

TECHNICAL BRIEF

SHEPHERD'S EYE IN THE SKY: THE POTENTIAL FOR AFRISCOUT DIGITAL GRAZING MAPS TO IMPROVE PASTORALISTS' GRAZING AND MIGRATION DECISIONS

Sophie Turnbull and Connor Harrison

Key messages

- Global Communities' AfriScout is a precision grazing application and community support service. It provides pastoralists with access to timely, open-source information on rangeland conditions and hazards. It does this through vegetation maps developed from satellite imagery and crowd-sourced information.
- AfriScout's model may be able to fill a critical gap for pastoralists in East Africa's arid and semi-arid areas. These groups currently struggle with a lack of reliable, climate-based information sources to inform migration decisions. This is a particularly salient need during the current, and protracted, Horn of Africa drought.
- As the start of a two-year impact evaluation of AfriScout, baseline data have been collected from pastoralists in Ethiopia and Kenya demonstrating the challenges pastoralists face and their need for reliable, accurate information to inform migration decisions.
- Data are produced from a small sample of current AfriScout users within the baseline survey. These data provide early indications of AfriScout's potential to create positive outcomes for pastoralist livelihoods, and herd and rangeland management. They also show the application's positive reception in terms of accuracy, usefulness and ease of use.



A Kenyan pastoralist using the AfriScout app.
Photo credit: AfriScout

About this brief

The brief draws on baseline data collected as part of a two-year impact evaluation of AfriScout. The evaluation is funded by the UK's Foreign Commonwealth & Development Office (FCDO)'s Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) initiative. It is conducted by Causal Design.

While the brief presents an overview of baseline data, full analysis and findings of AfriScout's impact, contribution, strengths and weakness will be shared after the collection and analysis of endline data (expected in 2025).

1. Introduction

Pastoralism is a critical livelihood and economic activity in East Africa's arid and semi-arid areas. However, the context in which pastoralists operate is changing rapidly, making pastoralism an increasingly vulnerable livelihood. Climate change-induced protracted droughts and floods, livestock diseases, armed conflicts and an increasing population have presented numerous challenges (Mokku, 2023; Strouboulis et al., 2023).

Currently, one main challenge is the protracted drought in the Horn of Africa, the most severe drought in recent history. There have been five failed rainy seasons in the past four years, and a sixth poor rainy season was forecast for March–May 2023 (Strouboulis et al., 2023; Abbonizio 2023). The drought has reached emergency levels across much of southern Ethiopia and northern Kenya. This has led the World Health Organization to describe it as 'one of the worst hunger crises of the last 70 years' (Strouboulis et al., 2023; Abbonizio 2023).

In this context of severe drought, pastoralists face increasing challenges to maintaining healthy herds and livelihoods. Millions of livestock have perished, leading to milk shortages and, subsequently, malnutrition across drought-affected communities (Strouboulis et al., 2023).

The worsening situation places pressure on pastoralists to travel farther from traditional rangelands in order to access sufficient pasture and water. This increases inter-community tensions, raiding and resource conflict (Strouboulis et al., 2023).

Under such conditions, the need for timely, accurate and accessible information to guide pastoralists' migration and rangeland management decisions is particularly salient. One innovation that seeks to address this gap is Global Communities' AfriScout. Nicknamed the 'shepherd's eye in the sky', it is a precision grazing service that provides pastoralists with digital grazing maps based on satellite-imagery vegetation data, and crowd-sourced indigenous knowledge.

This technical brief describes the context and challenges facing pastoralists in southern Ethiopia and northern Kenya. It also provides indicative early feedback that suggests AfriScout's potential to support pastoralists under increasingly challenging conditions.

2. Pastoralism in southern Ethiopia and northern Kenya

The vast majority of people in Africa's arid and semi-arid areas, including southern Ethiopia and northern Kenya, are partially or entirely dependent on pastoralism. This is because of limited alternative opportunities and the impossibility of other forms of agriculture in these drylands (Makokha et al., 2022; The New Humanitarian, 2013).

