SPARC
Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises

ISSN 2977-9669
December 2025

TECHNICAL REPORT

SUPPORTING (AGRO) PASTORALISTS' RESILIENCE THROUGH REAL-TIME MONITORING OF DROUGHT IN ETHIOPIA AND KENYA

Final technical report on the Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA) project

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How to cite: Shikuku, K.M., Banerjee, R., Lepariyo, W., Baraza, M., Gobu, W., Godana, N., Galgallo, D., Paliwal, A., Malicha, W., Cherotich, F., Ochenje, I., Fava, F., Jensen, N., Chelanga, P., Alulu, V., Naibei, O., Ericksen, P., and Whitbread, A. (2025) *Supporting pastoralists' resilience through real-time monitoring of drought in Ethiopia and Kenya*. Technical Report. London: SPARC Knowledge (https://doi.org/10.61755/GTOI2954).

About SPARC

Climate change, armed conflict, environmental fragility and weak governance and the impact these have on natural resource-based livelihoods are among the key drivers of both crisis and poverty for communities in some of the world's most vulnerable and conflict-affected countries.

Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) aims to generate evidence and address knowledge gaps to build the resilience of millions of pastoralists, agro-pastoralists and farmers in these communities in sub-Saharan Africa and the Middle East.

We strive to create impact by using research and evidence to develop knowledge that improves how the UK Foreign, Commonwealth & Development Office (FCDO), donors, non-governmental organisations, local and national governments and civil society can empower these communities in the context of climate change.

Acknowledgements

This technical report is published through the Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) programme, which is supported by the United Kingdom's Foreign, Commonwealth & Development Office (FCDO).

The Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA) project was also implemented as part of the SPARC programme. The authors are grateful to the KAZNET contributors, the national and county/regional governments of Kenya and Ethiopia, the National Drought Management Authority, Mercy Corps, the Kenya Livestock Marketing Council (KLMC), Livestock Marketing Associations (LMAs), and the many individual pastoralists and pastoralists' associations. Several researchers were involved in DIRISHA at different stages.

Thanks also to Pauline Njiraini (SPARC), and to the following International Livestock Research Initiative (ILRI) staff members for their excellent logistical and field support in Ethiopia and Kenya: Joy Andati, Cherinet Desalegn, Eskatnaf Getachew, George Kikoyo, Sabina Gitau, Ermiyas Mekonnen, Alemayehu Nigussie and Beth Njoroge.

The project team also gratefully acknowledges the support of Julie Grady Thomas, Emma Gogerty, Charlotte King, and Rajeshree Sisodia (SPARC); Deborah Eade for copyediting, Steven Dickie at squarebeasts.net for design and Rebecca Owens for proofreading; and Mireille Ferrari Cooney and Polycarp Onyango (ILRI) for their support with communication.

Finally, we acknowledge the collaboration with the Accelerating Impacts of the Consultative Group on International Agricultural Research (CGIAR) Climate Research for Africa (AICCRA) project in Kenya, the CGIAR Research Initiative on Livestock and Climate, and the CGIAR Science Programs on Climate Action and Sustainable Animal and Aquatic Foods.

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ACRONYMS

AICCRA	Accelerating Impacts of CGIAR Climate Research for Africa project
ASAL	arid and semi-arid land
CGIAR	Consultative Group on International Agricultural Research
DIRISHA	Drought Index-insurance for Resilience in the Sahel and Horn of Africa
EWS	Early Warning Systems
FAO	Food and Agriculture Organization of the United Nations
GDP	gross dometic product
GIS	Global Information System
IBDRFI	index-based drought risk-financing and insurance
IBLI	index-based livestock insurance
ICPAC	IGAD Climate Prediction and Applications Centre
IGAD	Intergovernmental Authority on Development
ILRI	International Livestock Research Institute
KAZNET	Kazi kwa net [working within a network]
KLMC	Kenya Livestock Marketing Council
MUAC	mid-upper arm circumference
NDMA	National Drought Management Authority (Kenya)
NDVI	normalised difference vegetation index
NGO	Non-government organisation
SDL	State Department for Livestock Development (Kenya)
SSA	sub-Saharan Africa
UAI	unit area of insurance
UNICEF	United Nations Children's Fund
WFP	World Food Programme of the United Nations

EXECUTIVE SUMMARY

Addressing climatic shocks, reducing vulnerabilities, and building the resilience of food systems are key national priorities of the governments in many countries in sub-Saharan Africa (SSA). One promising option to achieve these priorities in (agro)pastoral settings is by increasing access to information about the performance of markets and pasture conditions to enable decision-making and adaptation to climatic shocks. Crowdsourcing initiatives are increasingly used to gather information on climate risk in remote and often fragile contexts. Similarly, a critical step towards assessing and improving drought-monitoring systems and index-based drought risk-financing and insurance (IBDRFI) products is to ensure that there are ground-truthing datasets for calibrating the model parameters, verifying their accuracy, and improving their overall quality for assessing the impacts of drought.

The Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA) project (2021–2025) aimed to address these issues by answering three research questions. First, how do the impacts of drought progress from the lack of rainfall, to forage deficit, to animal health and performance, to markets, to human health and nutrition? Second, to what extent can we use agile digital tools, in combination with remote sensing, to collect cost-effective high-frequency data on the impacts of drought in pastoral regions? Third, can the sentinel network be used to improve the quality of and assessment of Early Warning Systems (EWS) and index-based livestock insurance (IBLI) products?

The DIRISHA project supported the establishment and expansion of sentinel zones in Ethiopia and Kenya for the real-time and dynamic monitoring of multidimensional indicators of shocks and resilience, dissemination of near real-time information to the intended users, capacity development of national stakeholders, policy influencing and advocacy, and promoting gender and social inclusion. These achievements led to the recognition of DIRISHA's work by the United Nations Office for Disaster Risk Reduction (UNDRR); and DIRISHA was also among the top six out of 200 nominations for the prestigious Sasakawa Award in 2025. Evidence from a randomised evaluation found that DIRISHA's KAZNET information crowdsourcing initiative: (1) increased pastoralists' awareness of, access to, and use of information; (2) increased the likelihood of pastoralists sharing information on markets and rangelands through social learning; (3) increased the likelihood of pastoralists changing livestock-management practices and using inputs, including livestock medicine and insurance; and (4) improved income from livestock.

Several recommendations arise from the DIRISHA project.

1. Many households continue to experience food insecurity in pastoral areas, even after better rainfall, as there is a time lag as pasture grows, animals recover, and food and income become available. Investments in fodder production and storage, market access and linkages, and rangeland management appear to be good options for mitigating the impacts of drought on food security.

2. Crowdsourcing the collection of high-frequency data is a promising approach to addressing data gaps in drought monitoring, especially in remote pastoral environments. This could help provide early warnings of drought and inform anticipatory action. Including women as data contributors is helpful for gathering information that men might find it more difficult to collect.

