



Mobility Matters: The Benefits of Pastoralist Mobility for Nutrition in Marsabit and Isiolo Counties, Kenya

USAID Nawiri Longitudinal Study Learning Brief 2

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Pastoralist mobility underpins resilience, food security, nutrition, and human and animal health. This learning brief presents preliminary findings on strategic mobility and its nutritional benefits to pastoral and agropastoral communities in select sites in Isiolo and Marsabit Counties, Kenya.

This brief is part of a series of learning briefs on the mixed-methods USAID Nawiri longitudinal research study, which took place in Marsabit and Isiolo Counties, Kenya, from September 2021 to September 2023. The research study is one component of the USAID Nawiri program, which is led by Catholic Relief Services. The mixed methods research study is a collaboration between Tufts and Kenyatta Universities, Catholic Relief Services, and Caritas.

Key Messages

- 1. As the central strategy of pastoral production, mobility occurs along established seasonal patterns but with variations to allow herders to optimize animal health and nutrition.** When unfettered, mobility allows pastoralists to seek the best pasture and browse conditions for different animal species, thereby maximizing nutritional benefits. Local customary institutions govern mobility and also work to preserve the natural resource base, such as by limiting overgrazing.
- 2. Mobility allows pastoralists to take advantage of opportunities while also mitigating risk.** Dryland areas experience highly variable rainfall and are characterized by nonequilibrium ecosystems. This means that opportunities (such as access to pasture and water) change over time and space. The most important risks faced by pastoralists include protracted droughts, outbreaks of animal disease, potential confrontation with other groups, overgrazing, and eventual contamination of environments. Regular mobility allows pastoralists to capitalize on emerging and shifting opportunities while also avoiding the inherent risks, but barriers to strategic mobility are numerous.
- 3. Mobility benefits the nutrition of people as well as livestock.** Mobility benefits human and livestock nutrition by enabling enhanced management of natural resources, increased resilience to climate variability, reduced risk of livestock loss, and sustained productivity of livestock herds. Animal health translates directly to human health in pastoral systems, by providing nutritious animal source foods and a major source of household income. For women, infants, and young children, staying at a *fora* (rangeland area for animal grazing) has clear nutritional benefits vis-à-vis increased availability of animal products and an uncrowded and less contaminated health environment. As such, women will often seek to maximize their time with infants and young children in the *fora*, including living year-round in such locations.

Introduction

Mobility is the central tenet of successful pastoral production systems. It underpins resilience, food security, nutrition, and human and animal health. Customary institutions operate at multiple levels to manage systems of mobility. As a key component of resilience, mobility is a form of adaptation and also enables risk mitigation, which is essential in dryland environments characterized by rainfall variability and ecological unpredictability. Multiyear droughts have greatly strained pastoral systems in northern Kenya, but mobility continues to allow communities to take advantage of existing and new opportunities, while also managing risk to the extent possible and offering significant nutritional benefits for people and animals.

This learning brief investigates strategic mobility as a central component of pastoral livelihoods and explores the linkages between mobility and human and animal well-being in selected communities in Isiolo and Marsabit Counties. The selected sites are characterized by persistent acute malnutrition in children under five years of age.

The USAID Nawiri longitudinal study shows that the underlying drivers of child acute malnutrition affecting the individual child or household vary by sentinel site and by season, and also emphasizes the importance of understanding the basic drivers linked to environment and seasonality; systems, and formal and informal institutions; and livelihoods systems (see [“The State of Malnutrition” Learning Brief 1](#) and [“Vulnerability, Risk, and Resilience” Learning Brief 3](#)).¹ This learning brief on livestock mobility and nutrition explores and elucidates the interconnections between these basic drivers and how they collectively influence pastoralist mobility and nutrition in the Kenyan arid and semi-arid lands (ASALs). An accompanying learning brief considers the resilience of livelihood systems and the risks associated with protracted drought, conflict, and other factors.²

Findings and Discussion

Background

Pastoral systems are inherently flexible and characterized by a dynamic relationship among people, livestock, and the environment. Mobility is central to this relationship and provides flexibility that allows herders to take advantage of the heterogeneity in the resource base distribution, thereby maintaining their herds' productivity and higher resilience in the dryland economy. Because of the patchy and asymmetric spatial and temporal nutrient distribution in the rangelands at different scales (ecological zones, plant species, etc.),³ pastoralists employ mobility to respond and smooth productivity over time.⁴

The primary mechanism for herd mobility is movement of animals to *foras*. The word *fora* can simultaneously signify transhumant livestock herds as well as the rangeland area where these animals are kept.⁵ *Foras* are often temporary seasonal locations for households and herds, while more permanent homesteads in villages house those people who do not travel regularly with the herds, including the elderly, school-age children and their mothers, and those who either do not have livestock or who employ others to graze their herds. *Foras* can be at comfortable walking distances from villages or far enough to require motorized transportation. The distance to *foras* depends on availability of forage and water, local grazing conventions, and seasonality, whereby herds migrate for longer periods and over greater distances during the dry season.

