REPORT

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Harvesting climate action across Kenyan counties

Insights from Nyandarua

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Key messages

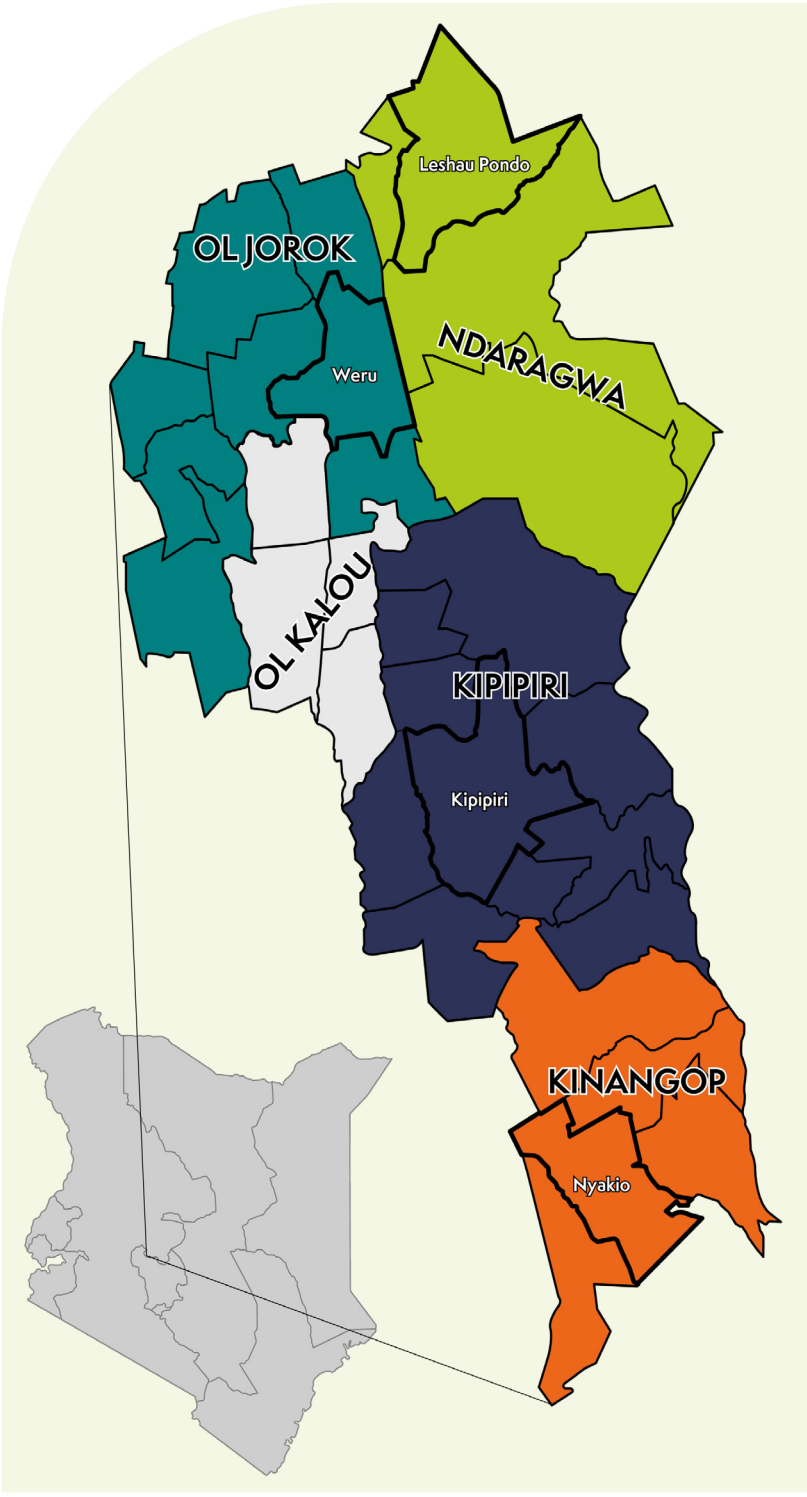
- The devolution of agriculture in Kenya gives the counties the agency to diversify and implement climate action.
- The leading value chains in Nyandarua are potatoes and dairy. There is a need to have cold storage warehouses for potatoes spread throughout the county rather than only at the county headquarters (Ol Kalou). This would tackle the transport challenge and minimize post-harvest losses.
- Priorities for climate action implementation in Nyandarua County in the coming years include green energy adoption, afforestation, and reforestation in line with the 15 billion trees policy in Kenya before 2032 (30% tree cover set by Kenya Forest Services), increased funding for climate change projects, reduced bureaucratic process for accessing climate finances, introduction of carbon credits and markets, and increased adoption of climate resilient planting materials.
- The county government of Nyandarua strongly advocates planting indigenous trees and removing eucalyptus, especially in wetlands.
- Knowledge development and sharing on climate change needs to be stimulated in Nyandarua County. This could be accomplished by including climate change in the school curricula and offering other knowledge-sharing activities. This will help build an environmentally aware generation that can contribute to a sustainable future.

