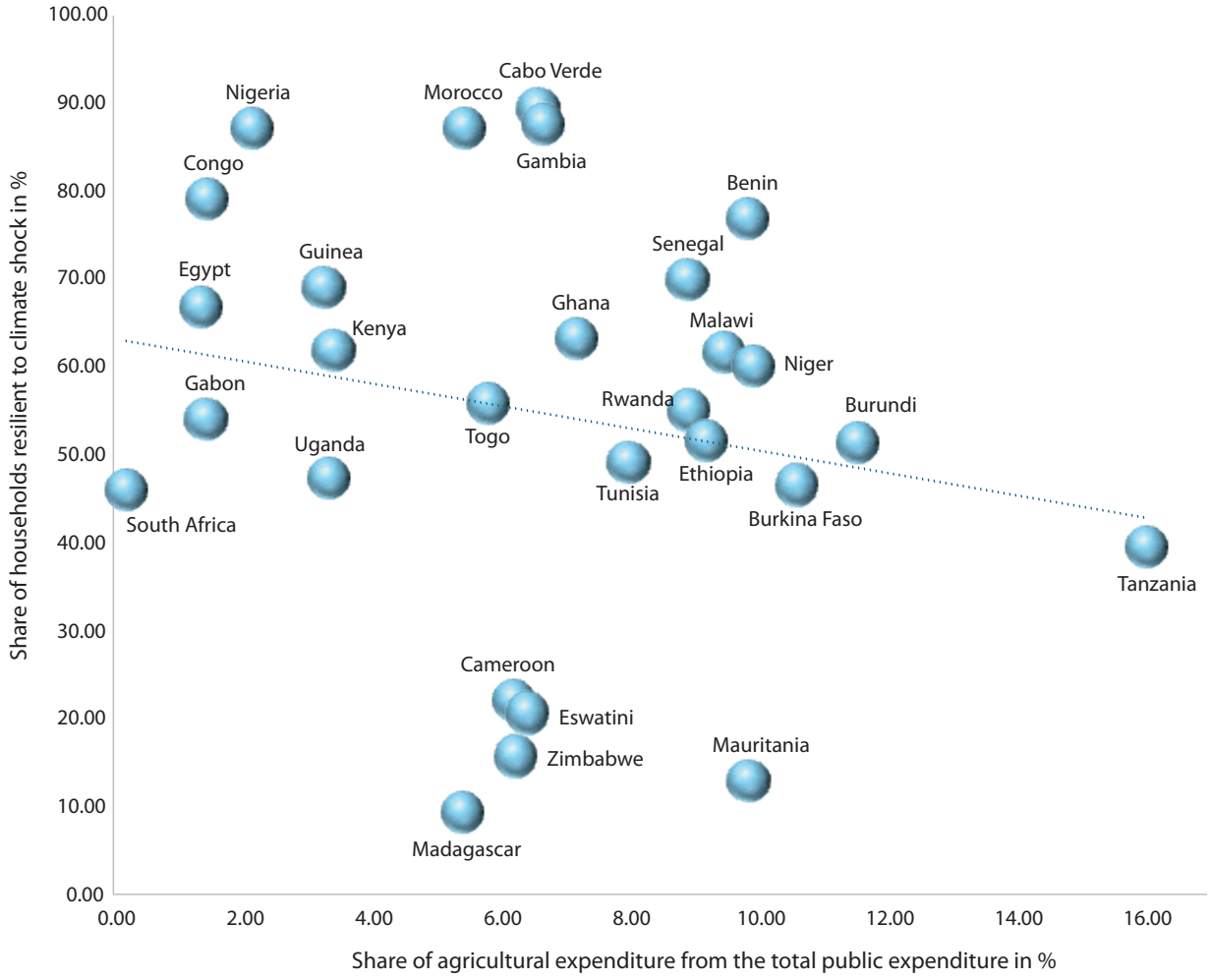
FIGURE 7.2—AGRICULTURAL RESILIENCE AND SHARE OF AGRICULTURE IN TOTAL GDP



Source: Authors' estimation based on the 2023 CAADP BR data (AU, CAADP, and AUDA-NEPAD 2024

CAADP BR. Surprisingly, our findings revealed a negative correlation, suggesting that nations allocating a larger portion of their budget to agriculture tend to exhibit lower levels of agricultural resilience (see Figure 7.3). Several factors could account for this unexpected outcome. Firstly, it is plausible that countries are directing their budgetary allocations not toward agricultural endeavors that bolster resilience but rather toward other agricultural investments with a lesser impact on enhancing agricultural adaptation. Secondly, the causal relationship might be reversed, implying that nations more susceptible to climate shocks might allocate a higher share of their budget to agriculture compared to less vulnerable counterparts. To mitigate such issues, we incorporated lag values (specifically from 2018 and 2020) of agricultural expenditure share and current resilience values from 2022. Consequently, the negative correlation likely stems from the ineffective allocation of agricultural expenditure in fostering climate-resilient agriculture. Considering the escalating threat posed by climate change, reevaluating the allocation of public expenditure toward climate-smart initiatives emerges as a crucial policy imperative for African nations.

FIGURE 7.3—PUBLIC AGRICULTURAL EXPENDITURE AND RESILIENCE OF AGRICULTURAL HOUSEHOLDS IN AFRICA



Source: Authors' estimation based CAADP BR data (AU, CAADP, and AUDA-NEPAD 2024).