In the Horn of Africa, the pastoral livestock and meat trade is valued at around \$1 billion per year; pastoralism constitutes 19% and 13% of the gross domestic product (GDP) in Ethiopia and Kenya, respectively (The New Humanitarian, 2013).

Mobility, including both micro- and macro-scale migrations with herds, is a critical resilience strategy used by pastoralists to maintain access to water and pasture (Butt, 2015). The success of mobility as a strategy depends on the availability of reliable information on where and when to travel, as well as other hazards, such as disease and conflict, to inform decision-making.

However, pastoralists have limited access to climate- and weather-related data to guide migration decisions. A SPARC scoping exercise identified several innovations that address the needs of pastoralists and agro-pastoralists (mostly digital technologies providing extension services and information). However, it concluded that pastoralists nevertheless remain underserved and marginalised when compared to agricultural populations in areas with higher rainfall (Makokha et al., 2022).

As such, many pastoralists' migration decisions rely on indigenous and historical knowledge. Moreover, pastoralists based their decisions on flows of information about social and environmental conditions shared by word of mouth between herders, scouts and herd owners (Asaka and Smucker, 2016).

But the accuracy of these traditional information flows for determining where and when to move herds is inherently limited. Indigenous knowledge is becoming increasingly unreliable as climate change has caused unpredictable and dramatic changes in the herding landscape.

Word-of-mouth information is also limited by its dependence on social networks and trust, and may be curtailed by increased competition for resources (Asaka and Smucker, 2016; Butt, 2015).

Making strategic mobility decisions based on inaccurate information can result in devastating immediate and long-term consequences. For pastoralists, this occurs both through irreparable herd loss and rangeland health, including over- and under-grazing and rangeland degradation.

Livestock per capita holdings are declining for pastoralists across East Africa, falling short of subsistence requirements for many pastoralist populations (Lind et al., 2020). According to one study, pastoralist households are losing an average of one third of their herds per year, amounting to huge economic losses (Machado et al., 2020).

One digital solution that provides pastoralists with access to reliable data – to improve pasture management, decrease herd losses, build resilience, and reduce the need for drought-related food aid – is AfriScout.

3. What is AfriScout?

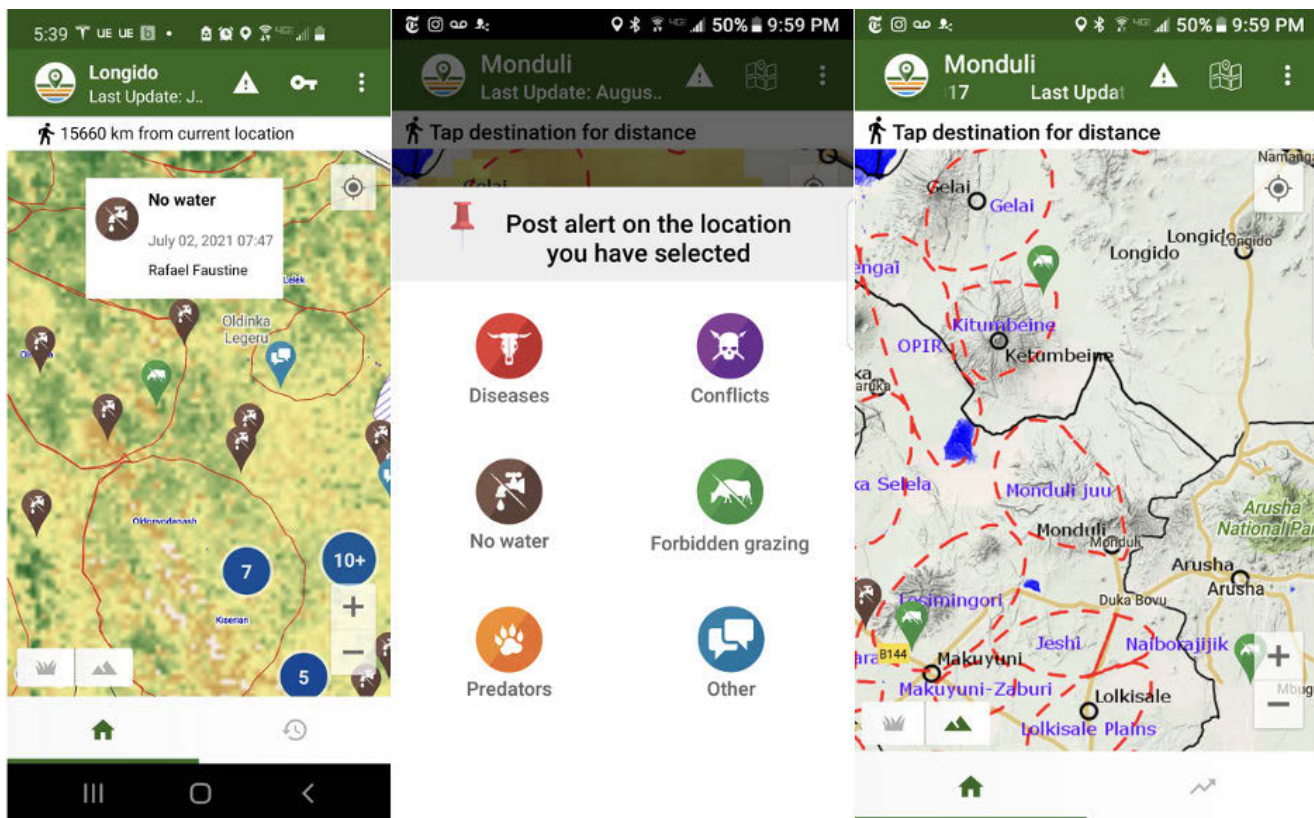
Effective strategic mobility plays a critical role in pastoralists' resilience and survival. This is particularly the case given rapidly changing contexts, like the current drought in the Horn of Africa. AfriScout thus seeks to provide access to accurate, timely, open-source information that enables pastoralists to make informed decisions that can preserve their livelihoods, herds and rangelands.