Introduction

Like many other nations, Kenya is grappling with the profound impacts of climate change on its agri-food systems. In response to this pressing challenge, the Kenyan government has formulated climate change policies to safeguard food security, promote sustainable agriculture, and mitigate greenhouse gas emissions. Thereby, climate-related policies, regulations, and frameworks are developed at the national and county levels to support climate change adaptation. The counties, however, formulate individual policies that align with those at the national level, which should then lead to the implementation of climate actions that county governments coordinate. All 47 Kenyan counties have created a unique County Integrated Development Plan (CIDP) outlining the strategies to stimulate county developments over the upcoming five years. Climate activities to be carried out over this period are essential elements of these frameworks.[1] Devolution of the agricultural sector empowers the counties to diversify and implement climate actions in its food systems while collaborating with the national government to strengthen community climate adaptation.[2]

As a potential solution to climate change impacts, Nyandarua County has adopted adaptation and mitigation measures in crop and livestock production such as agroforestry, tree planting, climate-smart-agriculture, fodder production and preservation, strip cropping, irrigation, and water harvesting. Apart from the on-farm adaptation and mitigation measures, the county government and non-governmental institutions offer off-farm services such as early warnings, farmer training, artificial insemination, and input provision to improve farmers' resilience to climate risks.[3] Several organizations provide training services to farmers on good agricultural practices, sustainable agricultural production and opportunities for value addition. However, few farmers can access these extension services due to the county's low number of extension officers. Further, only a small population of farmers utilizes the information on weather forecasting and early warning provided by the Ministry of Agriculture and Livestock.[3] Financial institutions, including banks, microfinance, and insurance companies, offer financial services to facilitate and strengthen farmers' action towards climate resilience. However, the agricultural loan and insurance uptake is low in the county due to high interest rates and too many (administrative) requirements needed to obtain loans.[3] Moreover, several climate-related policies, regulations, and frameworks have been developed at the national and county government levels to support the implementation of adaptation strategies.

Despite the significant initiatives by the county government and other stakeholders in climate adaptation and mitigation, implementation of climate actions is not yet happening at a desirable pace. This paper analyses the effectiveness of climate-related policies in accelerating the implementation of adaptation strategies in Nyandarua County.



Charting a new climate course: Policy, awareness and transformation

Agriculture is the main economic activity in Nyandarua County. The sector is affected mainly by climate-related hazards such as extreme precipitation, prolonged dry periods, and unpredictable and irregular rainfall patterns that adversely affect crop and livestock production. As a result of climate change, farmers in Nyandarua County are noticing an increase in incidences of invasive pests and diseases, floods, and frequent, prolonged dry periods that result in crop failures, which has a ripple effect on food insecurity. Climate change affects livestock production both directly and indirectly. A reduction in livestock productivity is a direct consequence of animal diseases and a decrease in the yield of feed crops and forages. The maturing of cows takes longer than several years ago due to climate-related issues. Subsequently, the cost of crop production has increased due to over-reliance on fertilizer and pesticides.[3]

To mitigate climate-related challenges, the county government and other stakeholders have collaborated to formulate policies and strategies addressing climate change and its effects. All these initiatives are geared towards mainstreaming climate change activities in county-specific programs and development plans.[1]