Strategic mobility follows seasonal patterns, with variations to optimize outputs

Strategic mobility differs by context and group while also sharing some characteristics. These shared characteristics include seasonal patterns, defined migration routes, and the degree of dispersion of herds across rangeland resources. Pastoralists' mobility decisions involve careful and advanced planning, balancing the needs of different resource users, changing environments, and social, cultural, and political constraints. Resource availability and rainfall patterns strongly influence the movement of people and livestock in the study sites in Isiolo and Marsabit Counties and lead to three distinct (and at times overlapping) mobility patterns:

- a. Small and circular movements around permanent villages primarily occur during the rainy season when water and pasture are plentiful. Herds are near villages, and hence people can access milk. Herds are kept away from the designated dry season reserve pastures.
- b. Mobility over long distances, including at times the crossing of national administrative and international boundaries, mostly occurs in the dry season when water and pasture resources are more dispersed. This form of mobility is the most demanding to manage as herders must maximize water availability, coordinate resource use with other herds and groups, engage in collective action, and coordinate security strategies.

- c. Circular movements within dry season reserves entail rotation among satellite *fora* within dry season grazing areas. Herds will move within the same reserve area when pasture and water resources become depleted, when dung accumulation is excessive, for security reasons, or to take advantage of sporadic rainfall.

Herds may stay in one general location for days, weeks, or months depending on the availability of resources, with daily grazing sites shifting to prevent overgrazing. When there is adequate vegetation, herders will seek out specific types of browse and pasture depending on herd composition, animal health, and availability: these variables drive movement decisions as herders aim to maximize animal nutrition.⁶ Mobility allows livestock to take advantage of pasture at the point of its growth cycle when it is most nutritious, and to respond to variable rainfall and vegetation patterns. Additional considerations for routes and temporary sites include water sources for human consumption and access to markets. Herders rely on markets to purchase food items (such as cereals) and veterinary medicines, and to sell animals as needed to meet the needs of household members back home. Likewise, relatives living in villages will send food items—including food aid—to the *fora* whenever possible. While young men are normally the primary herders in *foras*, other community members reside in the *foras* on a temporary, seasonal, or full-time basis. This can include older people of both genders, women of reproductive age, and children. Households allocate and divide their labor resources accordingly between the permanent villages and the *fora*.

Herders manage movement to *foras* and the day-to-day decisions around access to natural resources. Herders often send out advance scouts to investigate possible *fora* locations and routes. Herders and scouts seek to optimize resource access—including water, pasture, and browse—based on the local conditions, herd composition, and livestock requirements. Herders among and across groups must cooperate in watering animals and managing security. They often form temporary water access committees that plan times for water access and manage the arrival of new herding groups into a given area. Scouts and herders also consider potential barriers to movement and access, including the location of potentially hostile groups and areas of restricted grazing.

Customary institutions manage broader systems of mobility, ensure access to natural resources, and promote cooperation among and between groups. This system includes responding to the highly variable distribution of resources, such as by maintaining dry season reserves, and mitigating conflict through territorial negotiations with other groups. Increasingly, customary institutions cooperate with formal government systems, including liaising with local chiefs and county administrators to monitor dry season water use rules and resolve conflict over resources. This cooperative approach is especially important when a large number of groups—who at times have hostile relations—are seeking to access the same resources or territory. In turn, official authorities in some areas, such as Garbatulla ward, which has witnessed security incidents, have increased the duties of customary institutions in handling specific matters.