3. Pastoral regions frequently encounter resource-based conflicts because of competition for grazing grounds and water sources. Climate change, population pressure, and political tensions increase these disputes, especially in border regions shared by the Intergovernmental Authority on Development (IGAD) member states (Ethiopia, Kenya, Somalia, and South Sudan). DIRISHA's KAZNET digital platform can help in the following ways: (i) crowdsourced real-time data on rangeland conditions (e.g. availability of pasture, water, and grazing pressure) can help predict potential conflict hotspots; (ii) tracking livestock movement patterns across borders can identify stress zones where competition for resources is intensifying; (iii) KAZNET data can support peace-building efforts by providing evidence-based insights to guide resource allocation, government interventions and diplomatic negotiations; and (iv) collaboration with local conflict-resolution committees and traditional leaders can help integrate data-driven mediation strategies into EWS for conflict prevention.

4. Food insecurity in pastoralist communities is closely related to livestock productivity, which in turn is influenced by rangeland degradation, droughts and shifting grazing patterns. Inadequate nutrition, particularly among women and children, is becoming a major concern in arid and semi-arid land (ASAL) regions. KAZNET can be helpful by (i) integrating KAZNET's real-time rangeland data with GIS-based food-security monitoring systems enables decision-makers to predict and respond to potential food crises; (ii) linking data on pasture availability with household nutrition surveys can correlate environmental factors with malnutrition trends, improving targeting for humanitarian aid and nutritional interventions; (iii) real-time livestock health monitoring can serve as a proxy indicator for food security, as declining livestock conditions often signal potential food shortages; and (iv) partnerships with health and nutrition organisations (e.g. UNICEF, the Food and Agriculture Organization – FAO, or the World Food Programme – WFP) can enhance integrated responses that address both environmental and nutritional vulnerabilities.

5. Many countries across SSA, including Ethiopia and Kenya, are extremely vulnerable to climate-related shocks – such as droughts, floods, and locust invasions – which have a significant influence on livestock productivity and pastoral livelihoods. Traditional EWS frequently lack real-time updates and may not detect localised climate variations. DIRISHA's KAZNET can help strengthen such systems by (i) facilitating high-frequency data collection on pasture conditions, water points and the physical conditions of livestock provides timely signals of emerging climate-related threats; and (ii) integrating KAZNET data into countries' disaster risk-management systems can support provision of more precise and timely alerts to communities.

6. Women in pastoralist communities play a critical but often under-recognised role in livestock management, market trade and household food security; yet gender disparities in access to information, resources and decision-making power continue to limit their economic opportunities. In this regard, KAZNET's role can help by (i) collecting gender-disaggregated data, which can help identify inequalities in access to livestock market information, EWS, and financial services; (ii) promoting women as KAZNET data collectors (contributors), which can increase their participation and ensure that women's perspectives are included in decision-making; and (iii) collaborating with gender-focused organisations, which can help design interventions that empower pastoralist women through digital inclusion, financial literacy and leadership training.

7. Refining IBLI with KAZNET's real-time ground-truthing capabilities can greatly improve its impacts. Livestock insurance, specifically IBLI, is an important financial risk-management tool for pastoralists, but its performance is dependent on reliable, timely data on pasture conditions and drought severity. KAZNET can help improve IBLI by (i) providing ground-truthing data on vegetation and pasture conditions to improve the accuracy of satellite-based drought monitoring, which IBLI uses to trigger pay-outs; (ii) integrating KAZNET's real-time reports into IBLI models to enhance index calibration, ensuring fairer, more timely pay-outs for insured pastoralists; and (iii) increasing pastoralists' trust in IBLI by providing more transparent, data-driven pay-out triggers, reducing disputes and enhancing adoption rates.

Livestock at a communal water point in Modogashe, Garissa County, Kenya.
Photo credit: Meshack Baraza/ILRI

1. INTRODUCTION

This report documents the activities that DIRISHA implemented and its achievements. It provides lessons learnt and discusses the implications for policy and practice.

Transforming food systems is essential to achieving the 2030 Agenda for Sustainable Development in sub-Saharan Africa (SSA). However, food systems are increasingly threatened by the climate crisis (Wheeler and von Braun, 2013; Ortiz-Bobea et al., 2021; Dickerson, Cannon and O'Neill, 2022) and are unable to sufficiently anticipate, absorb and adapt to shocks and stresses (Fanzo et al., 2021). Addressing climatic shocks, reducing vulnerabilities and building the resilience of food systems are key national priorities for the governments of many countries across SSA. One promising option to achieve these priorities in (agro)pastoralist settings is increasing access to information about the performance of markets and pasture conditions to enable decision-making and adaptation to climatic shocks (Surminski et al., 2022). But the lack of data, especially from remote, difficult-to-reach and conflict-prone settings remains a serious challenge. At the same time, the increasing promotion and use of drought monitoring/Early Warning Systems (EWS) and index-based drought risk financing and insurance (IBDRFI) products for climate-related risk management in pastoral areas has highlighted the lack of quality-assessment processes and infrastructure.

Crowdsourcing initiatives are gaining increasing importance in the collection of climate-risk information in remote and often fragile contexts. Similarly, a critical step towards assessing and improving drought-monitoring systems and IBDRFI products is to ensure that there are ground-truthing datasets for calibrating the model parameters, verifying their accuracy, and improving their overall quality for assessing drought impacts. The relevance of such crowdsourced information depends on the ability to reach the target audience in a timely manner through a feedback mechanism that disseminates it back to the intended users. Although there is evidence on the use of crowdsourcing and citizen science for data collection (Adewopo et al., 2021; Solano-Hermosilla et al., 2022; Hasanain et al., 2023), there has been limited application in (agro)pastoralist settings in SSA (Chelanga et al., 2022) and there remains a gap in the dissemination of crowdsourced information. The access to, use of, and the effect of such information on decision-making and behavioural change is therefore not well understood.

To address these gaps, the International Livestock Research Institute (ILRI), through the Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA) project, established a network of sentinel zones in Ethiopia and Kenya as part of the Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) programme, which is funded by the Foreign, Commonwealth & Development Office (FCDO) of the UK government. The sentinel zones network uses a sampling frame that is based on regional socio-environmental geospatial strata to be representative of the rangelands in the Intergovernmental Authority on Development (IGAD) region. The approach is further based on data-collection protocols aimed specifically at tracking the temporal dynamics in rangeland conditions and markets and their impact on livestock productivity and household welfare.

The SPARC programme supported data-collection efforts initially in two sentinel zones, one each in Ethiopia and Kenya, and later expanding this into several additional geographical areas in both countries. SPARC further supported analysis of the dataset to better understand the complex chain of events that occur during drought-related shocks; from their early impacts on the hydrological cycle and vegetation production, on livestock productivity and in the socioeconomic domain, affecting the food security and welfare of pastoral households. The intervention had the ambition to set up new standards for data collection in pastoral drylands, improving understanding of the dynamics between drought and human welfare, and helping to improve the design of drought indicators. In addition to high-frequency monitoring, SPARC supported the near real-time dissemination of the information to multiple stakeholders to enhance resilience programming, decision-making and behavioural change.

Starting 2022, SPARC supported expansion of DIRISHA mainly in Ethiopia. Ethiopia has 14.7 million pastoralists representing 15% of the country's total population (United Nations Economic Commission for Africa, 2017). The country has Africa's largest national livestock herds with an estimated 128.6 million in 2018. The livestock sector contributes 16.5% to the national gross domestic product (GDP) and 35.6% to agricultural GDP (Guthiga et al., 2017). Despite the reliance on (agro)pastoralism for livelihoods and the immense contribution of livestock to economic development, Ethiopia is prone to recurrent large-scale droughts and pastoralists are becoming more vulnerable to shocks. Following five consecutive poor rainy seasons, Ethiopia experienced the most severe and protracted drought in recent history from 2020 to 2022. The Borena zone multi-agency rapid-assessment report indicates that more than 2.3 million head of livestock died due to prolonged drought during this period, leaving 67,000 households with no livestock and compromising efforts to improve food and nutrition security.