Like in other Kenyan counties, climate change policies formulated in Nyandarua County are aligned with the national government policies to safeguard the ecosystem against extreme climatic changes. For instance, through the Climate Change Act (2016) and the National Adaptation Plan (2015-2030), **the county government of Nyandarua encourages its residents in areas around Aberdare, Njabini, Kinangop, Geta, and other sub-counties to plant trees, to achieve the 30% tree cover targeted by the national government by the year 2032.** These tree-planting strategies conserve the soil, reduce the severity of frost in damaging crops, and create carbon sinks.[3]

Regarding the awareness of climate change policies, awareness is low among youth, women, and small-scale farmers. This could be attributed to insufficient funds for awareness creation activities, a lack of basic structures and methodologies to reach farmers, and costly face-to-face engagements.

Nyandarua County is actively developing specific climate-related policies to address climate challenges. Some of the county-specific frameworks include the County Environmental Action Plan (currently in draft stage), County Environmental Policy, Climate Action Plan (draft), and the County Waste Management Plan (draft). Through the Nyandarua CIDP, the county government has formulated a tree harvesting policy that regulates tree harvesting through controlled issuance of tree harvesting permits.[1] Other notable policies are the disaster policy that deals with livestock offtake during dry periods, and the issuance of relief food, livestock feeds, seeds, shelter, and water. National policies cascaded to the county level include the Forest Act, which guides how to attain 30% tree cover by 2032; The National Water Policy 2020; and The National Water Harvesting and Storage Policy 2010, which both outline how to conserve, manage and store water; and the Kenya Climate-Smart Agriculture Strategy which guides on investments and implementation of CSA activities guaranteeing productivity and food security while addressing climate adaptation and mitigation, (for example through the use of climate-smart crop varieties). The prerequisite for alignment to national policies reiterates the need for a close collaboration between the national government and county governments for climate policies to be effective.[4]

Despite formulating various climate policies, numerous challenges are associated with their implementation in the county. Due to a lack of funds, the enforcement of climate change policies is being derailed and, therefore, less effective. **A potential approach to accelerate climate policy implementation is to allocate funds to more climate action-related activities, stimulate field**

A farming field in Nyandarua County. Photo: Wiebe Smit

visits by policymakers in the county government to broaden their understanding of the current situation that farmers are facing and promote awareness through training.

Resilience in a changing world: Navigating climate challenges in Nyandarua

Climate change adaptation strategies in agriculture entail practices that ensure sustainability in agricultural production despite the changing climate.[5] In Nyandarua County, farmers have implemented various adaptation practices at the farm level to address the challenges posed by the changing climate. These practices are vital for ensuring food security, enhancing agricultural sustainability, and building resilience. One of the key strategies farmers implement in the county is agroforestry, where they intercrop their fields with fruit trees. This diversifies their agricultural production and contributes to increasing tree cover in the region, which has numerous environmental benefits.[6] Another crucial adaptation practice is conservation agriculture. This approach involves minimum tillage, crop rotation, and the use of crop cover. By reducing soil disturbance and promoting sustainable land management, farmers can maintain soil fertility, prevent erosion, and mitigate the impact of erratic rainfall patterns. Additionally, innovative technologies have found their way onto farms. Though at a small scale, greenhouse technologies are being used to provide a controlled environment for crop production, which can be particularly effective in changing weather patterns.

Farm waste management is another essential aspect of adaptation, with the installation of biogas systems being an innovative and promising initiative. These systems help reduce waste and produce renewable energy, further contributing to sustainable farming practices. To address the specific challenges associated with drought and diseases, farmers opt for climate-smart crop varieties that are more tolerant and have shorter maturity periods. This helps them adapt to changing climate conditions and improve overall productivity.

Farmers in Nyandarua utilize organic manure, crop rotation, mulching, and crop covers to improve soil water retention and increase soil carbon and organic matter. These practices enhance the overall soil health and resilience to changing weather conditions. In addition to these soil-focused strategies, farmers have embraced the "push-pull" technology approach to control pests. This involves intercropping crops like maize with repellent "push" plants like desmodium among maize rows and trapping "pull" plants like Napier grass on the farm's edges. This method effectively manages pests such as fall armyworms by luring them away from the main crops, disrupting their reproductive cycle, and reducing pest populations.[7] Climate change has led to new crop pests and diseases and increased resistance to conventional pest control methods.[8] To address these challenges, there is an urgent need for targeted support in Nyandarua.