Climate-Smart Agricultural Practices

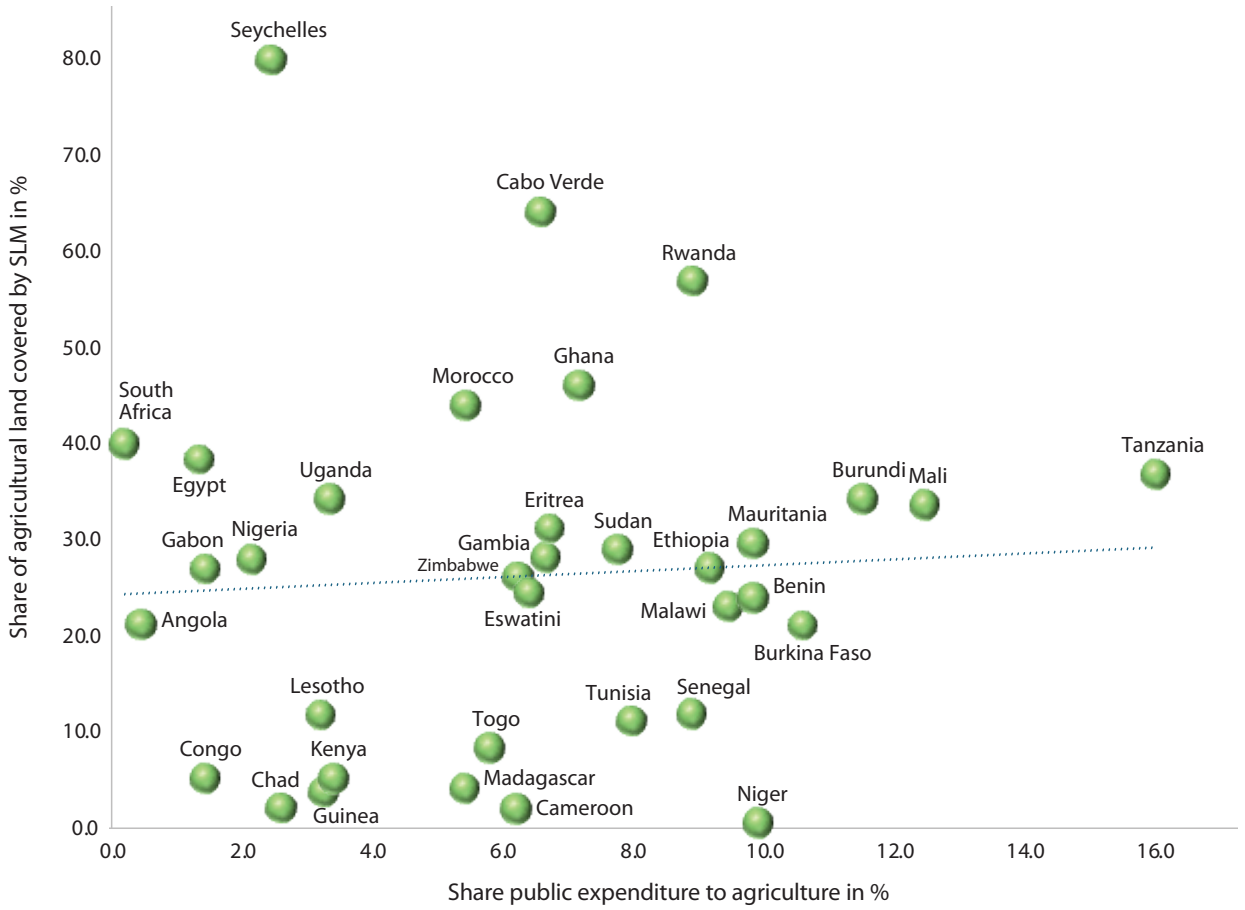
Numerous African countries are actively promoting CSA practices to enhance climate adaptation efforts. Rwanda, for instance, has introduced delineated and prioritized climate action programs, with CSA being a priority. The aim is to bolster adaptive capacity among a majority of rural households, as these bear the brunt of climate change impacts in the country. This prioritization aligns with the top priority intervention areas embraced by many African countries within their NAPs.

CSA can broadly be defined as farming practices, techniques, and systems that are designed to sustainably increase agricultural productivity and resilience to climate change, while also minimizing greenhouse gas emissions and preserving natural resources such as water and soil. It involves a combination

of traditional knowledge and innovative approaches tailored to specific local conditions, aiming to ensure food security and mitigate the impacts of climate change on agriculture. CSA aims to achieve three important objectives: enhance resilience to climate change, promote sustainable land use, and improve agricultural productivity in the face of changing climate conditions.

Despite the importance of CSA in mitigating and adapting to the adverse effects of climate change, the adoption of CSA practices in Africa is marred by several problems. Some even question the economic viability and profitability of such practices for smallholder producers in Africa. A study by the CGIAR Research Program on Climate Change, Agriculture and Food Security indicates that though the adoption of CSA practices imposes additional costs, the benefits outweigh these costs, with varying rates of financial profitability across different CSA practices (Ng'ang'a et al. 2020). The most widely accepted consensus that comes out of these studies is that the economic benefit of CSA practices is higher if adaptation actions are adopted as a complete package. The adoption intensity of CSA practices has shown a positive and significant impact on household income, net farm income, and income diversity. Those farmers who adopted the full package of CSA practices obtained higher incomes than those who adopted only a few of the practices (Sang et al. 2024). At the national level, adopting CSA on 25 percent of Ethiopia's maize and wheat land was found to increase annual GDP by an average of 0.18 percent and to reduce the national poverty rate by 0.15 percentage points (Komarek et al. 2019).

FIGURE 7.4—PUBLIC EXPENDITURE IN AGRICULTURE AND AGRICULTURAL LAND COVERED BY SUSTAINABLE LAND MANAGEMENT



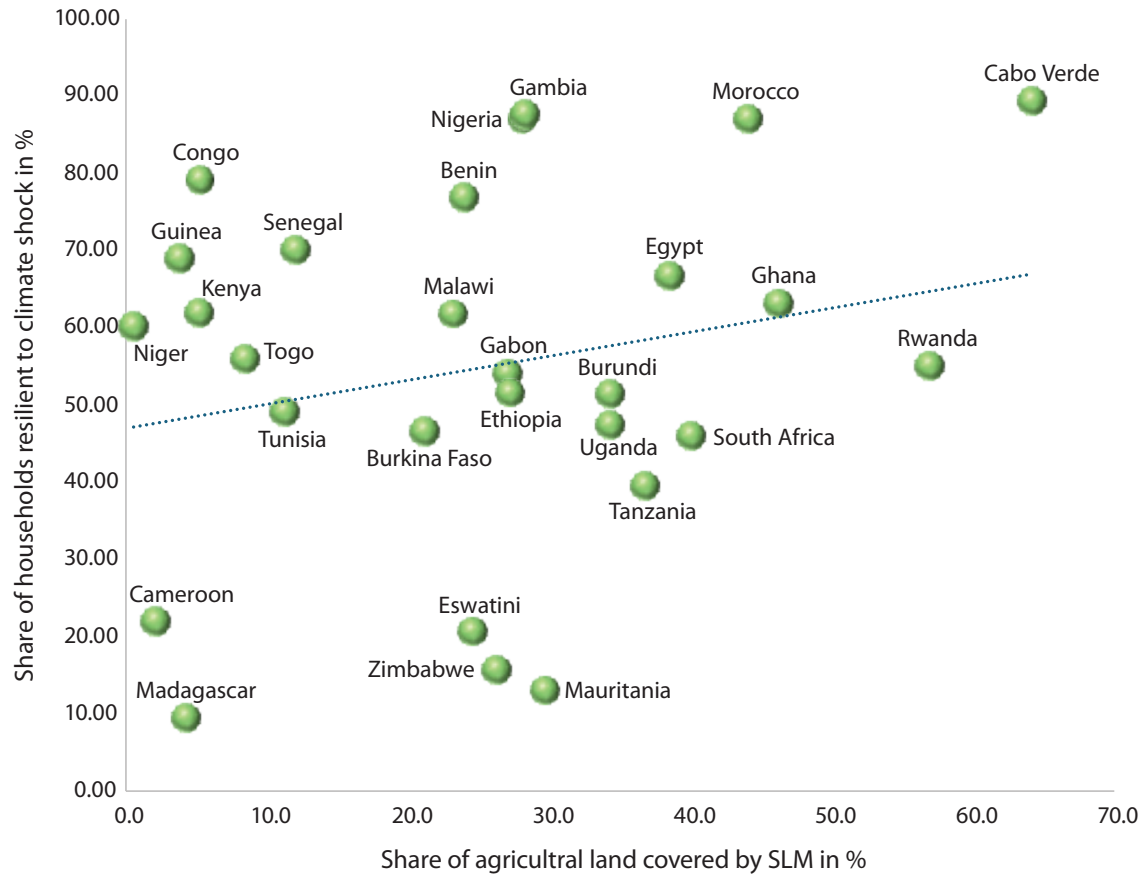
Source: Authors' estimation based on CAADP BR data (AU, CAADP, and AUDA-NEPAD 2024).

