REPORT

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# Harvesting climate action across Kenyan counties

## Insights from Isiolo

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## Key messages

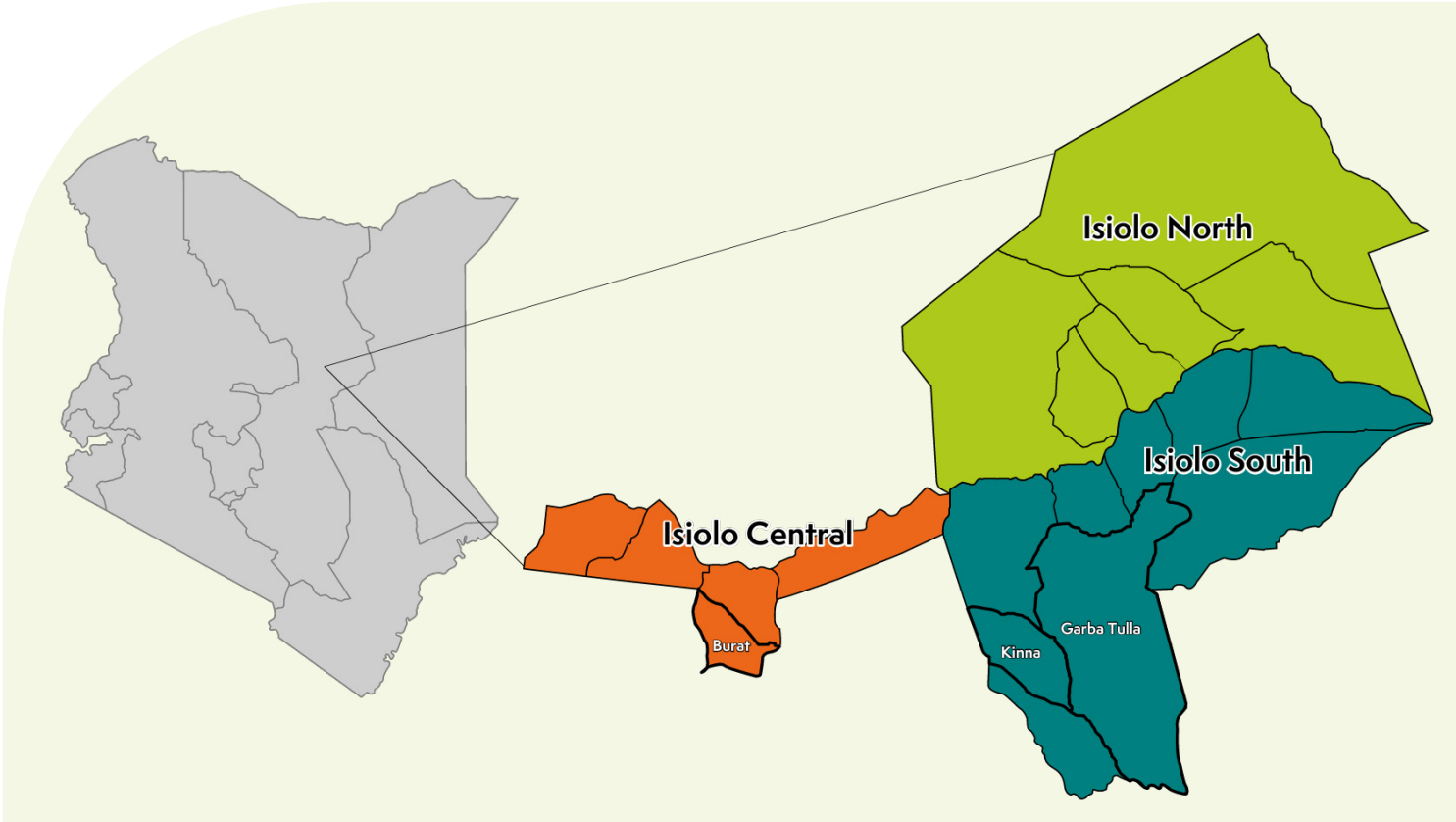
- To address policy implementation gaps, the county government should 1) foster public participation and stakeholder engagement, 2) create a conducive political environment for policy execution, and 3) increase the financial resources allocated to climate policy implementation at the county level.
- The Isiolo County Government recognizes that the current 2% (annual) budgetary allocation is insufficient for adequate climate action. This emphasizes the need to prioritize climate issues and stresses the need for increased budget allocation to supplement initial funds.
- Recently, there has been a shift from pure pastoralism to agropastoralism in Isiolo. However, this shift faces obstacles due to inadequate training in Good Agronomic Practices (GAPs).
- Adoption of camel farming, which is more drought tolerant than traditional livestock, is a possible remedy to climate-related challenges in the livestock sector. However, the costs of acquiring a camel are high.
- There is a positive trend in the adoption of fodder production to supplement the traditional pastoralist practices of purely grazing methods. There is a need, however, to further support fodder production in the county.
- Women's empowerment is critical in combating climate change and improving the food system in Isiolo. There has been a recent increase in women's groups involved in agricultural activities. Supporting these groups may lead to a cultural change, improve women's inclusion in agriculture, and increase food security overall.