Most regional producers rely on rainfed agriculture, but erratic rainfall patterns have prompted the adoption

Pastures and fodder production site at an agricultural training center in Oljo Orok. Photo: Wiebe Smit

of manual irrigation techniques. Few farmers use drip irrigation since reliable irrigation practices require access to resources like boreholes, water pumps, pipes, and solar energy. Unfortunately, many farmers lack the necessary funds to purchase or construct these facilities, hindering their ability to optimize irrigation and crop production. Furthermore, the available water resources are often insufficient to meet the needs of the entire community, which presents a significant challenge in the region.[3] However, water conservation methods such as water harvesting through tanks, wells, and ponds are implemented. These methods help manage water resources effectively, slightly reducing the impact of water scarcity on agricultural production.

In addition to the adaptation measures, farmers are engaging in mitigation practices to reduce greenhouse gas emissions. Examples of mitigation practices that farmers commonly implement include biogas production to curb deforestation, planting trees, and, to a lesser extent, using solar energy. Being the second-largest milk producer in the country after Kiambu, Nyandarua County has the potential to generate biogas at a large scale.[9]

Despite farmers' efforts to implement climate adaptation practices, they face several challenges. **The successful adoption of adaptive agricultural practices by farmers faces a significant challenge in the form of labour constraints. While offering promising solutions for enhancing farm resilience and sustainability, these practices are inherently labour-intensive. The geographical and seasonal dynamics of Nyandarua's agricultural landscape contribute to labour squeezes during specific times of the year, potentially hindering the widespread uptake of these innovative approaches.** The resulting mismatch between the labour demand of these adaptation options and the available workforce poses a critical bottleneck, necessitating careful consideration and targeted interventions to ensure the seamless integration of these practices into the agricultural fabric of Nyandarua. **Addressing the labour issue is paramount to unlocking the full potential of these adaptive strategies and fostering a more resilient and sustainable farming future in the region.** Being a county that produces large quantities of potatoes, farmers face post-harvest loss problems due to a lack of proper cold storage rooms, leading to spoilage and subsequent loss of income. Further, market prices remain very volatile, and, in most instances, producers sell their produce at low prices.[10] Farmers also lack sufficient funds to purchase farm inputs such as certified seeds and pesticides. Farm production costs continuously increase, and some suppliers sell low-quality seeds or even counterfeit inputs. Mulching is an important soil water conservation method. However, realizing sufficient grass cover for mulching is difficult on larger pieces of land, derailing the adaptation efforts. A drawback to mitigation efforts is planting the wrong type of trees, especially in swampy areas. Some farmers still plant trees such as the eucalyptus, which have been determined to provide little support to local biodiversity. The county government strongly advocates planting indigenous trees and removing eucalyptus, especially in wetlands.

> "Addressing the labour issue is paramount to unlocking the full potential of these adaptive strategies and fostering a more resilient and sustainable farming future in the region."

Overall, the adaptation strategies implemented by farmers in Nyandarua County are multifaceted, combining sustainable agricultural practices with innovative technologies. These measures are not only enhancing the resilience of the agricultural sector in the face of climate change. Still, they are also contributing to the region's environmental conservation and sustainable development. However, concerted efforts are necessary to support existing mitigation and adaptation gaps.

Nurturing knowledge: Empowerment, skill development and resource engagement

There is a strong emphasis on education and awareness creation on climate action in Nyandarua. Farmers are being trained on modern climate-smart farming techniques through Common Interest Groups (CIG) training, meetings commonly known as barazas, peer-to-peer learning and digital platforms. This ensures that farmers have access to up-to-date knowledge and resources for making informed decisions about their agricultural practices. Farmers also receive training from NGOs in farmer field schools. The main channels for accessing Climate-related information include radios, television programs such as Shamba Shape Up, and social media platforms such as WhatsApp, Google, and

digital SMS platforms (KALRO weather forecasting, Mshamba, iShamba, and Farmgo by YARA). Farmers also embrace peer-to-peer learning, face-to-face training, and traditional knowledge as essential sources of climate-related information.