1.1 Research questions

The DIRISHA project aimed at answering three research questions:

1. How do the impacts of drought progress from rainfall deficit to forage deficit, to animal health and performance, to markets, to human health and nutrition?

2. To what extent can we use agile digital tools, in combination with remote sensing, to collect cost-effective high-frequency data on drought impacts in pastoral regions?

3. Can the sentinel network be used to improve the quality of and assessment of EWS and IBDRFI products?

2. APPROACH: OUTPUTS AND ACTIVITIES

This section presents and discusses the milestones achieved and the activities that were implemented.

2.1 Output 1: Sentinel zones are established

2.1.1 Pilot studies in Borena zone in Ethiopia and Marsabit county in Kenya

Piloting involved setting up a sentinel zone in Ethiopia and another in Kenya. In Ethiopia, the sentinel zone was set up in the Borena zone and covered Saba-Elwaye, Harweyu-Yabello, Higo-Dubluk and Magole-Dillo. In Kenya, the sentinel zone was established in Merille, Korr, Kargi and Olturot in Marsabit county.

Monitoring used the KAZNET smartphone application. KAZNET [kazi kwa net] loosely translates as 'working within a network'. The initiative was designed to enable dynamic monitoring of multidimensional shocks and resilience indicators to inform targeted intervention and early action and to provide ground-truthing data required to support product-quality improvement for livestock insurance. For the pilot stage, DIRISHA recruited 16 individuals whom we called 'contributors' and assigned them micro-tasks involving weekly visits to livestock markets to gather information about livestock prices, the physical conditions of livestock, and the number of animals being sold on a particular day. Collectively, these are referred to as market tasks.

In addition, DIRISHA constructed 16 transect sites which contributors visited every week to take photos as a way to provide information about the vegetation conditions in the drylands. These are referred to as rangeland tasks. Further, each contributor was assigned four households whom they visited weekly to assess food-consumption patterns, livestock-production activities, and strategies used to cope with shocks. These are called household tasks. To ensure the quality of the information, the markets, rangelands and household tasks were geo-fenced. This means, for example, that a market task became available for contributors to complete only when they arrived at the assigned markets. In addition, DIRISHA collected photographic evidence used to confirm the status of the physical conditions of the different species of livestock.

2.1.2 Analysis of the pilot data

Data from the DIRISHA pilot study was used to answer the first and second research questions listed in Section 2. The project studied the causal link between forage condition and food security in Northern Kenya and Southern Ethiopia and probed the mechanisms through which the effects occur. Data showed that a 10% increase in the normal difference vegetation index (NDVI) – a proxy for forage conditions – reduced the likelihood of a household experiencing food insecurity by 12 percentage points. The main mechanisms through which better forage conditions increased food security were enhanced livestock productivity, lower prices for basic food commodities (cereals, legumes, and vegetables) and households' better coping strategies. The project further showed that: (1) the diets of pastoralists are changing as they cope with the impacts of drought; (2) tracking

commodities that pastoralists consume is helpful in understanding how their supply influences people's diets, and consequently their nutritional status; (3) digital innovations offer an opportunity to collect data that could otherwise be very difficult to collect in remote pastoralist settings; and (4) there is need for investments in cost-effective information-gathering mechanisms in pastoral areas to understand the mechanisms through which climate-related shocks affect livelihoods.

2.2 Output 2: Expanding the sentinel zones

Following the successful piloting of DIRISHA's sentinel zones approach, stakeholders increasingly demanded data to inform early action and enhance resilience in the fragile pastoralist settings. Efforts to expand the sentinel zones focused on increasing the value of the data for supporting resilience in the drylands. This was done by improving the representativeness of the information by covering more markets, including additional transects, and increasing the number of households monitored.

2.2.1 Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA)'s expansion in Ethiopia and Kenya

Starting in 2023, the sentinel zones were extended to the conflict-prone Somali region, the post-conflict Meyumuluke *woreda* (district), and the Borana zone in Ethiopia. In Kenya, DIRISHA expanded to cover five counties including Marsabit, Samburu, Isiolo, Garissa and Wajir. The expansion to new sentinel clusters and increasing geographical coverage within existing sentinel clusters followed the previous sampling protocol as outlined by Chelanga et al. (2022). This protocol identified potential sentinel clusters based on their socioeconomic and environmental factors, providing an extensive guide to expansion in the Horn of Africa. To align this with an IBLI implementation structure, the expansion followed unit areas of insurance (UAIs). This approach was deliberate to allow for comparability of earth-observation data and ground-truthing data within predefined boundaries. This, therefore, addresses the third research question, namely, 'can the sentinel network be used to improve the quality of and assessment of early warning systems and IBDRFI products?' Expansion was based on the need and recommendation for additional spatial coverage and for more granular or detailed data, in reference to variation within and between UAIs. The introduction of additional rangeland transects provides a more robust dataset; and monitoring more livestock markets provides a richer dataset to allow for analysis of dynamics within markets and UAIs.

Like the pilot phase, the implementation of the expansion phase commenced with engaging stakeholders at the community level. Local authorities and village elders were involved in the implementation, facilitating community endorsement and assisting in the identification of appropriate contributors and target locations. Sampling was conducted across three main domains within each UAI:

1. **Livestock market selection:** Markets were selected according to their significance in relation to pastoralist trade activities within the UAI. Local leaders and community knowledge facilitated the identification of key livestock markets, emphasising these characteristics by regular activity, accessibility and substantial volume of trade.

FIGURE 1. HARO BAKE LIVESTOCK MARKET IN BORANA, SOUTHERN ETHIOPIA

Source: ILRI

FIGURE 2. LIVESTOCK MARKET IN GARISSA

Source: ILRI

2. **Selection of contributors and households:** Contributors were selected from the communities with the assistance of the local leaders. The selection criteria encompassed fundamental digital literacy, consistent attendance at the market and a commitment to data-collection support. Households were selected following the protocol as described in detail by Chelanga et al. (2022).[1]

3. **Identification of rangeland transects:** Representative transects were selected for the routine monitoring of rangeland health, focusing on forage availability, suitability and trends in forage depletion and regeneration (Figure 3).