Unfortunately, the adoption of CSA practices is inversely correlated with their profitability (Nkonya and Koo 2017). Therefore, in addition to assessing the economic viability of CSA practices, it is crucial to acknowledge the institutional and infrastructural barriers impacting their adoption and effectiveness. Figure 7.4 illustrates the correlation between public agricultural expenditure and the agricultural area covered by sustainable land management, including

CSA practices. However, the data reveal a remarkably weak and nearly insignificant correlation. This implies that there is no discernible difference in the proportion of agricultural land covered by sustainable land management practices among countries, regardless of their levels of public agricultural expenditure. It suggests that current public agricultural investments have yet to yield observable sustainability improvements. This observation might elucidate the weak correlation between public agricultural expenditure and the area covered by sustainable land management, as depicted in Figure 7.4. While it is commendable that African governments are committed to allocating sufficient budgets to agriculture, it is imperative to emphasize the efficient allocation of these resources within agricultural activities.

We further examined the effectiveness of CSA practices in enhancing agricultural resilience, utilizing the same CAADP BR dataset. We aimed to illustrate the relevance of CSA in fortifying household-level economic resilience. As anticipated, our findings reveal compelling evidence of a positive correlation between the proportion of agricultural land covered by sustainable land management practices and the percentage of agricultural households resilient to climate shocks (see Figure 7.5). On average, countries that have made greater investments in CSA demonstrate a higher proportion of resilient rural households. However, it is noteworthy that the extent of land covered by CSA practices remains relatively low. Among the 35 countries analyzed, only three have managed to cover more than 50 percent of their agricultural lands with sustainable land management practices. This highlights the need for concerted efforts to scale up the adoption of CSA practices to maximize their impact on agricultural resilience.

FIGURE 7.5—INVESTMENT IN SUSTAINABLE LAND MANAGEMENT AND AGRICULTURAL RESILIENCE TO CLIMATE SHOCK

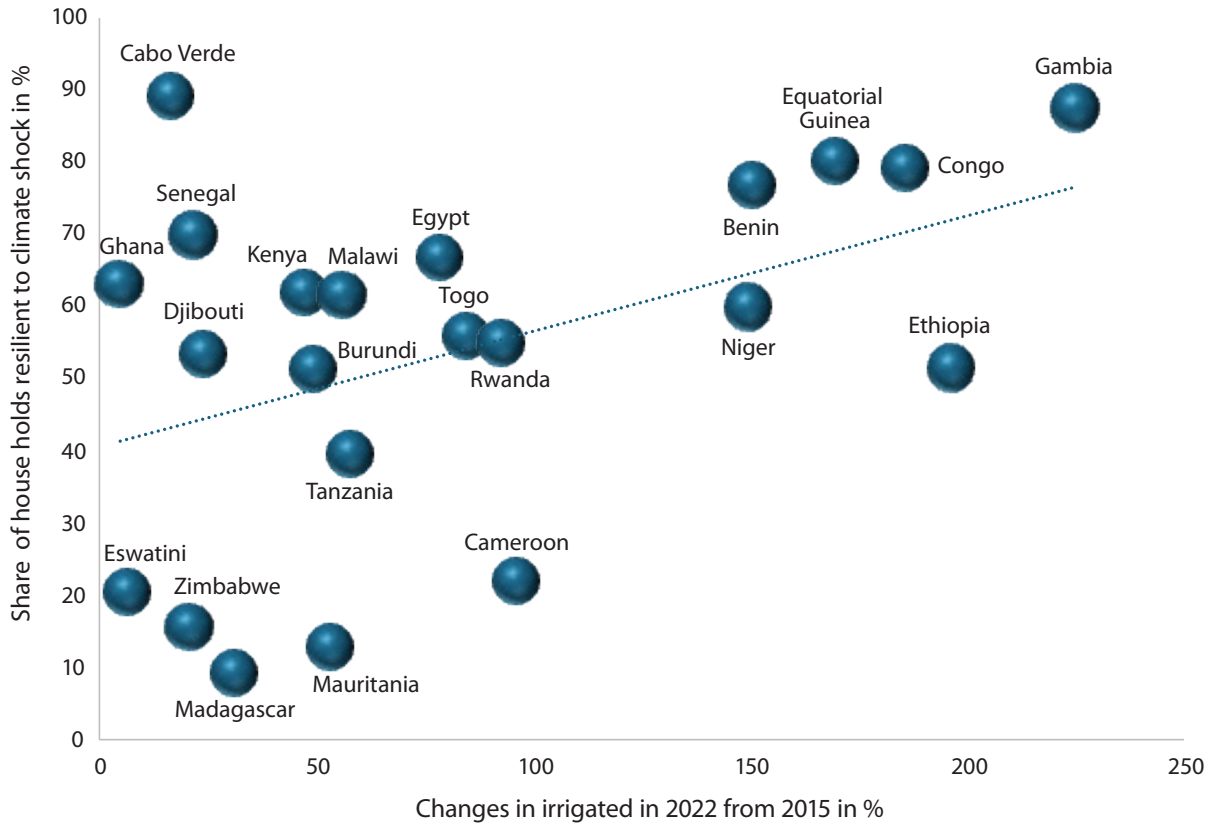


Source: Authors' estimation based on CAADP BR data.
Note: SLM = sustainable land management.

Irrigation investments

There is no denying the pivotal role of irrigation in fortifying agricultural resilience, particularly in regions susceptible to drought or unpredictable rainfall patterns. By offering a reliable water supply, irrigation aids farmers in mitigating the impacts of climate change, ensuring crops receive sufficient moisture and

FIGURE 7.6—INVESTMENT IN IRRIGATION AND THE RESILIENCE OF AGRICULTURAL HOUSEHOLDS TO CLIMATE SHOCK



Source: Authors' estimation based on the 2019, 2021, and 2023 CAADP BR data.

thereby reducing vulnerability to water scarcity while stabilizing yields. Moreover, the adoption of modern irrigation techniques such as drip and precision irrigation hold promise in optimizing water usage, fostering soil health, and minimizing environmental degradation, thus further bolstering agricultural resilience.