NGOs implement specific programs in partnership with the county government to support climate change adaptation targeting different sectors. Examples of such projects include Kenya Climate Smart Agriculture Programme (KCSAP) by the World Bank, which trains farmers on biogas production, solar systems, agroforestry, and conservation agriculture; and Financing Locally-Led Climate Action (FLLoCA), also by the World Bank, which aims to deliver locally-led climate resilience actions and strengthening the county and national government's capacity to manage climate risks. Farmers are also trained in climate-smart agriculture, installing kitchen gardens, Push-pull technology implementation, manual irrigation, good agronomic practices, waste management, and value addition. Different organizations, especially NGOs, provide such targeted training. Small-scale producers participate in knowledge sharing through training in farmer groups, chief barazas, and obtaining information from lead farmers (who are experienced and knowledgeable farmers disseminating new agricultural practices, technologies, and information to other farmers in their community. They can identify appropriate inputs and learn about new farming practices and technologies through such engagements.

Apart from sensitization and training, the government and other stakeholder groups provide farmers with climate-related resources such as input subsidies, financing, and farm inputs to support climate action implementation. For instance, the Cereal Growers Association (CGA) supplies farmers with farm inputs such as certified seeds, and the Farm to Market Alliance (FTMA) provides biogas production subsidies to farmers as well as mechanization support. Despite this support, the burden of the cost of production remains relatively high, hence posing difficulties in scaling up farm production.

Stakeholders, including Kenya's national and county governments and other development partners (GIZ, World Bank, World Food Programme, African Development Bank, community-based organizations, and the European Union), collaborate to finance and implement climate change-related projects. Some of the projects that showcase partnerships between different stakeholders are the World Bank's KCSAP project, which promotes climate-smart practices, and the FLLoCA program, which is carried out by the government but funded by the World Bank. FLLoCA aims to strengthen local resilience to the impact of climate change, natural hazards, and other shocks/stressors by building local capacity to plan, budget, implement, and monitor resilience investments in a way that promotes collaborative partnerships between communities and national and county governments. **Despite these efforts, climate change funds remain insufficient in Nyandarua, limiting the effectiveness of mitigating climate change challenges. Therefore, channeling more funds to the grassroots level is essential to implement efficient and timely adaptation and mitigation measures.** The county government of Nyandarua could heavily improve this process by properly planning and budgeting the delivery of climate solutions in the county effectively. Thereby, improved coordination between different knowledge disseminators

Biogas production. Photo: Wiebe Smit

is required to provide more support to farmers rapidly. However, the county also faces challenges accessing climate funds due to unrealistic or burdensome donor requirements.[3] This strongly affects the capacity of the county to deliver necessary support and implement climate actions.

Despite education, training, and awareness raising on climate change policies, farmers' adoption of climate change coping strategies is still low, and access to information is also relatively low among farmers. For example, youth farmers lack information on accessing climate action grants and loans. This implies that farmers need additional and consistent climate change training and support to ensure effective implementation of climate actions. **Farmers in Nyandarua would benefit from more available climate funding, additional Training of Trainers (ToT) on climate change adaptation, and introducing climate change as a topic in the education curriculum. Furthermore, there is a need for extensive training of youth farmers on climate action implementation, the development of a proper reward system for implementers of climate actions, and increased overall resource mobilization in the fight against the effects of climate change.**

To build farmers' capacity to adapt to climate change effects, there is a need for funding in the form of loans and grants or subsidies to support the construction or purchasing of water harvesting structures, farm inputs, tractors, and irrigation systems. Farmers would also benefit from constructing adequate storage facilities and warehouses within their communities, especially for the potato value chain. Localization of milk cooling plants is equally essential. Finally, farmers need additional support in appropriately managing water resources and accessing insurance mechanisms.