## Introduction

Isiolo, one of Kenya's 47 counties, is classified as a hot and dry area for most of the year with relatively low and irregular rainfall, making the county susceptible to drought. Temperatures in Isiolo County can vary, with hot and dry conditions being common. Rainfall is generally limited and unpredictable, and the region frequently experiences periods of water scarcity. The county is classified as an arid and semi-arid (ASAL) area with two rainfall seasons per year: long rains between March and May and short rains in October and November.[1]

Like other ASAL areas, Isiolo is experiencing climate hazards that adversely affect its residents' well-being. Following the agroecological zones framework provided by the Ministry of Agriculture, Livestock and Fisheries (MoALF, 2017), the county consists of three agroecological zones (AEZs). A semi-arid zone that covers 5% of the total land area, an arid zone, and a very arid zone covering 30% and 65% of the land area, respectively. Almost 80% of the communities in the county build their livelihoods around agriculture, particularly livestock production, which accounts for 54% of total household income.[1] Despite its importance, agriculture is highly vulnerable to climate effects and weather variability. Smallholder farmers whose livelihoods are dependent on natural resources are most affected by the effects of climate change. The primary source of livelihood income in Isiolo is livestock-oriented and specifically revolves around nomadic pastoralism. Recently, there has been a slight shift from pure pastoralism to agropastoralism, where livestock farmers adopt crop farming. However, erratic and unreliable rainfall has been a challenge in supporting farming, contributing to the high prevalence of food insecurity and poverty in the county.[1] As a result, most of the county's residents are left hungry and food insecure, forcing them to rely on relief food.[2]

Isiolo County acknowledges the critical importance of climate action and has been incorporating climate considerations into its development plans. Despite existing efforts, there are opportunities to enhance resilience further. Specifically, increasing resources supporting crop and livestock value chains, such as water harvesting and forage production, can significantly improve resilience. Initiatives promoting water and forage availability have the potential to boost production, increase incomes, and ultimately enhance livelihoods. Noteworthy are the county's ongoing adaptation and mitigation efforts, aiming to strengthen the resilience of value chains. Examples include the adoption of drought-resistant and fast-



growing crop varieties among crop farmers, rainwater harvesting and conservation by small-scale producers, and the embracing of conservation agriculture practices. Additionally, practices like intercropping, afforestation, and irrigation have been introduced in various parts of Isiolo. Livestock keepers also implement strategies such as on-farm fodder production and conservation, breeding improved livestock breeds, and animal health management to adapt to the changing climate conditions.[1]

The agricultural sector in Kenya is a devolved function, meaning that agricultural policies are developed and implemented by the county government. Therefore, most climate actions are supposed to be organized at the county level through the County Integrated Development Plans (CIDPs). In addition, the County Government Act of 2012 mandates that county governments ensure appropriate fiscal management and environmental sustainability. The Isiolo County government relies on national policies such as the Climate Change Act of 2016, the National Climate Change Action Plan (NCCAP), and the Kenya National Adaptation Plan (NAP) 2015-2030, as a basis for taking climate action. In the recent CIDP for Isiolo County (2023-2027), the mission under the Agriculture, Livestock, Fisheries, and Special Programs pillar is to improve the livelihoods of Isiolo residents by ensuring food, feed, and nutrition security through sustainable production systems, effective disaster risk management and adaptation to climate change.[3]

Additionally, the agriculture sector goals include 1) promoting the awareness, adoption, and implementation of disaster risk reduction measures across the sectors and communities and 2) mobilizing and promoting efficient utilization of resources for building resilience and disaster response. This shows the recognition by the Isiolo County government that there is a need to address climate-related challenges to improve the resilience of its residents.