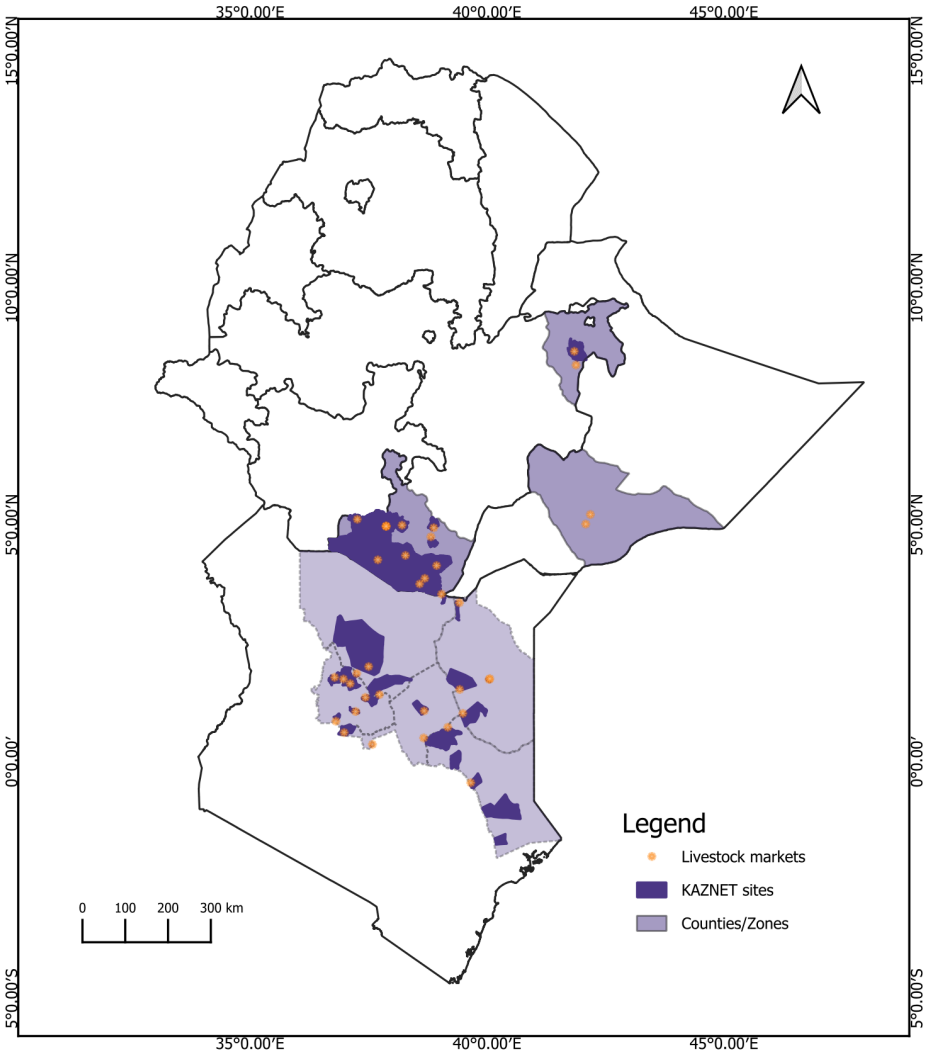
Figure 3 shows the measurement of the mid-upper arm circumference (MUAC) while Figure 4 presents the current DIRISHA project sites in Ethiopia and Kenya. In total, DIRISHA is working with 132 contributors (i.e. data collectors) covering 264 transect sites for rangelands condition monitoring, 45 livestock markets (monitoring prices, the animals' physical condition and volumes), and 528 households (monitoring food and nutrition security).

1 Selection criteria simply reflect the situation on the ground/in context. Care is taken not to ask people to be travelling for long distances to collect data. This approach ensures that contributors are motivated and has implications for sustainability.

FIGURE 3. MEASUREMENT OF MID-UPPER ARM CIRCUMFERENCE (MUAC) AS AN INDICATOR OF NUTRITION STATUS

Source: ILRI

FIGURE 4. CURRENT SENTINEL ZONE COVERAGE IN ETHIOPIA AND KENYA



Source: Watson Lepariyo/ILRI

2.2.2 Assessing sustainability

A randomised field evaluation was conducted in Southern Ethiopia to examine the effect of expectations about future financial rewards in relation to their efforts in the dryland information crowdsourcing initiative. The study further probed the mediating role of aversion to the loss of such rewards and of altruism. The study found that for a random sub-sample of the contributors, their expectations about future monetary rewards did not affect participation in the information-crowdsourcing initiative either during the three months when the reward was guaranteed or after it was withdrawn. Guaranteeing a continued financial reward correlated with contributors' greater efforts after the initial period, although this relationship disappeared after the role of expectations was considered. The findings suggest that when contributors are informed from the outset about the uncertainty of future rewards, and if the value of the information collected is made salient, their efforts in an agricultural crowdsourcing initiative will not be influenced by the expectation of a financial reward. This work is currently under consideration for publication as a book chapter.

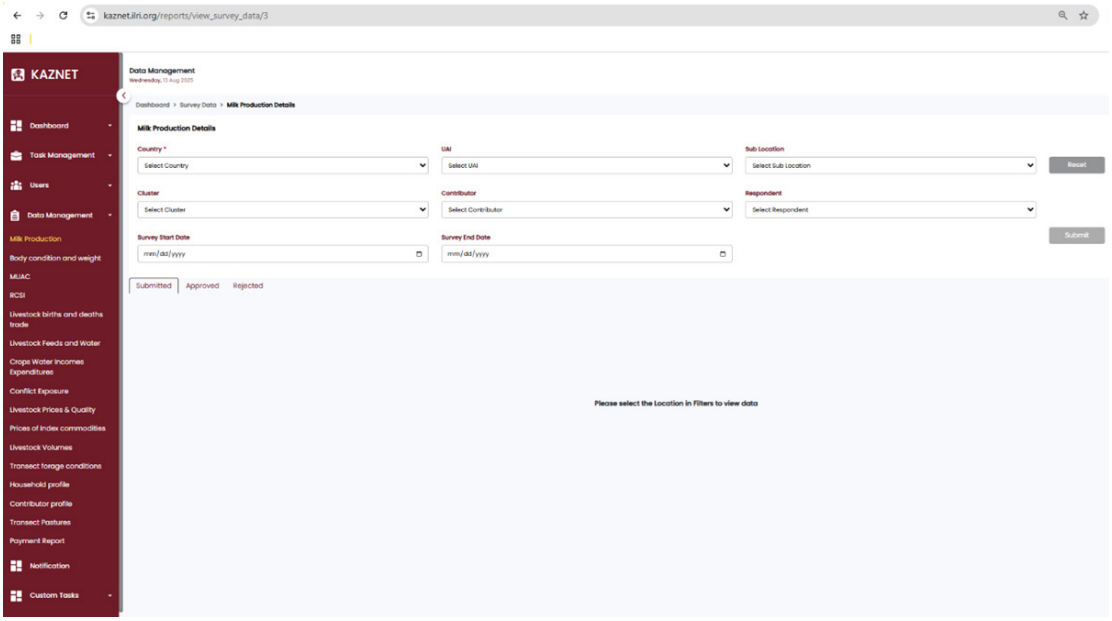
2.3 Output 3: Information collected through Drought Index-insurance for Resilience in the Sahel and Horn of Africa (DIRISHA) is disseminated in near real-time

To ensure use of the data collected, DIRISHA started disseminating information in 2024 to pastoralists and other national stakeholders for decision-making and resilience programming.