AfriScout's 'Theory of Change' is based on two key mechanisms: 1) the availability of AfriScout information and/or advice can *affect pastoralists' decision-making* and 2) AfriScout information and/or advice can influence decision-making resulting in positive outcomes for rangelands, herd conditions and pastoralists' well-being.

The AfriScout paper-based prototype

The AfriScout prototype was developed in 2013 by Project Concern International (PCI, now Global Communities). It provided pastoralists with paper maps of traditional grazing areas, overlaid with remotely-sensed normalized difference vegetation index (NDVI) data, a measure of vegetation density. PCI worked through local government and community networks to print and distribute paper maps every 10 days in Ethiopia and Tanzania.

Studies of the paper-based prototypes showed positive outcomes for pastoralists. The 12-month prototype resulted in improved livestock conditions and a 47% reduction in livestock mortality. A three-year study of the AfriScout prototype also demonstrated proof of concept, showing positive results in pastoralists' uptake, perceptions of map accuracy, and incorporation of map information into migration decisions (Machado et al., 2020).



Screenshots from the AfriScout mobile app
Photo credit: AfriScout

The study concluded that the attributable economic benefit of AfriScout, through improvements in herd condition and livestock holdings, and reduced time spent scouting, was approximately \$67 for every cow, camel or 10 goats owned.

The AfriScout app

Building on findings from the paper-based prototype, PCI partnered with Google, Nairobi-based iHub and pastoralists to re- envision AfriScout as a smartphone app in 2016. The AfriScout app was co-designed with pastoralists. It was revised with feedback gathered through several in-field usability studies to ensure it was as accessible, valuable and useful as possible for its target users.

The AfriScout app presents near real-time NDVI data (updated every 10 days), displaying current vegetation conditions and surface water within a user's traditional grazing area or rangeland. Users can also view topographical maps and calculate distances between locations to plan migration routes. The app also stores previous months' vegetation maps, allowing users to analyse changes over seasons in their local grazing areas.

The application also integrates crowd-sourced indigenous knowledge. Users then add this knowledge to the maps as geolocated 'alerts' to flag instances and locations of disease, restricted grazing, predators and conflict, among other potential hazards.