As depicted in Figure 7.6, our analysis reveals a robust correlation between investments in irrigation, quantified by the growth rate of land under irrigated agriculture, and the resilience of agricultural households. This correlation underscores the significance of prioritizing irrigation infrastructure development as a way of enhancing agricultural resilience in the face of climate variability.

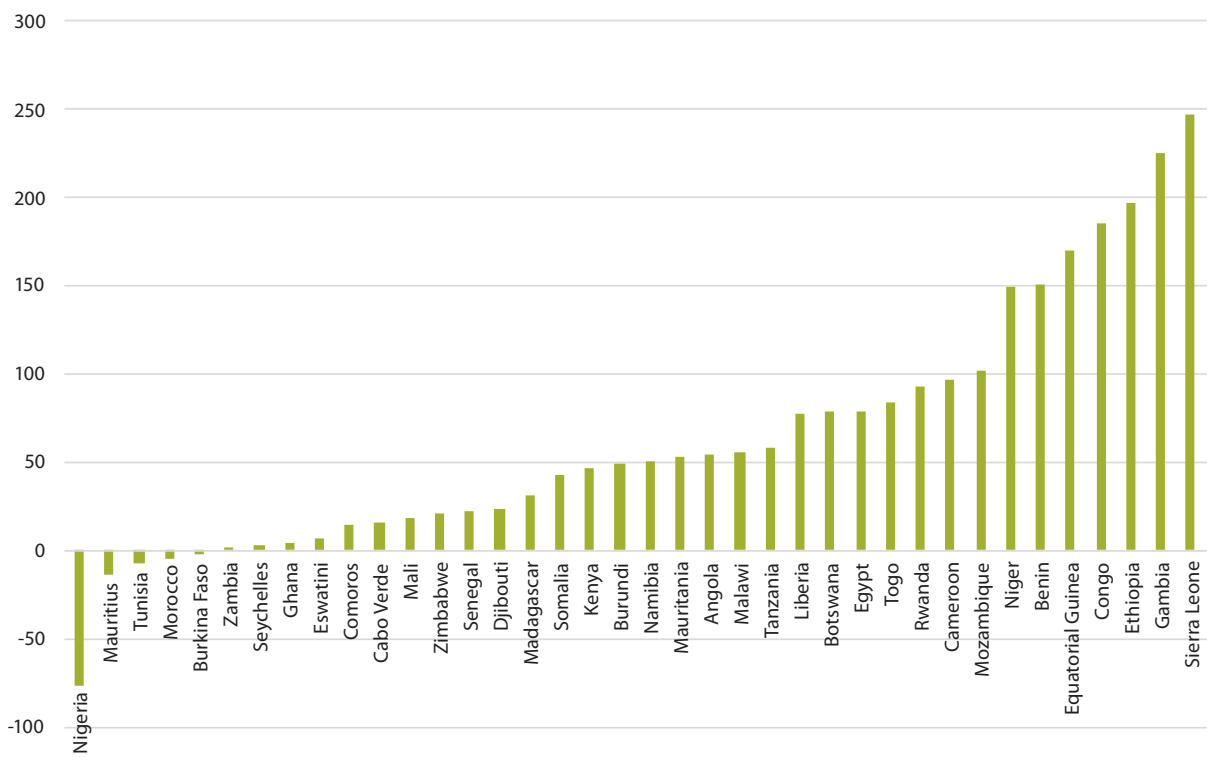
However, the pace of growth in irrigation investment falls short of meeting the necessary threshold to effectively build resilience in many countries. Figure 7.7 illustrates the changes in irrigated agricultural lands between 2022 and 2015, based on the 2023 CAADP BR data. Among the 38 countries analyzed, only 8 had managed to double or more than double their irrigated area by 2022. These countries have made substantial investments in irrigation and are on track to meet the targets set by the AU.

However, a significant portion of countries are lagging in irrigation investment. The median country in Africa has only been able to increase its irrigated area by approximately 50 percent over seven years, with an annual growth rate of 7 percent. In nine countries, the annual growth rate is less than 1 percent. Additionally, a few countries have experienced a decline in their areas of irrigated land. This decline could be attributed to data discrepancies or the obsolescence of existing irrigation schemes, rendering them unusable.

Expanding the area covered by irrigation is undoubtedly a crucial policy objective. However, it is equally imperative to address the issue of maintenance and upgrading existing irrigation schemes to ensure their continued effectiveness and sustainability.

Another crucial consideration regarding investment in irrigation in Africa is the feasibility and scalability of irrigation for smallholder producers. A study conducted by AKADEMIYA2063 in collaboration with FAO in Burkina Faso and Niger aimed to explore the feasibility and scalability of small-scale irrigation. The findings revealed that significant amounts of agricultural areas could be developed for small-scale irrigation, yielding positive and significant net economic returns. Table 7.3 provides a summary of the area size that can feasibly be developed for small-scale irrigation and the net returns achievable per unit of area under different irrigation technologies.

FIGURE 7.7—PERCENTAGE CHANGES IN IRRIGATED AREAS FROM 2015 TO 2022



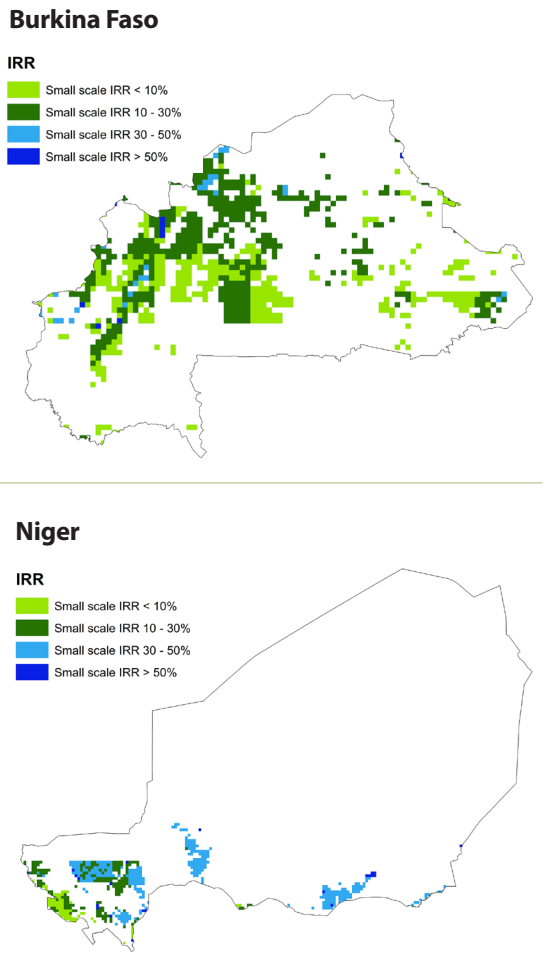
Source: Authors' estimation based on the 2019, 2021, and 2023 CAADP BR data.