The Kenyan Ministry of Agriculture, and Livestock Development (MoALD) has been working closely with the county to formulate policies that guide climate change management. However, there are challenges with implementing these policies as the county's adaptive capacity is hindered by insufficient investments in disaster risk reduction to build resilience, insufficient use of available emergency response funds, insufficient equipment for disaster response, a lack of education, and overall inadequate funding.

## Charting a new climate course

Farmers (mainly agropastoralists) in Isiolo County identify unpredictable rainfall, prolonged drought, floods, and rising temperatures as the region's primary climate and variability challenges. These have led to the depletion of water resources, reduced crop yields, and diminished livestock productivity, and increased household food insecurity. Prolonged periods of drought and heat stress have increased livestock mortality rates and the prevalence of pests and diseases. Farmers identify issues like land degradation and excessive reliance on fertilizers as climate-induced challenges in crop production. The repercussions of climate change disrupt both economic and social activities, necessitating increased reliance on safety nets and relief food support by households.[1] Drought has also exacerbated other environmental problems in the region, such as human-wildlife conflicts, as wildlife moves towards crop and livestock farms for sustenance. The Isiolo County government recognizes the substantial impact of climate change and has actively worked to formulate local policies and initiatives aimed at mitigating climate effects. A notable example is the enactment of the Isiolo County Climate Change Fund Act, which allocates 1.5% - 2% of the annual county budget to support climate action initiatives.[2]

The successful implementation of climate actions heavily depends on stakeholders' awareness, understanding, and perceptions of climate policies and regulations. The overall low awareness of climate policies among the residents of Isiolo County underscores the necessity to improve the dissemination of information on climate policies, particularly among farmers. Government extension officers are crucial intermediaries between the county government and local communities, conveying information related to climate change, best farming

Isiolo was the first county in Kenya to implement the County Climate Change Fund Act, showing its commitment to combating climate-related challenges.

practices, and food system policies. Their efforts are complemented by village-based advisors (VBAs) who serve as intermediaries between non-governmental organizations (NGOs) and communities. **However, there is a considerable gap in human resources to reach the entire agropastoral population in Isiolo, highlighting the need for public-private partnerships to enhance human capacity through training interventions.**

## Guiding actions through existing policy frameworks

A robust policy framework is crucial for offering structured guidance in implementing effective climate actions. Policies addressing climate concerns have been developed at both national and county government levels by regulatory bodies tasked with ensuring environmental sustainability. National climate-related policies, such as the Kenya NAP 2015-2030, emphasize low-carbon climate resilience and prioritize pillars such as food and nutrition, water and the blue economy, disaster risk reduction, and natural resource management.[4] These national policies are adopted at the county level, where localized policies are formulated before being actioned in the county.

The County Government of Isiolo has implemented the County Climate Change Fund Act (CCCF), 2018, creating a framework to fund and coordinate climate action locally and allocating 1.5%–2% of the county's annual budget to climate adaptation and mitigation programs.[5] Isiolo was the first county in Kenya to implement this Act, showing its commitment to combating climate-related challenges. The implementation of activities funded through the CCCF are monitored by the County Steering Committee and (local) Ward Planning Committee. Approximately 70% of this fund is dedicated to climate-specific county projects, with the remaining 30% dedicated to related activities (awareness creation and research & development (20%) and administration (10%)).

Other relevant policies include the Rangeland Management Bill, focusing on restoring and managing rangelands to enhance community resilience, and the Isiolo County Energy Master Plan, presently in development, which aligns with the Integrated National Energy Plan that aims to improve energy production efficiency in the country. This alignment has the potential to directly enhance food systems by ensuring reliable and sustainable energy sources for agricultural processes, storage, and distribution, thereby boosting productivity and resilience in the food supply chain. Further, Isiolo has a county contingency plan under the Disaster Risk Reduction Strategy that focuses on a community-led, participatory approach, including a climate risk assessment and the development of efficient adaptation and mitigation measures. Additionally, the county government is developing the County Environmental Action Plan (linked to its national counterpart), which aims to integrate environmental issues into development

*Self organized womens farmer group. Photo: Wiebe Smit*

to ensure improved sustainability in the usage of natural resources.