AfriScout field agents are critical in raising awareness, recruiting users and training pastoralists to use the app. Field agents are local to – and are each responsible for – one AfriScout mapped area. Each area corresponds to one traditional grazing territory (with an average size of 657 km² in Ethiopia and 2,348 km² in Kenya).

Field agents visit pastoralist communities within their mapped area. They actively raise awareness and recruit users to AfriScout; provide download and onboarding support; and conduct regular follow-ups with AfriScout users, either in person or via phone call or SMS.

Launched in 2017, the AfriScout app is freely available in Ethiopia, Kenya and Tanzania via the Google Play Store or a QR code. The app currently has over 38,000 users – 12,400 in Ethiopia, 19,300 in Kenya and 7,100 in Tanzania.



Field agents train pastoralists to use the AfriScout app
Photo credit: AfriScout

The AfriScout app is implemented on the ground using two models: AfriScout Steward, which aims to disseminate pure information, and AfriScout Regen (in development), which disseminates both information and hands-on grazing planning advice.

AfriScout Steward

The AfriScout Steward model disseminates community-wide information through an individual's smartphone. Thereafter, it is anticipated that the individual will introduce these data into their household and community decision-making processes.

AfriScout Steward does not seek to advise. Rather, it provides real-time information that pastoralists can integrate into their own decision-making. This information is around grazing, migration and other aspects of herd and rangeland management (e.g. the decision to vaccinate or sell livestock, or ensuring that the movement of livestock is done in such a way as to avoid conflict with other herders, particularly in times of resource scarcity).

AfriScout Regen

AfriScout Regen is a more intensive grazing module. It is being developed to give access both to digital grazing maps and hands-on grazing planning support. Under the AfriScout Regen model, smaller regenerative grazing units (RGUs) are defined within communities with direct stewardship responsibilities.

AfriScout Regen also supplies automated triggers for potential herd movements and herd sizing during wet and dry seasons, informed by community planning and satellite information. Hands-on regenerative grazing training and planning support are an important part of AfriScout Regen, following the multi-paddock or Holistic Planned Grazing approach™ (Savory Institute, 2020).

This approach aims to increase the density and frequency of herd movement within rangelands through rotational grazing in ‘virtual paddocks’.

As with AfriScout Steward, field agents are critical to the implementation of AfriScout Regen. Field agents receive additional guidance and training to enable them to conduct multi-day community-level training on AfriScout, featuring subject matter such as regenerative grazing, carbon sequestration, community mapping, how to create virtual paddocks, and how to develop community grazing plans.

Furthermore, field agents provide frequent ongoing training, monitoring and support to users, as well as regularly collect data on herd movements. Following a successful pilot conducted in 2022, AfriScout Regen was launched in Ethiopia in 2023. So far, 30 RGUs have been launched, with 40 more to be finalised by April 2024. Rollout in Tanzania is ongoing, and Kenya’s rollout is planned to take place over the next two years.

4. AfriScout users in southern Ethiopia and northern Kenya

This section presents an overview of the characteristics of potential AfriScout users. It draws on baseline data from the AfriScout impact evaluation, which were collected before AfriScout was fully and actively implemented in all study areas. These data were collected from 3,505 pastoralist households across southern Ethiopia and northern Kenya (1,753 and 1,752 households, respectively) in January–February 2023.

Herd size and conditions

Pastoralists’ herds consist of sheep and goats (owned by 93% of households in Ethiopia and 81% in Kenya), camels (80% in Ethiopia, 41% in Kenya) and cattle (27% in Ethiopia, 19% in Kenya).

As shown in Figure 1, according to self-reported herd condition data, one third or less of pastoralists’ animals were in good condition. In Kenya, conditions for all animal types were evenly distributed between good, moderate and poor. Meanwhile in Ethiopia, proportionally more animals were in poor condition, particularly cattle. The majority of respondents (75% in Kenya, 90% in Ethiopia) reported that their animals’ condition had deteriorated over the past year. Almost all respondents attributed this to a lack of suitable pasture.