Catalyzing collaborative capacities: Building alliances for impact

Effective climate action implementation relies on a well-crafted process of co-production of actionable knowledge involving all relevant stakeholders.[11] The national government is critical in formulating climate policies through relevant ministries, departments, and agencies. For instance, the Kenya Agricultural and Livestock Research Organization (KALRO) has been mandated to support the development of policies around environmental utilization and conservation related to crops, seeds, and livestock breeding. Policy formulation and implementation consist of individuals across different levels collaborating to identify the gap through public participation forums before an action plan is developed to formulate a policy direction. Players in various sectors (environment, water, and agriculture) prepare possible policy issues and forward them to other stakeholders, like the county government, for review before implementation.[1]

> Major restrictions to stakeholder engagement lead to infrequent meetups which is a bottleneck for timely decision-making.

Through platforms such as workshops, conferences, institutional research centres such as universities, field days, national agricultural shows, books and pamphlets, and WhatsApp groups, stakeholders are informed and trained on various climate challenges, and possible climate change policies for formulation are identified. In Nyandarua County, plans are underway to form a climate change body. The mandate of this body is to monitor NGOs and other stakeholders in issues concerning climate change engagement. **Some of the major restrictions for stakeholder engagement in this process are linked to financial challenges, such as logistics costs for attending meetings and forums. This results in infrequent meetups between stakeholders and thus becomes a bottleneck for timely decision-making.** Therefore, some funds are required to facilitate appropriate stakeholder engagement through these types of meetings.

Monitoring, assessing and appraising progress

Continuous monitoring and evaluation (M&E) of climate actions in Nyandarua's food system is critical as it helps to identify best practices of climate mitigation and adaptation initiatives. Currently, M&E in Nyandarua consists of farm visits to observe whether adaptation measures are implemented at the grassroots level. For the county department of agriculture, there is dedicated M&E staff that monitors the progress of various projects in the county, whereas for monitoring NGO activities, there are dedicated coordinators (desk officers). A set of indicators is used to assess the efficiency of ongoing activities led by county and non-county actors. **The main challenge,**

however, is the limited number of staff available to conduct M&E. If the human capital available for conducting M&E would be increased, better mapping of best practices (or failures) would help the county identify efficient projects and activities in the future.

Way forward

A comprehensive and collaborative way forward is essential to address the climate challenges in Nyandarua County. First and foremost, there should be an increased focus on funding and resource allocation to support climate action initiatives. This includes allocating funds to climate action-related activities, field visits by policymakers to understand farmers' needs better, and promoting awareness through training programs. These funds should also be channeled to the grassroots level to ensure efficient and timely implementation of adaptation and mitigation measures. Additionally, there is a need to enhance awareness and knowledge dissemination among various stakeholders, focusing on farmers. This can be achieved through educational programs and training, using digital platforms and traditional knowledge sharing. Climate change should be incorporated into the national education curriculum to ensure the younger generation is well-informed about climate challenges and action opportunities.

Specific strategies should be implemented to bolster climate resilience and adaptation in agriculture, including promoting sustainable practices such as agroforestry, conservation agriculture, and climate-smart crop varieties. Farmers should also be encouraged to adopt innovative technologies like greenhouse farming and biogas production. Access to irrigation infrastructure, including drip irrigation, should be improved, and water conservation measures should be encouraged. The county government should also support constructing and decentralizing proper storage facilities and warehouses, especially for crops like potatoes and milk cooling plants. Collaboration among stakeholders is vital for effective climate action. This includes partnerships between national and county governments, NGOs, development partners, and the private sector. Thereby, the formation of a climate change body in Nyandarua County can help monitor and coordinate the efforts of various stakeholders. However, addressing financial challenges that hinder stakeholder engagement in meetings and forums is crucial to ensure effective collaboration. Finally, monitoring and evaluation of climate actions must be a continuous process. More resources should be allocated to increase the capacity for monitoring and evaluation, which will help identify best practices and areas for improvement. By following this comprehensive way forward, Nyandarua County can make significant progress in climate change adaptation and mitigation, ultimately enhancing the resilience of its agri-food systems.

Recommendations

The most important requirement for building a resilient livelihood is increasing the efficiency of scarce resources in the productive system. Different stakeholders can adopt various measures in the short, medium, and long terms to collectively contribute to addressing climate change. To ensure the potential success of climate change policies, relevant stakeholders have developed frameworks to enhance future sustainability and support mitigating climate change effects and resulting vulnerabilities.