The CIDP and the county spatial plan equally play crucial roles in policy and strategy implementation by serving as frameworks for coordinated and sustainable development. CIDPs provide a comprehensive roadmap for county-level development, enabling the integration of climate considerations into various sectors such as agriculture, water resources, and infrastructure. The county spatial plans, on the other hand, guide land use and spatial development, helping to manage vulnerabilities and enhance resilience to climate impacts, ultimately contributing to effective climate policy and strategy implementation at the local level.

While there are existing climate-related policies and programs, policy gaps persist. The deficiency in policy implementation effectiveness suggests that the mechanisms for translating policies into concrete actions may be lacking or poorly executed. The inadequate allocation of funds implies that the financial resources earmarked for climate-related initiatives fall short of what is necessary for comprehensive and impactful implementation. Additionally, insufficient awareness among stakeholders highlights a potential lack of understanding or knowledge about existing climate policies and their implications. **To address these gaps, the county government can enhance policy implementation by fostering public participation and stakeholder engagement, creating a conducive political environment for policy execution, and increasing the financial resources allocated to climate policy implementation at the national and county levels. Furthermore, the recognition that the current 2% budgetary allocation is insufficient emphasizes the need to prioritize climate issues, necessitating an increased budget allocation to supplement the initial funds and ensure more effective climate action.**

## Navigating climate challenges in Isiolo

Livestock production is the primary livelihood practice for approximately 80% of Isiolo County's population. However, climate change poses challenges to both livestock and feed production. The quality of livestock is diminishing due to limited availability of feeds and water, leading to a decline in farmers' incomes from livestock sales.

In collaboration with NGOs, the county government is actively engaged in initiatives to enhance the adaptive capacity of communities by promoting agropastoralism as a means of diversifying incomes. Agropastoralism involves a combined approach to crop production and livestock rearing.[6] **Encouraging diversification, especially a transition from pure pastoralism to agropastoralism and other non-farm activities, is advocated by NGOs and development partners to mitigate food insecurity resulting from climate shocks, reducing dependence on a single income source. Additionally, farmers are adopting drought-tolerant animals, particularly camels, which dominate the region's value chain.** The unique adaptability of camels to arid regions makes them a significant source of milk and meat, contributing significantly to the agricultural landscape of Isiolo.[7] Further, there are efforts to encourage camel farming and the utilization of camel products. One such initiative is the establishment of the Anolei Dairy Women's Camel Milk Cooperative, a women's cooperative society in the county dedicated to processing and distributing camel milk.[8] Nevertheless, the production of camel milk faces challenges, specifically post-harvest losses caused by the absence of an adequate handling facility.[9]

Livestock production is the primary livelihood practice for approximately 80% of Isiolo County's population.

Livestock production in Isiolo generally faces challenges primarily due to a shortage of feeds and fodder. To address this, farmers are increasingly adopting fodder production practices to alleviate forage scarcity. The dissemination of fodder technologies is primarily carried out through extension officers, VBAs, and farmer groups. Farmers commonly use natural grass, Napier grass, maize stover, and bean straw as animal feeds. Additionally, trees such as *Leucaena* are utilized for their fodder value. The Partnership for Resilience and Economic Growth (PREG) initiative supports fodder production in Isiolo County by providing inputs and training to stakeholders involved in livestock farming.