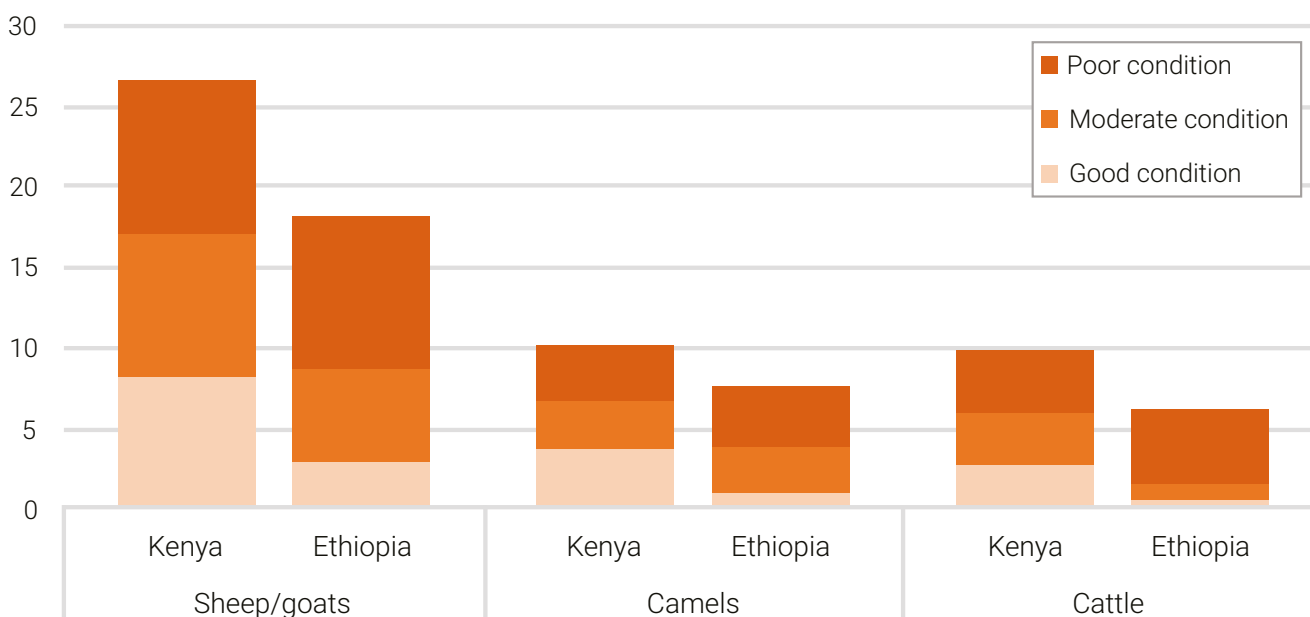
Herd migration

In Kenya, pastoralists typically migrated six times per year, with migrations lasting 26 days. In Ethiopia, pastoralists typically migrated three times per year, with migrations lasting 60 days.

In both countries, half of pastoralists’ migrations were unsuccessful, meaning they did not find sufficient water and pasture for their livestock. The average duration of scouting visits was higher in Ethiopia (29 days) compared with Kenya (10 days). In both countries, each visit cost the same (about \$23).

The majority of respondents reported losing some of their herd during their last migration, with an average of 14% losing more than half their whole herd. The most common reason for animal losses while migrating was lack of pasture, followed by lack of water and livestock diseases.

FIGURE 1. HERD CONDITIONS BY ANIMAL AND COUNTRY (N=3,505)



Conflict

Conflict appeared to be a greater problem in Kenya than Ethiopia. In Kenya, 57% of respondents reported that they experienced grazing or resource-related conflict in their community in the past six months. The same number reported that they avoided certain areas due to insecurity in the past month. Figures in Ethiopia were 19% and 20%, respectively.

Similarly, 42% of respondents in Kenya and 16% in Ethiopia reported that conflict had greatly affected their ability to work or earn a living in the past year. Half of scouts in Kenya, and 7% of scouts in Ethiopia, encountered conflict during their last scouting mission.

Information sources

The baseline survey confirmed that pastoralists, particularly in Ethiopia, continue to rely on traditional sources of information to identify suitable pastureland, as shown in Figure 2. These include indigenous knowledge, word of mouth, scouting and the advice of community elders. Proportionally more pastoralists in Kenya than Ethiopia reported using weather or climate data sources, namely AfriScout, and radio-based weather services.