2.3.1 Improving the functionality of KAZNET to include dissemination

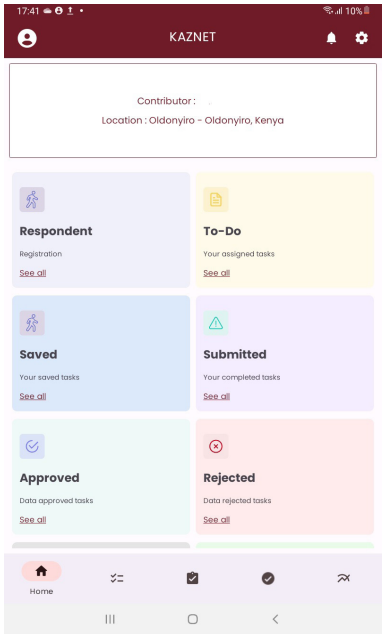
The information submitted by the contributors is presented in visual form on KAZNET dashboards for dissemination to the intended users. These dashboards show trends in key indicators of livestock markets' performance, the availability and suitability of vegetation for livestock consumption, and household food security. KAZNET has both web-based and mobile phone-based dashboards. KAZNET is available on Google play store. Figures 5–8 show the KAZNET dashboards.

FIGURE 5. KAZNET WEB PAGE



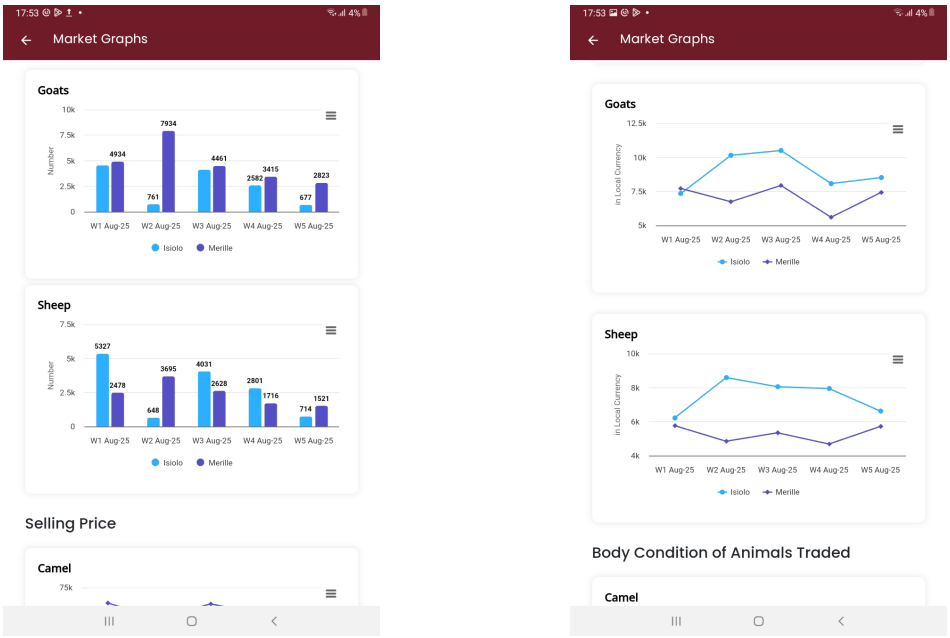
Source: Watson Lepariyo/ILRI

FIGURE 6. KAZNET APP FRONT END



Source: Watson Lepariyo/ILRI

FIGURE 7. EXAMPLES OF KAZNET DISSEMINATION DASHBOARDS FOR MARKET INFORMATION



Source: Watson Lepariyo/ILRI

FIGURE 8. KAZNET DASHBOARD SHOWING INFORMATION ABOUT THE MID-UPPER ARM CIRCUMFERENCE (MUAC) AND LIVESTOCK STATISTICS

Source: Watson Lepariyo/ILRI

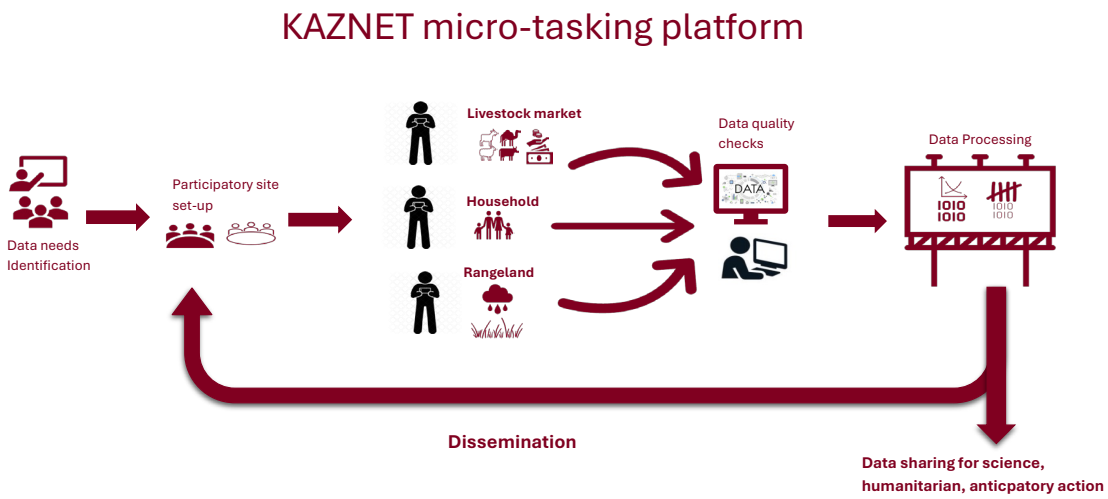
2.3.2 Dissemination of information to multiple stakeholders

The intervention involved signing up individuals and members of cooperatives and pastoralist associations to ILRI's KAZNET mobile phone information-dissemination dashboards. To accelerate the diffusion of the crowdsourced markets and rangelands information, social learning (through the group structures) was combined with digital innovation (KAZNET dashboards). In addition, the intervention conducted capacity-building activities in the form of training and dissemination of manuals and guides to ensure that pastoralists, humanitarian organisations, extension officers, and non-government organisations (NGOs) could accurately interpret the information provided. Figure 9 presents a schematic diagram of how DIRISHA works.

In the expansion phase of DIRISHA, the research team undertook extensive scoping to identify appropriate channels and forms in which information would be useful to different users, given their varied capacities. The assessment provided crucial insights that guided the implementation of the dissemination. Lepariyo et al. (2024) provide insights on how to disseminate information and the potential channels given the constraints in drylands. Through the scoping exercise, the research team identified key factors to consider such as:

1. Existing information channels in the community.
2. Packaging of the information to be disseminated.
3. Penetration of digital gadgets required for receiving information.
4. Cost effectiveness of information delivery.
5. Available indigenous channels that could potentially disseminate digital information.

FIGURE 9. SCHEMATIC REPRESENTATION OF KAZNET PROCESS FLOW



Source: Vincent Alulu/ILRI

Through the scoping exercise and a baseline survey that was implemented as part of a random evaluation of the KAZNET initiative, it was noted that the preferred channel varies with the type of information. The research team established three potential channels to deliver digital information.

Sentinel community households: Households providing data are the first point of contact with the contributors, who have weekly interaction during visits to gather information. Despite this, most data-gathering approaches obtain information with no clear mechanism for providing feedback after the information has been processed. It is therefore paramount to design a dissemination approach that allows participating households to obtain data that has been turned into useful information. In the sentinel zones, the design allowed contributors to use the mobile phone application to gather and disseminate information at the same time. This feature allows contributors to provide on-demand feedback as requested by households and any other interested community members. This dissemination approach reduced the need and cost associated with travelling back to communities to convey the survey findings. Data can be summarised and provided in near real-time.