To enhance crop production in the county, VBAs organize training sessions for farmers on crop diversification, involving intercropping and diversifying farm activities with beekeeping and poultry alongside other forms of livestock and crop production. This diversification

strategy helps safeguard farmers against significant losses during dry seasons.[10] VBAs also provide training and assistance to farmers in developing financial savings plans, serving as a financial security measure to overcome credit constraints and accumulate capital for investments in climate-smart practices. **Smallholder savings play a crucial role in scaling up the adoption of climate adaptation strategies**.[11]

In Isiolo County, farmers have implemented water conservation practices, with furrow irrigation being the most widely adopted method. This irrigation approach contributes to consistent crop production even during dry seasons, reducing reliance on rainfall. Additionally, farmers are practicing climate-smart agricultural production, incorporating strategies such as soil fertility management, agroforestry, water harvesting, conservation tillage, and cultivating drought-resistant crop varieties. CSA strategies enhance farmers' adaptation capacity and contribute to reducing carbon emissions. Farmers have embraced early land preparation and planting, facilitating timely actions and creating unfavorable conditions for pests and disease-causing organisms, decreasing pest populations. To manage pests, farmers have also installed shade nets, which act as protective barriers to prevent pests from accessing crops.

*Furrow Irrigation system Photo: Wiebe Smit*

Water is critical in crop and livestock production and plays a vital role in food security. Resolving the water scarcity challenge in the agricultural sector requires a thorough consideration of water management practices.[1] **In Isiolo, small springs managed by community-appointed committees serve as the primary water source, presenting a recurring challenge due to water scarcity at the household level.** Farmers employ conservation agriculture practices at the farm level, minimizing soil disturbance and using cover crops to improve water retention in the soil. Additional water conservation methods include rainwater harvesting and storage using water tanks, as well as well-digging. Farmers' efforts to conserve water are challenged, especially by shallow wells, which lead to rapid water loss through evaporation, and financial constraints hindering the establishment of adequate water storage systems. **Financial support is crucial to help farmers establish efficient water harvesting systems.** The existing furrow irrigation systems, susceptible to water loss and livestock-caused damage, highlight the need to support farmers in adopting modern irrigation methods. The available water is inadequate for the entire community, resulting in water rationing and prolonged waiting times, leaving some communities without access to water. **Therefore, the county government needs to regulate water resources, ensuring equitable access to water for all communities.**

**In Isiolo County, the region derives financial benefits from carbon credits obtained through the Northern Rangeland Trust** (**NRT**). This initiative incentivizes farmers to participate in environmental conservation activities, notably tree planting. The funds generated from carbon credits are allocated with a community-centric approach, directing 70% of the proceeds to the local community, providing a financial boost for sustainable projects and initiatives. Additionally, 30% of the funds are allocated to rangers, contributing to the protection and preservation of the natural environment. This system not only promotes climate-friendly practices but also supports local communities and conservation efforts in a balanced and inclusive manner.

Despite farmers' efforts to implement climate adaptation practices, they encounter several challenges. The transition to camel production is challenged by the high

costs involved. The acquisition of a young camel can amount to approximately KES 70,000 (USD 450), while an adult may cost as much as KES 350,000 (USD 2,250). Furthermore, the shift from pastoralism to agropastoralism faces obstacles due to inadequate training in GAPs. This lack of training hampers farmers' knowledge and skills in efficient crop production. **Farmers have identified a significant ecological concern linked to the proliferation of *Prosopis juliflora*, a shrub used as livestock fodder. Our study reveals a notable paradox wherein this shrub, initially introduced to enhance livestock nutrition, has gained notoriety due to its rapid and uncontrollable spread. The unintended consequences of overreliance on *Prosopis juliflora* as a primary source of livestock feed have raised alarms, as farmers report livestock fatalities resulting from excessive consumption.** Additionally, farmers need more knowledge in bookkeeping, a crucial aspect of planning and forecasting production activities. Finally, the poor state of roads further complicates transporting and selling perishable goods, such as vegetables, to the market, limiting farmer income potential.

Participation in collective action through groups enhances farmers' bargaining power, promotes savings, and mitigates production risks.[13] Despite the prevalence of women's groups, various financial and cultural constraints impede women's active participation in farming. Financial barriers often restrict women's access to resources, such as credit and inputs, hindering their ability to fully engage in agricultural activities. Cultural norms, deeply rooted in the community, further compound these challenges. Traditional gender roles and expectations limit women's decision-making power in farming, often relegating them to supportive roles rather than key decision-makers. Religious and cultural practices, which may influence societal norms, can also contribute to the constraints faced by women in agriculture. Customary land ownership patterns, where much of the land is owned by men, create additional hurdles for women seeking to expand their agricultural activities. These norms may be reinforced by religious beliefs or interpretations that perpetuate gender-based divisions of labor and ownership. Addressing these challenges requires a multifaceted approach that considers financial empowerment, educational opportunities, and the transformation of cultural and religious norms to create an inclusive environment where women can actively and equitably participate in farming and decision-making processes.