5. Early perceptions of AfriScout

In addition to collecting baseline data from pastoralists who had never used AfriScout, data were also collected from the approximately 10% of pastoralists who were already using the application. The existence of this small sub-set of users within the overall population surveyed provided the opportunity to collect data on early perceptions of the application from these users. These findings, amongst others, illustrate the positive reception the application has had among pastoralists who have used it, as well as its usefulness when it comes to real-life decision-making in regards to migratory movements.

The majority of the AfriScout users (n=366) found the application easy to understand (80%), accurate (99%) and useful for migration decision-making (98%). Over 90% of AfriScout users believe that using AfriScout positively impacts their migratory outcomes through a range of factors, which include improving rangeland conditions, improving herd condition, avoiding hazards and conflict, and reducing the time spent looking for pasture.

FIGURE 2. MOST USED INFORMATION SOURCES FOR MIGRATION DECISION-MAKING (N=3,505)

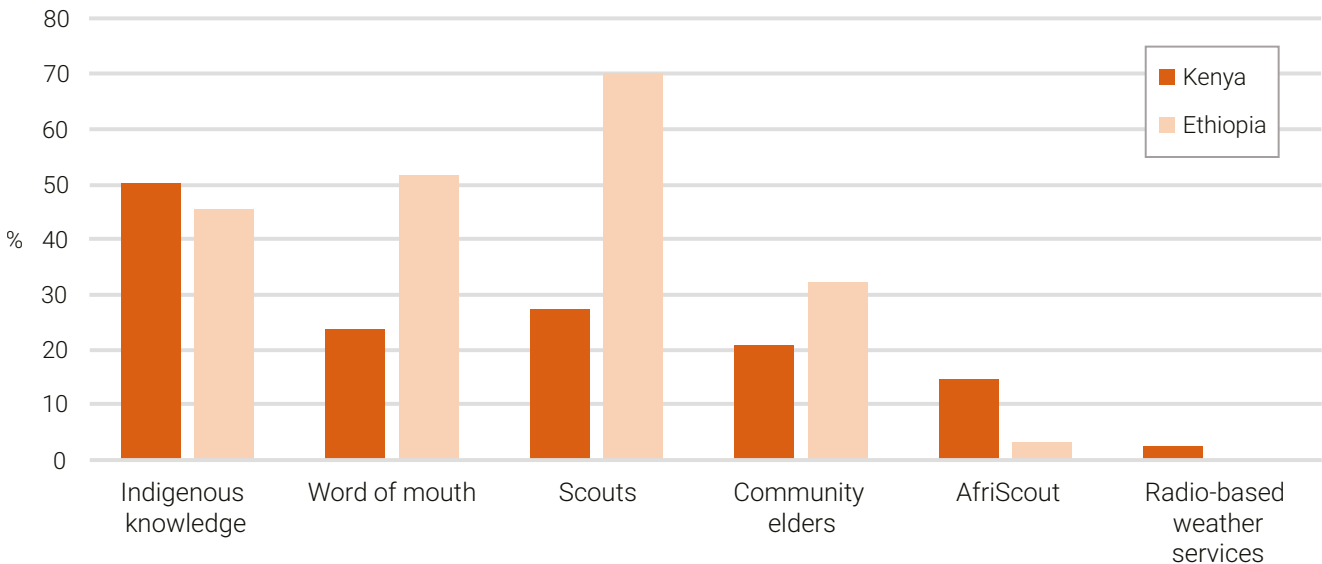
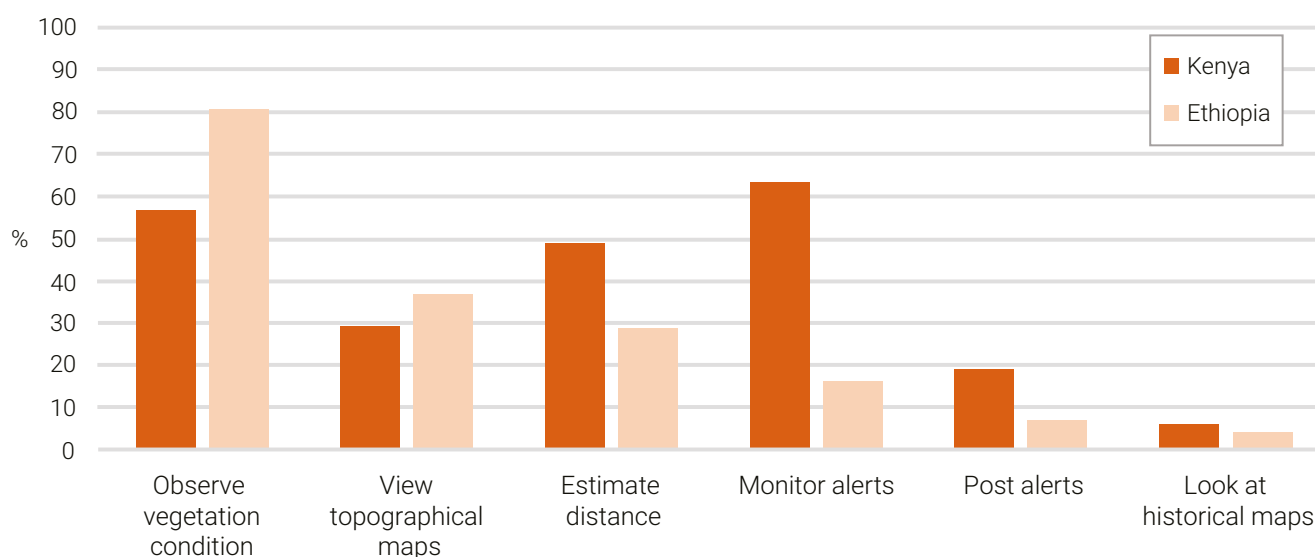