TABLE 7.3—POTENTIAL IRRIGATION AREAS IN BURKINA FASO AND NIGER

Adaptability indicators	Treadle pumps	Motor pumps	Small reservoirs	Communal river diversions
Burkina Faso				
Application area (thousands of ha)	849	1,066	572	632
Net income (US$ per ha per year)	530.04	506.57	646.85	189.87
Net income (US$ per 100m^3 of water)	21.13	20.85	20.90	6.59
Niger				
Application area (thousands of ha)	133	136	98	6
Net income (US$ per ha per year)	827.07	808.82	714.29	666.67
Net income (US$ per 100m^3 of water)	91.67	91.67	46.67	20.00

Source: Tadesse et al. 2024a; Tadesse et al. 2024b.
Note: ha = hectare.

FIGURE 7.8—GEOGRAPHICAL DISTRIBUTION AND FEASIBILITY OF SMALL-SCALE IRRIGATION IN BURKINA FASO AND NIGER



Source: Tadesse et al. 2024a; Tadesse et al. 2024b.
Note: IRR stands for Internal Rate of Return

The potential and feasibility of irrigated lands extend across wider geographic areas, with significant implications for income distribution and the development of value chains, as shown in Figure 7.8. Based on these case studies, it appears that African countries possess substantial amounts of land with potential for irrigation development tailored to smallholder producers, which would enable them to fortify their agriculture against climate shocks. Harnessing this potential warrants the highest possible policy attention if the agricultural sector is to adapt effectively to the changing socioeconomic and biophysical environment.

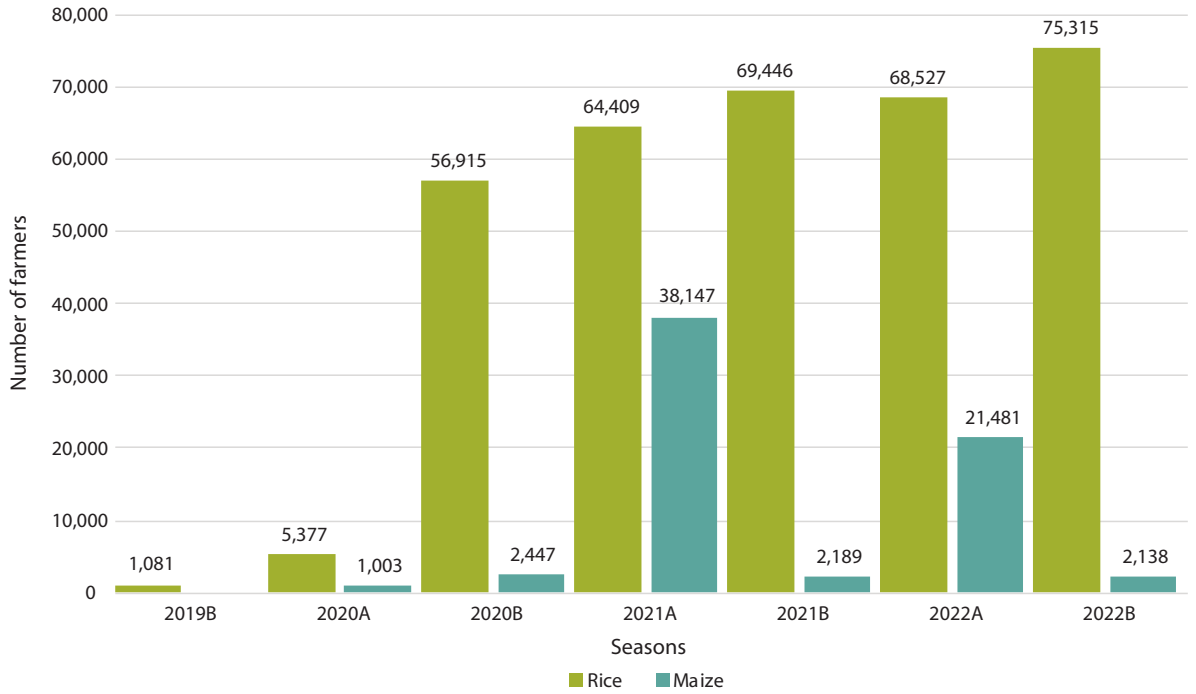
The State of Weather-Based Agricultural Insurance in Africa

Agricultural insurance is a valuable tool for farmers to manage risks that are beyond their control on the farm (World Bank 2019). Access to such insurance can help smallholder farmers deal with losses from climate change (Weber 2019). Different types of agricultural insurance include indemnity-based crop insurance, such as named peril and multiple peril crop insurance, as well as index-based insurance, such as index-based livestock insurance, and weather index insurance (Shumba 2022). All these insurance options are an essential way for farmers to protect themselves from climate change–related losses (Mcleman and Smit 2006). However, insurance products are not widely accessible or affordable for farmers in developing countries, particularly in Africa, where small-scale and subsistence farmers are most vulnerable to climate change risks (Raithatha and Priebe 2020). Limited access to insurance therefore has a significant impact on African agricultural producers who rely on rain-fed agriculture (Elum and Simonyan 2016).

There are a mix of benefits and challenges associated with weather-based agricultural insurance in Africa. While insurance can minimize contract problems, provide faster payouts for crop damage, and increase farmers' investment in agricultural inputs, coverage and uptake remain low. In many African countries, agricultural insurance coverage does not exceed more than 1 percent. Rwanda, for example, has introduced crop and livestock insurance for smallholder farmers to protect them from shocks. Its National Agricultural Insurance Scheme (NAIS) subsidizes 40 percent of the insurance premium, so farmers need to cover only 60 percent.