**The county government can play a pivotal role by providing additional support to enhance the community's adaptive capacity to climate change. Improving market regulations can address marketing challenges while funding for water tanks and borehole installations can alleviate water scarcity issues. Input subsidies, improved infrastructure like roads, and the construction of storage facilities, particularly for fodder, can enhance feed availability during dry seasons. Furthermore, promoting gender equality and women's empowerment can significantly bolster resilience to climate shocks.**[14]

## Nurturing knowledge

The Isiolo County government, in collaboration with NGOs such as World Vision, the World Food Program, and VBAs, actively supports the implementation of climate adaptation and mitigation measures. This support is manifested through capacity building, training initiatives, and the allocation of resources. The county's agriculture department is pivotal in fostering connections and networks between farmers and diverse stakeholders engaged in climate action.[3] By facilitating these networks, the agriculture department contributes to the exchange of knowledge, resources, and sustainable practices, fostering a collaborative environment that enhances climate resilience in the agricultural sector. This interconnected approach helps farmers access valuable information, technology, and support systems to adapt to and mitigate the impacts of climate change on their farming practices.

Several programs, such as the Merti Integrated Development Programme (MIDP) and Livestock Management System (LMS) Program, have been instrumental in training farmers on livestock management and feed production. This training encompasses animal husbandry practices, fodder production, and storage practices, contributing to increased resilience to climate shocks. The MIDP also promotes dairy goat farming by providing improved breeds of goats and assisting in constructing livestock housing. Other NGOs like ActionAid train farmers on value addition and financial management.

Special attention is given to women and youth who receive training on saving models like village savings and lending associations. This strategy aims to enhance savings capacity and promote agricultural investment, ultimately improving the resilience of vulnerable farming households to the effects of climate change. GAPs and climate change awareness are also disseminated through county government projects, including the Kenya Climate Smart Agriculture Project (KCSAP).

Organizations like SNV and AGRA support the VBA model to disseminate climate action information and supply farm inputs to local communities. VBAs serve as intermediaries between implementers and communities, setting up demonstration plots (DEMO plots) as learning centers. Through these plots, farmers gain knowledge of innovative farming techniques, optimal seeds, and fertilizer varieties for sustainable agricultural production. VBAs also educate farmers on value addition, farm management, and bookkeeping, all promoting collective action through farmer, marketing, or savings groups.

Climate policy implementers go beyond knowledge-based support, providing tangible resources to enhance farmers' adaptive capacity. The Isiolo County Department of Agriculture and Irrigation supplies farmers with inputs such as seeds and fertilizers, while agrovets offer subsidized seeds through soft loans. Programs like LMS provide discounted sunflower processing machinery, and Action Aid distributes sunflower seeds to support local processing. Safety net programs established by governmental and non-governmental institutions facilitate cash transfers to communities, mitigating food insecurity linked to climate change impacts like droughts and floods.

Despite these efforts, inadequate funding remains a significant constraint to imparting climate knowledge to the local community. The county government collaborates with stakeholders and relies on the national government and donor funding, such as from the World Bank through initiatives like KCSAP and the Financing Locally-Led Climate Action **(**FLLoCA**)** Program. The latter grants support locally-led climate adaptation practices, enhancing community resilience, while the former finances and promotes climate-smart agricultural practices in rural Kenyan counties, including Isiolo.

## Building alliances for impact

Stakeholder engagement is vital in formulating climate action policies, research, and implementation. A worthwhile climate action decision calls for integrating contributions from all the relevant stakeholders. In Kenya, the formulation of climate policies is usually initiated by either level (national or sub-national) of government. Different departments, technical experts, and stakeholders contribute to the development of policies. According to the constitution of Kenya, public participation and engagement are vital in the policy-making process. The drafted policy is shared on government websites, relevant institutions' websites, and public participation workshops to gather input from the public.