FIGURE 3. USEFUL FEATURES OF AFRISCOUT ACCORDING TO USERS (N=366)



As shown in Figure 3, users in both countries derive benefits from a variety of application features. In Ethiopia, the most important feature of the app is the ability to observe vegetation conditions through NDVI data (81%), followed by topographical maps (37%) and estimating migration distance (29%). In Kenya, pastoralists find the ability to monitor alerts to be the app's most useful feature (63%), followed by vegetation monitoring (57%) and estimating migration distance (49%).

The types of alerts found most useful were similar in both countries, with disease alerts most useful (81% in Kenya, 82% in Ethiopia), followed by conflict alerts (76% in Kenya, 57% in Ethiopia), water (58% in Kenya, 37% in Ethiopia), predators (42% in Kenya, 19% in Ethiopia) and forbidden grazing (31% in Kenya, 27% in Ethiopia).

When pastoralists were asked why the alerts were useful, their answers corresponded very much with these features. Around 80% of households in Kenya and Ethiopia reported that alerts help protect livestock from diseases, and 56% reported that alerts help avoid conflicts with neighbours.

6. Conclusions

The findings presented in this brief reveal the challenges that pastoralists in Ethiopia and Kenya face in the context of the prolonged drought in the region, and AfriScout's potential to improve pastoralists' grazing and migration decision-making through digital grazing maps. Among these challenges are high rates of unsuccessful

migrations, long migration routes and poor herd condition. The latter two factors appear worse in Ethiopia. For many Kenyan pastoralists, conflict also appears to be a particular challenge.

It is too early to draw concrete conclusions about AfriScout's effectiveness, however, baseline data from a sub-sample of pastoralists who have already used AfriScout suggest it has potential to create positive outcomes.

These data show the application has been positively received by those pastoralists who have already used it, based on its perceived reliability, usefulness and accessibility. This gives early indications of AfriScout making positive contributions to pastoralist livelihoods, herds and rangelands.

Other findings also indicate AfriScout's potential utility and relevance as a timely source of reliable, climate-based information to inform migration and rangeland management decisions. This includes pastoralists' reliance on traditional and word-of-mouth sources.