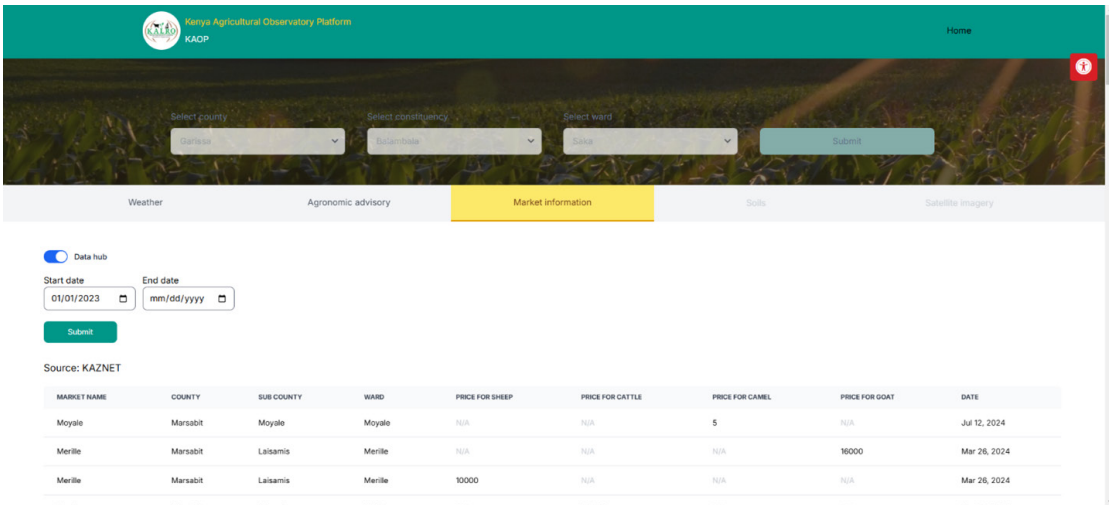
Producer groups: The choice of this channel is motivated by the fact that delivery of interventions through organised producer groups in drylands has gained traction over the last decade. This is viewed as an approach that increases reach and can have a spill-over effect especially in communities with stronger social ties, therefore making it feasible to deliver information through organised producer groups. This approach promotes peer-to-peer diffusion of information, while leveraging existing digital gadgets within the organised producer groups to ensure that community members who do not possess a mobile phone can still get information via group members who do. Lastly, the information also complements the activities of the targeted producer groups by providing data relevant to their enterprises. Figure 10 shows a capacity-building session where a contributor is explaining to a group of women pastoralists about the KAZNET information and dashboards.

FIGURE 10. KAZNET INFORMATION DISSEMINATION SET-UP MEETING AMONG WOMEN PASTORALISTS IN NGILAI, SAMBURU NORTH

Source: Watson Lepariyo/ILRI

National digital information hubs: Platforms that provide aggregated digital information are increasingly becoming available at national and sub-national levels. These platforms form a critical channel for disseminating information to a wider audience. The Kenya Agricultural Observatory Platform (KAOP) is an example of such a platform, which provides information on market intelligence, good agricultural practices and weather forecasts (Figure 11). Such platforms provide information to a broader audience and in aggregated form, thus allowing the complementarity of different sources, facilitating the dissemination of data on different indicators. This makes the information more accessible, unlike independent digital tools reaching the same audience using different mobile/web applications.

FIGURE 11. KAZNET LANDING PAGE IN THE KENYA AGRICULTURAL OBSERVATORY PLATFORM (KAOP)



Source: Watson Lepariyo/ILRI

2.3.3 Assessing access, use, and welfare effects of the information

A randomised control trial (RCT) was conducted to assess the effect of the crowdsourcing initiative on access and use of information and welfare. The experiment had two dimensions: 178 villages were randomly assigned to either the KAZNET initiative or the control group. The RCT targeted pastoralist groups with at least one member owning a smartphone. Participants in the KAZNET group were invited to an information session that explained the initiative, including the process of data collection, and gave them the opportunity to register for weekly updates about livestock markets, vegetation conditions and household food security from both their areas and other areas. Information was disseminated via smartphone dashboards and social learning was used for spreading the information within the groups. Participants in the control group were not exposed to the KAZNET initiative. The findings were that the KAZNET initiative increased pastoralists' awareness of, access to, and use of information. Participants in the KAZNET arm were more likely to share information on markets and rangelands. They were also more likely to change livestock-management practices and use inputs including livestock medicine and insurance. In addition, results showed that the KAZNET initiative improved income from livestock.

2.4 Output 4: The capacity of users is improved

2.4.1 Capacity-building of data collectors (i.e. contributors)

The standard KAZNET established a protocol for the initial training of data collectors to equip them with the necessary skills to undertake their tasks. As part of their induction, a week-long training covered crowdsourcing concepts, use of KAZNET software, measurement of children's MUAC, and identification of suitable transects for monitoring. Contributors were further trained in practical skills required in the implementation of the KAZNET protocol from identifying households to submitting data. The aim of the training was to ensure that contributors could accurately and consistently administer/complete KAZNET tasks and that they were able to troubleshoot and resolve minor technical glitches. Further feedback was constantly provided through the data-collection application and quarterly visits were conducted as part of continuous capacity-building of the data collectors.

FIGURE 12. INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE (ILRI) RESEARCHER GUIDING A CONTRIBUTOR ON HOW TO USE THE KAZNET APP

Source: ILRI

2.4.2 Capacity-building of pastoralists

The sampled households were first introduced to the project at registration and were invited to participate in the study on a voluntary basis. After confirming participation, these households were visited each week. This allowed the contributor to provide information regarding the approach and further guidance on the measurements being taken, including MUAC, in which they had been trained about what each colour and measurement represent. This also served to build the capacity of the participating households to enable them to use this first-hand information.

FIGURE 13. INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE (ILRI) RESEARCHER ENGAGING THE COMMUNITY ABOUT KAZNET

Source: ILRI

2.4.3 Capacity-building of other users

Data collected in KAZNET was processed into shareable formats by aggregating information and generating dashboards. Information users were trained in how to access and use information on the KAZNET dissemination application tab. For example, when disseminating information to pastoral producer groups, the groups were first introduced to KAZNET and taken through the process of data collection, quality checks, processing to generate dashboards, and finally, accessing the KAZNET dissemination dashboards. These training courses allowed group members to use the information and to be able to assist others in registering to access KAZNET information.

2.5 Output 5: Policy influencing and advocacy

In workshops conducted by the Jameel Observatory and the Climate Change, Insurance, and Conflict conference, representatives of Ethiopia's Ministry of Agriculture asked for the integration of DIRISHA into an ongoing resilience programme being implemented in Southern Ethiopia. Subsequently, we organised a national stakeholder workshop with policy-makers, the Ministry of Agriculture, the Ministry of Irrigation and Lowlands, the Ethiopia Meteorological Institute, the Irrigation and Pasture Development Bureau, the private sector including the Oromia Insurance Company and Lersha, academic institutions, and *kebele* administrators (the *kebele* is the smallest administrative unit in Ethiopia, contained within a *woreda*, or district).