In Isiolo, community engagement is pivotal in agricultural practices, facilitated through various platforms and forums. At the grassroots level, farmers primarily participate in community gatherings known as chief barazas, providing an informal yet crucial space for communication and collaboration. Additionally, the integration of modern communication technology is evident, with platforms like WhatsApp serving as a contemporary means of information exchange among farmers. Group meetings further contribute to disseminating knowledge and fostering a sense of community among local farmers.

Beyond the community level, stakeholders are actively involved in specialized forums that address specific aspects of rural life. These include the Landscapes forum, which focuses on sustainable land management practices; the Water Resources forum, which emphasizes water-related issues; and the OneHealth forum, which takes an integrated approach involving humans, wildlife, and the broader ecosystem. The latter underscores the interconnectedness of various environmental elements and acknowledges the importance of a holistic perspective.

To ensure effective coordination and collaboration among these diverse forums and community initiatives on drought management, the National Drought Management Authority (NDMA) plays a crucial role in overseeing the activities through the County Steering Committee. This centralized coordination mechanism helps streamline efforts, align objectives, and ensures a cohesive approach to addressing agricultural and environmental challenges in Isiolo. The combination of traditional community gatherings, modern communication tools, and specialized forums, along with the support of overarching coordination bodies like the NDMA, reflects a comprehensive and inclusive approach to community engagement and sustainable development in the region.

In Isiolo, community engagement is pivotal in agricultural practices, facilitated through various platforms and forums.

## Monitoring, assessing, and appraising progress

The successful progress and implementation of climate policies, climate action projects, and initiatives in the county will depend on effective monitoring and evaluation (M&E) processes, starting from policy gap identification through the formulation of policies and implementation. A well-established climate adaptation M&E system is an essential element of the climate adaptation process. Being a relatively new concept (in Isiolo), climate adaptation M&E is constrained by limited data availability and scales of interventions. To overcome the underlying challenges, Kenya and Kenyan counties like Isiolo have adopted a phased approach to establishing a more robust and standard climate adaptation M&E system equipped with financial resources and human capital. A comprehensive M&E system that captures climate adaptation outputs, outcomes, impacts, and trends significantly enhances climate resilience in society. The M&E system guides climate adaptation data collection, analysis, and reporting. The M&E is conducted through data collection to determine the impacts of various projects and ensure that the activities undertaken are linked to an overall set of indicators. The progress of such projects is mainly monitored through GIS and field surveys.[15]

Specific indicators are used to assess the effectiveness and impact of climate action measures. In general, indicators such as yields, quantity sold, crop variety, quality of farm produce, amount of farm input used, and the general welfare of the farmers are measured. However, the increased expenses associated with M&E activities pose a challenge, placing strain on the financial resources allocated for efficient assessment and enhancement. **It is, therefore, essential to establish a robust system for monitoring, assessing, and appraising the progress of climate change programs in Isiolo County, facilitating informed decision-making and continuous improvement.**

## Way forward

To tackle the lack of fodder availability and limited income opportunities simultaneously, investing in fodder production can contribute to job creation for youth and women and improve fodder quantity in the county. Pastoralists engage in various business activities related to fodder, such as production, processing, and transportation to markets, to broaden their livelihood sources. The county government and other relevant stakeholders should establish effective market linkages to

*Camel farmer in Isiolo. Photo: Wiebe Smit*

enhance the connection between fodder producers and potential buyers. Encouraging collective action through fodder-producing- and marketing groups can strengthen producers' position in the market. Training in modern fodder production, storage, and marketing methods is crucial to making this a reality.

In Isiolo County, farmers have adopted climate adaptation practices, including kitchen gardens for fruits and vegetables, poultry farming, and beekeeping. These measures aim to increase income and improve their adaptive capacity. Sustainable agricultural practices like irrigation, certified seed use, and fertilizer application have also been adopted. To expand agropastoralism in Isiolo, the county government should support the installation of modern irrigation and water harvesting systems.

Women in Isiolo, through self-help groups, play a significant role in climate interventions by engaging in fodder production and camel milk. Collective production and selling of fodder enhances women's resilience to climate variability. Women are active in crop production, and VBA training has led many to join village-based savings and lending associations, boosting their income. The county government should enhance the capacity of farmer groups through training and collaboration with donor organizations.