Using a mixed-methods impact evaluation of AfriScout, Causal Design, AfriScout and SPARC hope to build on these findings and learn more about the attributable outcomes of AfriScout on pastoralist decision-making, and herd and rangeland conditions.

The final results of the impact evaluation are expected in 2025.

Acknowledgements

The authors would like to thank Jon Kurtz, Katharine Vincent and Mark Redwood from SPARC, and Chris Bessenecker, Tom Mortimore and Hellen Mutogoh from AfriScout, for their reviews and inputs for this brief and support for the impact evaluation. We also would like to thank the participants of the AfriScout evaluation baseline survey for their time and for sharing their thoughts.

References

- Abbonizio, A. (2023) *Regional Drought Response Plan for the Horn of Africa, January–December 2023*. Nairobi, Kenya: World Food Programme (https://docs.wfp.org/api/documents/WFP-0000146045/download/?_ga=2.85168153.1837377359.1681203286-1962024017.1677049829).
- Asaka J.O. and Smucker T.A. (2016) 'Assessing the role of mobile phone communication in drought-related mobility patterns of Samburu pastoralists' *Journal of Arid Environments* 128: 12–6 (<https://www.sciencedirect.com/science/article/abs/pii/S0140196315301014>).
- Butt, B. (2015) 'Herding by Mobile Phone: Technology, Social Networks and the "Transformation" of Pastoral Herding in East Africa' *Human Ecology* 43(1): 1–14 (<https://www.jstor.org/stable/24762844>).
- Lind, J., Sabates-Wheeler, R., Caravani, M., Kuol, L.B.D. et al. (2020) 'Newly evolving pastoral and post-pastoral rangelands of Eastern Africa' *Pastoralism* 10: 24 (<https://pastoralismjournal.springeropen.com/articles/10.1186/s13570-020-00179-w>).
- Machado, E.A., Purcell, H., Simons, A.M. and Swinehart, S. (2020) 'The Quest for Greener Pastures: Evaluating the Livelihoods Impacts of Providing Vegetation Condition Maps to Pastoralists in Eastern Africa' *Ecological Economics* 175: 106708 (<https://www.sciencedirect.com/science/article/abs/pii/S0921800919315204>).
- Makokha, C., Jaquez, C. and Reid, E. (2022) *Innovations for pastoralists and agro-pastoralists in fragile and conflict-affected settings*. Scoping paper. London: SPARC (<https://www.sparc-knowledge.org/publications-resources/innovations-pastoralists-and-agro-pastoralists-fragile-and-conflict-affected>).
- Mokku, J. (2023) 'Climate change destroys the livelihoods of Kenyan pastoralists'. Africa Renewal, 4 January 2023 (<https://www.un.org/africarenewal/magazine/january-2023/climate-change-destroys-livelihoods-kenyan-pastoralists>).
- The New Humanitarian (2013) Pastoralism's economic contributions are significant but overlooked. Produced by IRIN News while it was part of the United Nations Office for the Coordination of Humanitarian Affairs, 16 May 2013 (<https://www.thenewhumanitarian.org/news/2013/05/16/pastoralism-s-economic-contributions-are-significant-overlooked>).
- Strouboulis, A., Tesfaye, B., Edwards, A. and Yayboke, E. (2023) 'Climate and Crisis in the Horn of Africa' in *Rethinking Humanitarian Assistance: Climate and Crisis in the Horn of Africa*. Washington D.C.: Center for Strategic and International Studies (CSIS), pp. 3–9 (<https://www.jstor.org/stable/resrep47049.4>).
- Savory Institute (2020) 'What is Holistic Management?' Blog. 29 January 2020 (<https://savory.global/what-is-holistic-management/>).

How to cite: Turnbull, S. and Harrison, C. (2024) 'Shepherd's eye in the sky: the potential for AfriScout digital grazing maps to improve pastoralists' grazing and migration decisions'. London, UK: SPARC (www.sparc-knowledge.org/publications-resources/shepherds-eye-sky-potential-afriscout-digital-grazing).

This work is licensed under CC BY-NC-ND 4.0

This material has been funded by UK aid from the UK government; however the views expressed do not necessarily reflect the UK government's official policies.

Funded by