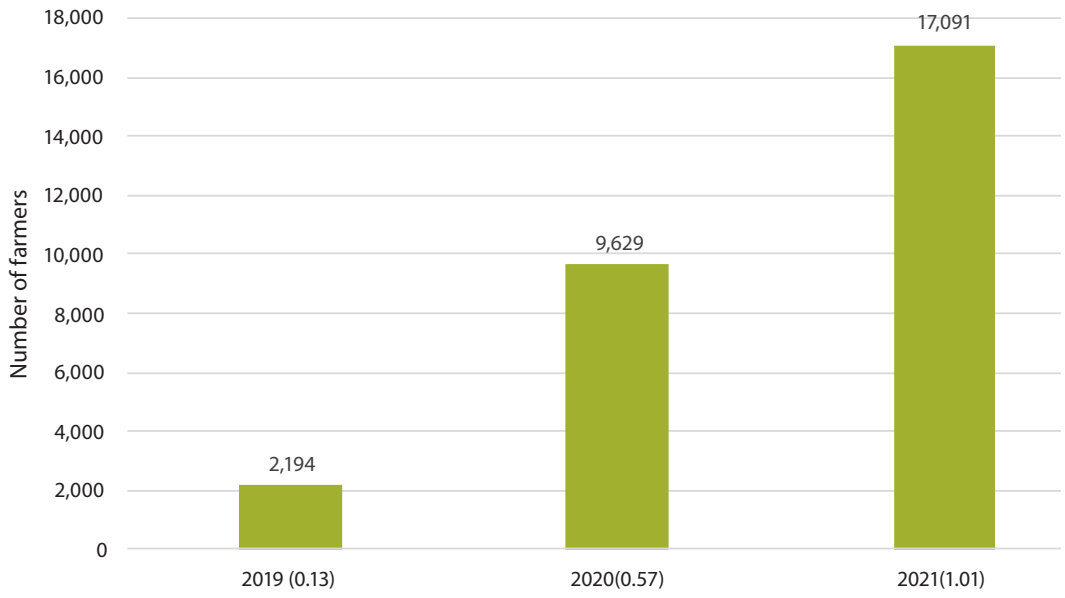
Data from Rwanda's Ministry of Agriculture and Animal Resources indicate that the number of farmers being covered by NAIS is increasing over time (Figure 7.9). Rice and maize are the most widely insured crops, followed by Irish potatoes. While the number of rice farmers purchasing insurance is increasing, the number of maize farmers with insurance oscillates between seasons. The highest rates of insurance for maize farmers were recorded during the first season of 2021. More than 75,000 rice farmers (3.6 percent of the total crop farmers) have purchased insurance through NAIS. However, there is less uptake of livestock insurance as a way of mitigating the risk of livestock death. About 17,000 farmers

FIGURE 7.9—FARMERS WHO PURCHASED CROP INSURANCE THROUGH THE NATIONAL AGRICULTURAL INSURANCE SCHEME IN RWANDA



Source: MINAGRI 2022.

FIGURE 7.10—NUMBER OF FARMERS WHO HAVE PURCHASED LIVESTOCK INSURANCE IN RWANDA



Source: MINAGRI 2022.
Note: Numbers in the parenthesis refer to the share of farmers who purchased livestock insurance.

purchased livestock insurance through NAIS in 2021, which is close to 1.01 percent of the total number of livestock keepers in Rwanda (Figure 7.10).

The challenges associated with expanding agricultural insurance include dealing with climate features such as large spatiotemporal rainfall variability, solving trade-offs between protection and the cost of premiums, lack of stakeholder involvement in insurance product analysis, poor understanding of crop insurance, inability to pay premiums, rigid enrollment criteria, uncertainty in cash flows, and inadequate knowledge of farmers' risk perception. These factors all contribute to the complexity of the agricultural insurance landscape in Africa (Fonta et al. 2018). The high transaction costs associated with contract enforcement among smallholder producers make the expansion and sustainability of weather-based insurance for African farmers more difficult. A study in Nigeria indicates that the country's agricultural insurance uptake is low due to the underdevelopment and ineffectiveness of formal insurance markets in many developing countries. Factors such as high administrative costs, moral hazard, adverse selection, and protracted delays in indemnity payment discourage the utilization of this type of insurance (Aina et al. 2024).

Various efforts are being made to develop and scale up weather index-based insurance products in Africa. Syngenta Foundation/UAP Insurance is developing SMS-based mobile applications to assist in scaling up insurance products for drought or excessive rainfall in Kenya. PlaNet Guarantee is implementing index-based insurance products in Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo through the International Bank for Reconstruction and Development (World Bank 2011). MicroEnsure is developing local capacity and a favorable environment to reach low-income people with flexible, affordable, and responsive weather index insurance in Rwanda. In Kenya, index-based livestock insurance is designed to protect Kenyan pastoralists from drought-related asset losses.

Raising awareness and capacity within producer organizations (as intermediaries between insurance suppliers and smallholder producers) can be an effective way of sustainably scaling up agricultural insurance in Africa. The involvement of producer organizations helps to minimize transaction costs by reducing information asymmetry as well as increasing bargaining power for farmers so that they pay the lowest possible insurance premium. It also helps to create economies of scale for insurance service providers. The future of weather-based agricultural insurance in Africa is therefore directly linked to the capacity and effectiveness of smallholder producer organizations and associations.

The Challenges of Building Climate Resilience and Adaptation

A recent meta-analysis suggests that a wide range of factors affect African farmers' decisions on whether or not to adopt improved agricultural practices (Arslan et al. 2022). Of all the determinants, factors related to access to extension, information, farmer group participation, and credit are more significant and consistent than other factors. Access to general information (as opposed to narrowly focused practice-specific information) and farmer group participation increase

adoption most consistently across a range of farming technologies and contexts. System-level constraints are more significant than farm-level constraints as they affect the overall capacity of a country to implement adaptation actions and build adaptive capacity. A study by Williams and others (2021) indicates that technological and institutional factors are the major system-level barriers to implementing adaptation actions. In this section, we review the most important challenges related to expanding the implementation of NAPs in Africa identified in these studies and other public discussions.

Adaptation Finance in Africa

The role of risk finance in facilitating adaptation cannot be overstated. In the past decade, climate finance directed toward Africa has notably increased, totaling around $26.4 billion in 2018 (GCA 2022). This surge reflects a growing acknowledgment of the urgent need to bolster regional adaptation efforts. Multilateral funds such as the Green Climate Fund have been pivotal in supporting adaptation projects in Africa, allocating more than $3.5 billion for resilience and adaptation (Fenton et al. 2017). Regional development banks such as the African Development Bank have also initiated targeted programs such as the Africa Climate Change Fund to address adaptation needs. Additionally, private sector involvement in climate resilience is expanding, with investments in adaptation-focused projects rising, particularly in emerging markets in Africa (IFC 2017). Innovative financing mechanisms such as the African Risk Capacity are being explored by African countries to mobilize extra resources for adaptation efforts. These developments underscore a growing momentum toward allocating funds for adaptation actions in Africa, propelled by governmental and global institutional initiatives.

Despite this progress in developing adaptation and risk finance in Africa, significant challenges persist. These include limited financial resources, weak institutional capacity, fragmented governance structures, and insufficient data and information. Consequently, Africa still grapples with a substantial funding gap for climate adaptation, with an estimated $579 billion required by 2030 across 51 African countries. This far exceeds the annual outlay of $11.4 billion observed in 2019 and 2020. While most adaptation funding stems from the public sector, unlocking a broader array of potential actors necessitates creating an environment conducive to investment and scaling up innovative finance instruments (GCA 2022).

Opportunities do exist to harness domestic and international funding, forge stronger partnerships, leverage technology, and integrate adaptation into broader development agendas. New developments are emerging in response to the need to specifically allocate funds for adaptation actions by governments and global institutions. However, the outcomes of the 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28) presented a mixed bag for Africa. While notable successes were achieved in areas such as addressing loss and damage, bolstering climate finance, advancing adaptation measures, and promoting renewable energy initiatives, there is still a palpable gap to overcome to meet the continent's ambitious goals for combating climate change and fostering sustainable development. Despite a commendable effort that resulted in the mobilization of more than $85 billion aimed at curbing temperature escalation, significant funding shortfalls persist, particularly in crucial areas such as adaptation, which is indispensable to building Africa's resilience against and response to climate-related challenges (Shirley, Deme, and Onyango 2023).