Embracing camel husbandry can improve resilience and sustainable development in Isiolo County. Camels, well-suited for arid environments, offer a transformative adaptation strategy for communities facing climate challenges. Camels efficiently convert sparse vegetation into valuable milk and meat and are more capable of thriving under Isiolo's climatic conditions than cattle due to their low water consumption needs and high disease resistance. Adopting camel husbandry can improve food security through reliable nutrition sources, and integrating camels into agriculture can promote ecological sustainability by reducing pressure on water resources, resulting in a more resilient farming system. Promoting camel husbandry is a strategic and sustainable approach for Isiolo communities to adapt to climate changes and ensure a secure future. However, the county will need to support farmers financially to increase the uptake of camel husbandry.

Embracing camel husbandry can improve resilience and sustainable development in Isiolo County.

## Recommendations

Based on the findings, the study recommends the following:

- To ensure efficiency in climate change policy implementation, the county government should bridge the gap in climate policy awareness between policymakers and smallholder farmers through training. The government should invest in user-friendly and relevant information platforms to raise awareness of climate change policies and adaptation, ultimately improving overall climate resilience in the county.

- To address the challenge of animal feeds, the government, in partnership with NGOs that promote fodder production in Isiolo County, should develop a business model that will link producers with excess fodder to pastoralists in the regions with deficits. Also, there is a need to train farmers on proper fodder storage and the use of silage and hay to ensure sufficient fodder availability during dry periods.

- In the agricultural landscape of Isiolo, farmers have identified *Prosopis juliflora* as a prominent shrub utilized for livestock fodder. Yet, it has garnered notoriety for its rapid spread and detrimental consequences on animal health. According to accounts from local farmers, the unchecked proliferation of *Prosopis juliflora* has led to inadvertent overfeeding, resulting in severe consequences such as livestock mortality. This phenomenon underscores the urgent need for comprehensive scientific investigation into the ecological impact of *Prosopis juliflora* on livestock, exploring the factors contributing to its rapid expansion and the potential toxicological effects on animals. Understanding the dynamics of this shrub's interaction with the local environment and livestock is crucial for developing sustainable agricultural practices and mitigating the risks associated with its utilization in livestock feeding programs.

- The implementation of climate action has been slowed by inadequate fund allocations to the sector. The available funds, especially from donors, must be increased to implement climate change interventions. The county government should leverage more funding from the international community and public funds in the county budget to boost funding availability for climate action. This will ensure adequate climate action funding and, therefore, increase the chances of successful climate action implementation.

- Despite the numerous climate policies, the level of implementation could be higher due to several factors, including insufficient institutional coordination. In collaboration with the World Bank through projects such as FLLoCA, the county government needs to strengthen the institutional capacity of local institutions and all relevant stakeholders to ensure effective coordination and implementation of climate adaptation strategies in the county.

- The county government and non-governmental institutions actively promote agropastoralism among the pastoralists. However, the adoption rate is still relatively low. The adoption rate can be raised through consistent training and capacity building to encourage households to destock and invest in crop production and fodder production alongside livestock rearing. Farmers should also be encouraged by the county government to explore the fodder value chain as an alternative source of livelihood.

- Camel is one of the major sources of milk and meat in Isiolo County. Some milk is sold through women's cooperatives, but these cooperatives need more modern technologies and infrastructure for camel milk storage. The county government could provide support by providing milk preservation infrastructure and market linkages to boost their income from sales. Households should also be encouraged to invest in agricultural value addition to increase their source of livelihood

To optimize the effectiveness of VBAs in Isiolo, it is imperative to implement a structured enhancement of the current model. The lack of facilitation and incentives for VBAs poses a significant challenge to their pivotal role in information provision. A recommended approach involves establishing a sustainable financial support system and ensuring fair (travel) compensation for VBAs. Simultaneously, introducing performance-based incentives can serve as a motivational driver, fostering increased engagement. Additionally, tailored training programs should be developed to enhance the knowledge and skills of VBAs, keeping them up-to-date on the latest developments. Recognition programs acknowledging exemplary contributions and integrating VBAs into local decision-making processes will reinforce their significance within the community. By adopting this multifaceted strategy, the VBA model can be enhanced in a scientifically informed manner, ensuring sustained and impactful community development in Isiolo.

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