Some of the priorities for climate action implementation in Nyandarua County in the coming years include green energy adoption, afforestation and reforestation (in line with the 15 billion trees policy in Kenya before 2032), increased funding for climate change projects, a more simplified bureaucratic process for accessing climate finances, the introduction of carbon credits and markets, and the increased use of climate resilient planting materials. The following recommendations are made to the Nyandarua county government to accelerate implementation and, in addition to that, support climate resilience among farmers in the county:

- To address the local community's low awareness of climate change policies, the county government should develop more sustainable models to reach as many farmers as possible in partnership with other stakeholders. Examples to support awareness creation are an improved promotion campaign on climate change, increased available climate change funding for the local community, development of robust M&E approaches at the community and institutional level, and co-creating a climate action implementation master plan for the county. Also, the county could benefit considerably from increasing the number of extension officers on agriculture and climate and improving their capacity to enhance the quality of farmer training and education, therewith supporting the CIDP agriculture sub-sector priority number one of 2023 to 2027 on agriculture policies/ legislations and regulatory frameworks, and Provision of agricultural extension support services.[12]

- To address the lack of funding, the government (national and county), in collaboration with the private sector, should formulate appropriate policy, regulatory, and institutional frameworks to promote the creation of and improve access to loans and grants to support climate-smart and low-emission technologies.

- The county government should decentralize services to address the challenge of high transport costs and inadequate access to inputs. For example, the county government could establish input collection points in each ward throughout the county. A warehouse/storage facility could also be constructed locally to reduce post-harvest losses. The latter mainly applies to the Irish potato, which has a meagre shelf life unless properly stored. Building such storage units would align with the County Integrated Development Plan (CIDP 2023-2027) agriculture sub-sector priority three on agribusiness development by facilitating post-harvest handling.[12]

- To address challenges related to the marketing of farm produce (for example, the volatile prices of commodities and access to markets), the county government, in collaboration with private organizations, should further emphasize the promotion of agricultural marketing through policies, training, and capacity building to support post-harvest value addition and reduce food losses among farmers. Additionally, farmers should be better linked to existing markets to avoid losses. Farmers should embrace collective action in the form of farmer groups at the production and marketing levels as a potential way of spreading costs/risks. The county government could support farmers in taking collective actions.

- To ensure efficiency in seed generation (which is a CIDP agriculture sub-sector priority number two), better partnerships should be developed between farmers, researchers (seed breeders), and other relevant stakeholders. Farmers should be recognized as active seed generation agents rather than relying on external partners for seed production. This will ensure that newly produced seed varieties better incorporate the needs of farmers.

- To enhance climate action efforts, the government should consider introducing climate change in the educational curriculum right from the primary school level. Even if this proves challenging to implement due to the national coordination of curricula in Kenya, the county could organize activities focusing on climate change and climate action for school children to stimulate awareness creation. This will help students make better choices, live sustainably, and join the fight against climate change. Starting to learn early will create environmentally aware citizens for a sustainable future.

- In partnership with the private sector, the government should invest in clean energy. Farmers should be supported in the establishment of solar pumps and biogas production. This would significantly contribute to climate change mitigation in the county.

- To avoid project duplication, the county government should work closely with other implementing organizations to improve efficiency and streamline climate action implementation in the county. This could also free up funds, which could be used for other climate-related activities. For example, some farmers in the county have started a form of contract farming in the ***Canola*** value chain with an organization called Agventure. This crop generates revenue for farmers and has extensive benefits to the soil due to its nitrogen-fixing properties. The crop also supports biodiversity. Equally, biogas production seems to be gaining momentum in the county. Through consolidated efforts, the county government can advise the other stakeholders on areas to support to avoid duplication.

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Acronyms

CGA	Cereal Growers Association
CIDP	County Integrated Development Plan
CIG	Common Interest Groups
CSA	Climate Smart Agriculture
FLLoCA	Financing Locally-Led Climate Action
FTMA	Farm to Market Alliance
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
KALRO	Kenya Agricultural and Livestock Research Institute
KCSAP	Kenya Climate Smart Agriculture Programme
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organizations
SMS	Short Message Service
ToT	Training of Trainers

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CLIM-EAT

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