In addition, information from DIRISHA was presented at workshops and seminars to influence policy and practice, as well as policy briefs summarising DIRISHA's work and making recommendations for policy and practice. Given the influence of *kebele* administrators in communicating with government officials at higher levels, we made efforts to ensure their involvement in all the meetings we conducted at the local level. Further, by embedding our approach and intervention within the cooperative structures established by the government, we were able to show the alignment with government priorities for greater buy-in.

2.6 Gender and social inclusion

Our high-frequency data collection and dissemination, as well as capacity-building activities, will ensure the participation of men, women and youth. Specifically, the recruitment of contributors for the crowdsourcing tasks will consider women and youth; and dissemination efforts will also ensure that the target cooperatives include them. There are continuing efforts to engage more women contributors, so that information can be collected and disseminated on areas that may or may not affect women differently. However, given the social norms, markets access and mobility, getting more women contributors has been a challenge in both countries.

3. PUBLICATIONS ARISING FROM THE DROUGHT INDEX-INSURANCE FOR RESILIENCE IN THE SAHEL AND HORN OF AFRICA (DIRISHA) PROJECT

TABLE 1. LIST OF PRODUCTS GENERATED BY THE DIRISHA PROJECT

Type of knowledge product	Title of the knowledge product	Publication status	Link
Report	Disseminating KAZNET crowdsourced dryland information: A report of the baseline survey in northern Kenya	Published	https://hdl.handle.net/10568/151693
Report	Building resilience through dynamic monitoring of shocks and enhanced access to near real-time information using citizen science and crowdsourcing techniques: A report of a national stakeholder engagement workshop in Ethiopia	Published	https://hdl.handle.net/10568/174369
Policy brief	Crowdsourcing data can help monitor drought impacts on food security	Published	https://www.sparc-knowledge.org/publications-resources/crowdsourcing-data-drought-impacts-food-security
Research brief	Digital innovations for high-frequency ground-truthing and monitoring of household welfare in pastoral communities	Published	https://hdl.handle.net/10568/121918
Journal article	Crowdsourcing initiatives and the diffusion of information: Experimental evidence from livestock keepers in Kenya	Published	https://www.sciencedirect.com/science/article/pii/S030691922500140X
Journal article	The impact of forage condition on household food security in Northern Kenya and Southern Ethiopia	Published	https://hdl.handle.net/10568/149180

Type of knowledge product	Title of the knowledge product	Publication status	Link
Journal article	KAZNET: An open-source, micro-tasking platform for remote locations	Published	https://hdl.handle.net/10568/118465
PowerPoint presentation	Crowdsourcing information for climate resilience in the drylands	Published	https://www.youtube.com/watch?v=6F-GnFrOtnw
PowerPoint presentation	Livestock markets and resilient drylands. Presented at the Jameel Observatory drylands food security and resilience, early-action research and evidence dialogue held in Addis Ababa, 15–16 May 2025	Published	https://hdl.handle.net/10568/174780
Blog	Beyond smartphones: How citizen volunteers are supporting the drylands livestock market intelligence platform KAZNET in Kenya and Ethiopia	Published	https://www.ilri.org/news/beyond-smartphones-how-citizen-volunteers-are-supporting-drylands-livestock-market
Blog	Harnessing the digital connectivity of pastoralists to close data gaps	Published	https://www.ilri.org/news/harnessing-digital-connectivity-pastoralists-close-data-gaps
News article	From data to resilience: Kelvin Shikuku and KAZNET shortlisted for 2025 Sasakawa Award	Published	https://www.sparc-knowledge.org/news-blog/news/data-resilience-kelvin-shikuku-and-kaznet-shortlisted-2025-sasakawa-award https://www.youtube.com/watch?v=QcdcrCGFYEE&t=25s
Presentation	ICTforAg 2024: Nairobi - Experiences from ILRI	Published	https://www.youtube.com/watch?v=s-rXN_iQOOc&t=3241s
Manual	Implementation manual for launching and maintaining sentinel zones	Published	https://hdl.handle.net/10568/130313
Manual	Launching, maintaining, expanding and disseminating crowdsourced information in drylands	Completed and proofread; pending publication by ILRI	N.A.
Book chapter	Social nudges for stimulating farmers' participation in agricultural information-crowdsourcing initiatives	Revised and resubmitted	With editors
Smartphone application	KAZNET smartphone app	Published	https://play.google.com/store/apps/details?id=org.ilri.kaznet&hl=en

Source: Authors

4. CONCLUSION AND RECOMMENDATIONS

In the face of unpredictable, recurrent and intense climate shocks, the critical need for timely and accurate information is increasingly clear. Crowdsourcing initiatives that use a participatory approach combining crowdsourcing techniques with citizen science can help to provide information near real-time in a cost-effective manner. Crowdsourced information from livestock markets, rangelands transects and households can support decision-making and resilience programming while providing important ground-truthing data for improving the design and accuracy of IBDRFI products for climate-risk management in pastoralist settings.

The importance of near real-time information for early and anticipatory action needs more attention. DIRISHA has made a significant contribution in providing such information gathered from fragile and remote pastoralist contexts where conventional approaches have failed. The major achievements of the DIRISHA project (2021–2025) include: (1) the establishment and expansion of sentinel zones in Ethiopia and Kenya for the real-time and dynamic monitoring of multidimensional indicators of shocks and resilience; (2) near real-time dissemination of information to the intended users; (3) capacity development of national stakeholders; (4) policy influencing and advocacy; and (5) promoting gender and social inclusion. These achievements led to the recognition of DIRISHA's work by the United Nations Office for Disaster Risk Reduction (UNDRR); and DIRISHA was among the top six out of 200 nominees for the prestigious Sasakawa Award in 2025.

Most stakeholders appreciated the ability of DIRISHA's KAZNET platform to monitor shocks in near real-time. They reported that when shocks are identified early, they can be addressed in a timely and cost-effective manner to minimise adverse impacts. In our discussions with insurance companies, the importance of ground-truthing data was acknowledged as a way of providing a mechanism to compare the performance of the normalised difference of vegetation index (NDVI) with the situation on the ground. Contexts are changing rapidly and are increasingly characterised by more frequent, intense and prolonged droughts. In such changing contexts, DIRISHA's work has supported regional programmes on drought-risk financing and resilience-building. More importantly, DIRISHA connected several important dimensions in such fragile contexts: including providing a better understanding of the relationship between droughts and conflict; improving the performance of value chains through markets development; and promoting innovation for resilience-building by identifying the mechanisms through which drought affects livelihoods.

A key element in the success of DIRISHA was partnership. DIRISHA engaged with several partners at different levels including:

- CGIAR's Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project
- CGIAR's Climate Action and Sustainable Animal and Aquatic Foods Science Programs
- National Drought Management Authority (NDMA)
- County governments of Isiolo, Marsabit, Samburu, Garissa and Wajir in Kenya

- Kenya Agricultural and Livestock Research Organization (KALRO)
- Kenya's Ministry of Agriculture and Livestock Development through the State Department for Livestock Development
- Kenya Livestock Marketing Council (KLMC) and its associated Livestock Marketing Associations (LMAs)
- Ethiopia's national and regional governments
- Private sector including insurance companies.