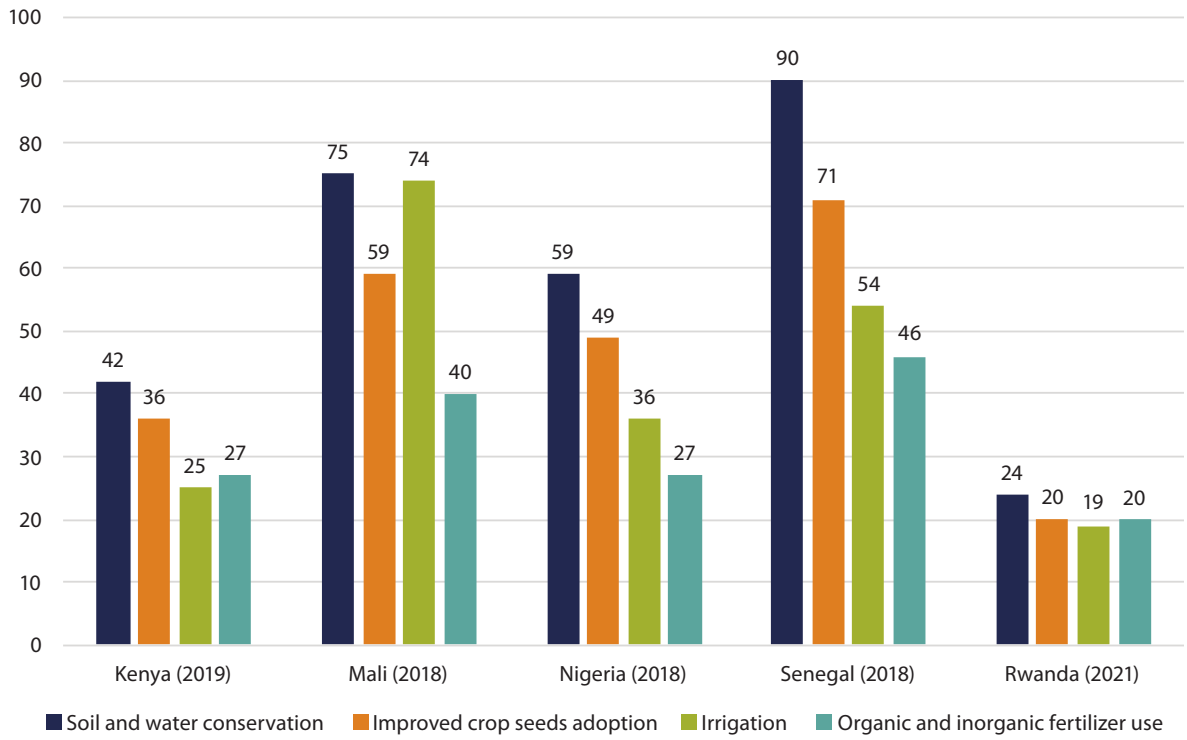
The establishment of the Loss and Damage Fund, created at COP27 in Egypt, backed by $792 million in commitments, marks a positive stride forward. However, this sum falls short of the estimated $290 to 440 billion needed to comprehensively address Africa's loss and damage requirements (Hemingway Jaynes 2023). Africa also needs enhanced support to attain its climate finance targets, especially in fulfilling the New Collective Quantified Goal on Climate Finance commitments and accessing domestic funds effectively (Guzmán et al. 2022).

Scaling of Adaptation Actions

Several interventions have been piloted and found successful in reducing the adverse impacts of climate risk on agricultural production and rural livelihoods in Africa. However, the extent of scale-up and scale-out is very limited. The adverse effect of climate change will be effectively reversed only if adaptation actions are implemented at scale to cover wider areas and to address a significant number of vulnerable groups. Unless countries can scale up best practices and invest to the extent that generates economies of scale, it is unlikely that any meaningful resilience will be achieved.

Figure 7.11 shows the extent of scale-up needed to fully reverse the lost agricultural production and productivity attributed to climate change in selected countries: Kenya, Mali, Nigeria, Rwanda, and Senegal. For example, to fully recover lost agricultural production in Mali, the total area covered by

FIGURE 7.11—SCALE-UP REQUIRED TO COMPENSATE FOR THE IMPACT OF CLIMATE CHANGE, IN PERCENTAGES



Source: Authors' compilation from economy-wide modeling by AKADEMIYA2063.
Note: Numbers in parentheses indicate baseline years.

soil and water conservation practices in 2018 must be scaled up by 75 percent. Alternatively, it would be possible to reverse the adverse impacts of climate change if Mali increased the area under irrigation by 74 percent. This means that if Mali's agricultural sector is to remain resilient and avoid a significant reduction in agricultural GDP, the country must significantly increase its level of investment in scaling existing adaptation interventions. This interpretation applies to other countries as well.

Effectiveness of Climate Information Services

Africa's vulnerability to climate change impacts has led to a growing focus on weather and climate information services (WCIS) in recent years (Hansen et al. 2022; Ofoegbu and New 2022). These services provide valuable climate-related information to various stakeholders, including farmers, policymakers, and humanitarian organizations, to help them make informed decisions and build resilience to climate variability and change. A variety of innovations have been developed by a wide range of global and regional institutions to provide predictive climate information services. However, the level of uptake and impact of these services is not yet significant.

The use of WCIS in Africa varies across regions, sectors, and seasons. In Senegal, for example, at the beginning of the rainy season, nearly 80 percent of farmers were found to have used WCIS to decide on sowing dates and about 60 percent to decide on crop varieties. In the middle of the growing season, about 70 percent used WCIS to decide on fertilizer application dates (Ouedraogo et al. 2021). Factors limiting the use of WCIS include accessibility of information, communication channels, awareness, education, and socioeconomic conditions. In some areas, particularly where WCIS is well established and tailored to local needs, uptake has been significant, leading to positive impacts on livelihoods, agriculture, water management, and disaster risk reduction.

Several studies have documented the impacts of climate information services in Africa (Djido et al. 2021). These impacts range from improved agricultural productivity and food security to enhanced water resource management and reduced vulnerability to climate-related disasters. For example, farmers who receive timely climate information are better able to plan their planting and harvesting

activities, leading to increased yields and incomes. Similarly, early warning systems based on climate information help communities prepare for and respond to extreme weather events, reducing loss of life and property damage. However, these impacts are very much context-specific and limited to certain areas and farmers.