ILRI and NDMA have identified areas where DIRISHA's work would be complementary, especially by providing information about markets' performance. The LMAs have indicated that information coming from DIRISHA would be useful for them to understand the performance of their own and neighbouring markets in terms of livestock volumes, number of traders and livestock prices.

In Marsabit, Kenya, the Moyale sub-county livestock office has indicated that information about rangelands conditions is useful in informing grazing plans especially when overlayed with UAIs. In Wajir, the county government's department of livestock production has emphasised the value of DIRISHA's data about historical and current livestock prices by species and grade, market volumes and transaction trends, locations and schedules of major livestock markets, and trade routes and market actors. Specifically, Wajir county has indicated that the data would play a crucial role in supporting the livestock production department's evidence-based decision-making and strengthening value-chain interventions in line with its development agenda. DIRISHA's KAZNET is being considered for inclusion in Kenya's Climate Risk Management in Agricultural Extension curriculum. There is also interest in Kenya's Ministry of Agriculture and Livestock Development to include DIRISHA's KAZNET in the Disruptive Agricultural Technologies (DAT) manual for the Food Systems Resilience Project (FSRP). At a more local level, pastoralists are now directly receiving information through an in-built dashboard in KAZNET that shows the performance of markets and rangelands.

In Ethiopia, a national stakeholder workshop generated several recommendations for embedding DIRISHA's KAZNET crowdsourcing platform into Ethiopia's National Livestock Strategic Plan and fostering multi-sectoral collaborations. Among the recommendations were the call to: (1) strengthen partnerships with government agencies (Ministry of Agriculture, Ministry of Irrigation and Lowlands, National Disaster Risk Management Commission, Ethiopia Meteorological Institute) to integrate KAZNET data into national programmes and policies; and (2) develop cross-border data-sharing frameworks for conflict resolution and resource management. DIRISHA also supports the AgData platform and the Kenya Agricultural Observatory Platform (KAOP).

Several recommendations arise from the DIRISHA project.

1. **Lagged impacts and the call for increased investment**. Many households continue to experience food insecurity in pastoralist areas, even after rainfall improves, as there is a time lag as pasture grows, animals recover and food and income become available. Investments in fodder production and storage, market access and linkages, and rangeland management appear to be good options for mitigating the impacts of drought on food security.

2. **Implementing crowdsourcing initiatives in a socially inclusive manner**. Crowdsourcing the collection of high-frequency data is a promising approach for addressing data gaps in drought monitoring, especially in remote pastoralist environments. This could help provide early warnings of drought and inform anticipatory action. Including women data contributors is helpful for gathering information that men might find it harder to collect. In addition, this would also enable getting more nuanced data on different gendered needs, changes in behaviour and approaches at the household level which may not be captured in relying only on male contributors.

3. **Using KAZNET for cross-border conflict assessments**. Pastoralist regions frequently encounter resource-based conflicts because of competition for grazing grounds and water sources. Climate change, population pressure and political tensions also fuel these disputes, especially in border regions shared by IGAD member states (Ethiopia, Kenya, Somalia and South Sudan). DIRISHA's KAZNET platform can help in the following ways: (i) crowdsourced real-time data on rangeland conditions (e.g. availability of pasture, water and grazing pressure) can help predict potential conflict hotspots; (ii) tracking livestock movement patterns across borders can identify stress zones where competition for resources is intensifying; (iii) KAZNET can help better understand relationships related to conflicts and markets; (iv) KAZNET data can support peace-building efforts by providing evidence-based insights to guide resource allocation, government interventions and diplomatic negotiations; and (v) collaboration with local conflict-resolution committees and traditional leaders can help integrate data-driven mediation strategies into EWS for conflict prevention.

4. **Integrating rangeland and GIS data for food-security planning**. Food insecurity in pastoralist communities is closely related to livestock productivity, which is influenced by rangeland degradation, droughts and shifting grazing patterns. Nutritional inadequacies, particularly among women and children, are becoming a major concern in ASAL regions. KAZNET can be helpful in the following ways: (i) integrating KAZNET's real-time rangeland data with GIS-based food-security monitoring systems enables decision-makers to predict and respond to potential food crises; (ii) linking data on the availability of pasture with household nutrition surveys can correlate environmental factors with malnutrition trends, improving targeting for humanitarian aid and nutritional interventions; (iii) real-time monitoring of livestock health can serve as a proxy indicator for food security, as declining livestock conditions often signal upcoming food shortages; and (iv) partnerships with health and nutrition organisations (e.g. FAO, UNICEF, WFP) can enhance integrated responses that address both environmental and nutritional vulnerabilities.

5. **Enhancing anticipatory action with KAZNET's high-frequency data**. Both Ethiopia and Kenya are extremely vulnerable to climate-related shocks – such as droughts, floods and locust invasions – which have a significant influence on livestock productivity and pastoralists' livelihoods. Traditional EWS frequently lack real-time updates and may not detect local climate variations. KAZNET can help strengthen such systems in the following ways: (i) facilitating high-frequency data collection on pasture conditions, water points and the physical conditions of livestock provides timely signals of emerging climate-related threats; (ii) integrating KAZNET data into countries' disaster risk-management systems can support provision of more precise and timely alerts to communities; (iii) data-driven anticipatory action strategies can ensure early interventions, such as:

- repositioning emergency livestock feed supplies ahead of droughts
- mobilising veterinary services before disease outbreaks escalate
- providing cash transfers or insurance pay-outs when drought stress indicators reach critical levels
- collaborating with meteorological departments, the IGAD Climate Prediction and Applications Centre (ICPAC), and humanitarian organisations to improve forecast accuracy and preparedness measures.

6. **Mainstreaming gender-inclusive research within pastoral systems**. Women in pastoralist communities play a critical but often under-recognised role in livestock management, market trade and household food security. However, gender disparities in access to information, resources and decision-making power continue to limit their economic opportunities. In this regard, KAZNET's approach can help: (i) collecting gender-disaggregated data to help identify inequalities in access to livestock market information, EWS, and financial services; (ii) promoting women as KAZNET data collectors (contributors) to increase their participation and ensure that women's perspectives are included in decision-making along with tracking changes in behaviour on areas such as market access and mobility that male contributors may have missed; and (iii) collaborating with gender-focused organisations to design interventions that empower pastoralist women through digital inclusion, financial literacy, and leadership training.

7. **Refining IBLI with KAZNET's real-time ground-truthing capabilities**. Livestock insurance, specifically IBLI, is an important financial risk-management tool for pastoralists, but its performance depends on reliable, timely data on pasture conditions and drought severity. KAZNET can help improve the IBLI product by: (i) providing ground-truthing data on vegetation and pasture conditions to improve the accuracy of satellite-based drought monitoring, which IBLI uses to trigger pay-outs; (ii) integrating KAZNET's real-time reports into IBLI models to enhance index calibration, ensuring fairer and more timely pay-outs for insured pastoralists; (iii) increasing pastoralists' trust in IBLI by providing more transparent, data-driven pay-out triggers, reducing disputes and enhancing adoption rates; and (iv) collaborating with insurance providers, financial institutions and government agencies to expand IBLI access to more underserved communities, ensuring that climate-resilience financing reaches those in need.

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