Governance of Adaptation Actions

Collaboration among communities, governments, and both private and nonprofit organizations is paramount for effective climate adaptation actions. However, managing this collaboration poses significant challenges, and it often proves less effective in practice. Many African countries have established multisectoral climate change leadership and technical working groups, meticulously designed to incorporate representatives from government ministries, civil societies, donor groups, academia, and the private sector, with clearly outlined objectives.

Despite their well-defined structures and articulated objectives, these working groups frequently lack practical effectiveness and influence. Meetings are irregular, and when they occur, discussions tend to focus on less strategic and binding issues, such as approving or validating policy documents. Consequently, they struggle to effectively coordinate activities, prevent redundancies, and design collaborative efforts.

Recognizing this challenge, some countries, such as Rwanda, have taken proactive steps to address it by reorganizing their climate change working groups based on a programmatic approach. This approach aims to consolidate smaller climate change projects into selected flagship programs that can be implemented at scale. Moreover, it facilitates the alignment of stakeholders working in the same programmatic area, enabling them to contribute to the design, implementation, and evaluation of these programs. This strategic restructuring holds promise for enhancing the effectiveness and impact of collaborative climate adaptation efforts.

Apart from the stakeholder coordination challenge, some adaptation action requires a governance system that involves the active and genuine participation of local communities to make sure that the actions result in sustainable outcomes. Typical examples are adaptation actions related to ecosystem management. Common ecosystem management practices in Africa include community-based natural resource management, protected area management, sustainable forestry, agroecology, and watershed management. These approaches often involve collaboration between local communities, governments, and organizations to balance conservation with human needs, promoting biodiversity, sustainable resource use, and resilience to environmental changes.

This suggests that if countries wish to be effective in implementing adaptation plans and achieving sustainable outcomes, they should commit to revisiting and strengthening their climate change governance systems. An effective system provides the framework, policies, and mechanisms needed to address the impacts of climate change at local, national, and international levels. Good governance ensures coordination among stakeholders, allocates resources efficiently, fosters innovation, and promotes accountability, all of which are essential for successful adaptation efforts. Without proper governance structures in place, adaptation actions may be disjointed, insufficient, or ineffective in addressing the challenges posed by climate change.

Tracking Adaptation Actions and Outcomes

As discussed in Section 2, unlike measuring mitigation, it is very difficult to measure adaptation capacity through a single indicator. Measuring climate adaptation capacity poses several challenges due to the multiplicity of adaptation changes required to build resilience. One major challenge lies in establishing comprehensive and standardized metrics to assess adaptation progress across different regions and sectors. Adaptation strategies vary widely based on local contexts, making it difficult to create universal measurement criteria. Additionally, attributing specific outcomes solely to adaptation actions can be complex, as various factors contribute to climate resilience. Any indicator for measuring adaptation should be a composite indicator that captures all aspects of structural adjustments through the adoption of technologies, institutional innovation, and infrastructural developments as well as behavioral changes. Currently, such a metric does not exist. Limited data availability, high cost of data collection, and the long-term nature of adaptation efforts further complicate measurement, often resulting in difficulty tracking and evaluating the effectiveness of implemented adaptation measures.

The presence of several climate change initiatives with varying monitoring and evaluation systems also makes the measurement and tracking of adaptation actions and outcomes very challenging and inconsistent. The different initiatives use different performance indicators and targets, making it complicated to perform comparisons across countries and years. A consistent and comprehensive central database system that can serve as a source for all initiatives and tracking needs across all countries would help to address this.

Conclusion and Recommendations

This chapter has undertaken a comprehensive examination of the conceptual and practical dimensions surrounding climate adaptation efforts in Africa, with a particular emphasis on the agricultural sector. Agriculture is not only the backbone of many African economies and livelihoods but is also the sector most profoundly impacted by climate variability and extreme events. As a result, almost all African countries have identified agriculture as a priority sector for their climate adaptation action. However, our analysis has revealed that, despite noteworthy advancements under several Malabo indicators, African agriculture remains susceptible and insufficiently resilient to climate shocks. Approximately 4 out of 10 agricultural households remain vulnerable to these disruptions. Moreover, the shift away from agriculture and the proportion of public expenditure allocated to the sector is weakly correlated with enhancements to agricultural resilience.

Though the level of implementation and investment in agricultural adaptation remains disconcertingly low, Africa has demonstrated commitment through the development and submission of nationally determined contributions and elaborated national adaptation plans. These plans encompass a diverse array of adaptation actions, which can be categorized into six adaptation pathways based on their impact pathways and co-benefits. Such categorization aids countries in prioritizing actions relevant to their specific contexts, enhancing the effectiveness of implementation efforts.

Bridging the gap between plans and actions requires concerted efforts and strategic interventions. Drawing from our analysis, several recommendations emerge for shaping the post-Malabo climate adaptation agenda. These recommendations are as follows:

1. **Align continental and national adaptation plans and tracking systems.** Harmonizing climate adaptation strategies and plans at regional, continental, and national levels is paramount. Consolidating these efforts under a unified NAP facilitates prioritization and implementation across sectors, while also streamlining tracking mechanisms for adaptation ambitions and actions.
2. **Strengthen institutional capacity.** Building technical expertise, institutional structures, and coordination mechanisms is critical for effective adaptation planning and implementation. Governments should invest in capacity-building efforts spanning national, regional, and local levels to support adaptation initiatives comprehensively.
3. **Support knowledge sharing and capacity development.** Facilitate knowledge sharing and capacity development across nations, communities, and stakeholders to increase understanding of climate risks and adaptation choices. This might entail fostering South–South collaboration, peer learning networks, and access to climate knowledge and technology. The capacity building should focus on investing in research and development for generating technologies and innovations that help to enhance adaptations at farm and community levels.
4. **Enhance climate information services.** Timely and reliable climate information is indispensable for informed decision-making and planning. Policies should prioritize the development and dissemination of climate information services tailored to local needs, encompassing early warning systems, risk assessments, and sector-specific forecasts.
5. **Mainstream adaptation into sectoral policies.** Integrating adaptation considerations into sectoral policies and planning processes is essential for fostering climate resilience across key sectors. Governments should mainstream adaptation into sectoral policies, investment plans, and regulatory frameworks to ensure climate-compatible development.
6. **Boost community-based adaptation actions.** Supporting community-led adaptation initiatives strengthens local resilience and empowers vulnerable communities. Policies should promote participatory approaches, local knowledge systems, and community-led adaptation planning processes, with a focus on marginalized groups.
7. **Enhance financial mechanisms for adaptation**. Mobilizing adequate and predictable finance is crucial for effective adaptation implementation. Policies should prioritize the allocation of public funds for adaptation, explore innovative financing mechanisms, and enhance access to international climate finance sources.

By heeding these recommendations and adopting a holistic approach to climate adaptation, Africa can bolster its resilience to climate change, safeguard livelihoods, and foster sustainable development in the face of evolving climate challenges.