The modality of these customary institutions differs by group and location. In Malkadaka ward in Garbatulla Sub-County (Isiolo), for instance, *foras* are found in a *dedha*, a larger territorial unit governed by a council of elders known as the *dedha* council (*jarsa dedha*). One of the Malkadaka *dedha* council's directives is to maintain a ten-kilometer dry season grazing reserve around the permanent settlements; this area is off-limits for grazing of larger herds except when opened by the *dedha*. In Marsabit County, among the Ituria pastoralists in the Laisamis ward, traditional institutions also play significant roles in natural resource management. Referred to locally as a council of elders, the Ituria traditional institutions are not as formal and hierarchical as the Borana *dedha* in Garbatulla. During the rainy season, the Ituria council of elders meets to set grazing

restrictions on drought reserves—mainly the areas covering Thurusi *fora* wells and the grazing zones within a twenty-kilometer radius of permanent settlements reserved for the milk herds (*nkilepo*). New and emerging strategies of the Ituria council of elders include cooperating with formal authorities, such as the local chief and the deputy county commissioner, to enforce the rules of access and use of dry season grazing reserves.

Mobility allows pastoralists to take advantage of opportunities while also mitigating risk

Within pastoral systems, herders change locations and adjust routes to take advantage of the most appropriate available pasture for the types of animals in their herds and to access available water resources. Given the high variability in dryland areas, the locations of such resources change seasonally and annually based on precipitation and vegetation patterns. Similarly, the risks faced by herders shift depending on a variety of internal and external factors, including dimensions of climate and conflict. Mobility regimes are therefore both dynamic and flexible, shifting as necessary to capitalize on opportunities while avoiding risks.

The narrative from one group of study participants illustrates how a flexible and dynamic system of mobility operates. We interviewed a group of women at Kiltamany *fora* in Samburu County who originated from Koya location in Laisamis (Marsabit County). These women provided details on their route over the approximately five months since they had departed from Thurusi *fora* (a larger grazing area that was hosting animals from multiple groups when visited by the research team in October and November 2022). The group based their movement trajectory and temporary settlement locations on the availability of pasture and water (for both animals and humans), herd composition (types of animals), herd size, and animal health. Despite the serious drought conditions, their flexible route and regular migration to new sites allowed them to take maximum advantage of available resources. They stayed at three *foras* for one month each (Lkis, Bejolo, and Laisamale), two for two weeks (Sapache and Kiltamany), and stopped at five other locations for one to two nights while



Photo by Elizabeth Stites – Cattle herd from Wajir County brought to Isiolo Count to access water.

assessing the availability of resources. Pasture and browse were limited or nonexistent at some locations, necessitating regular onward movement as vegetation became exhausted. While they were struggling with the drought conditions and, in particular, negotiating with local communities for access to water, it was their ability to keep their animals moving that allowed them to avoid the worst effects of the drought.

This flexibility also exists at the institutional level, whereby customary decision-making mechanisms consider the high variability when establishing fallback grazing reserves or deciding on larger movements. The extent of involvement of the customary institutions in mobility decisions varies depending on the conditions and the availability of resources. For example, collective action and centralized decision-making may be less important in times of plenty when there is less of an imperative to manage use of resources. This is markedly different from periods of climate stress, when customary institutions weigh in to determine access to dry season reserves and how best to balance the needs and vulnerabilities of specific households. For example, in January 2023, participants in Laisamis explained that most herds had moved on from Thurusi *fora* in the preceding months due to dwindling supplies of water and pasture. Many had moved further east in Samburu and Isiolo Counties and towards the Waso Nyiro River. However, the elders decided that households who had small herds, many weak animals, or were themselves vulnerable (such as single women or those with many young children) would stay in Thurusi. This decision saved these people and herds from making the long journey while also ensuring that they would have adequate access to resources in Thurusi once the large herds had departed. This example illustrates the flexibility inherent in the systems that manage mobility, risk, and resource use, and shows that these systems are able to consider needs and profiles of individual households while also managing the well-being of the larger group.

Mobility has consistently allowed pastoralists to take advantage of opportunities and mitigate risk, and yet has also evolved over the past three decades. This speaks to the dynamic nature of mobility regimes over both the short and long term and how this dynamism responds to change. As climate variability increases and droughts (in many instances) become longer and more severe, some pastoral households in Isiolo and Marsabit Counties now travel further with their herds to find pasture and water. On the other hand, other households have adopted more sedentary livelihoods due to drought-induced animal loss, increased involvement in market economies, and loss of pasture. This is evident, for instance, among Samburu and Rendille communities living in permanent villages in Koya in Laisamis, home to large numbers of women, children, and the elderly. While nearly all of these demographic groups would have spent substantial periods (if not all their time) in *foras*, today it is mostly men, adolescents of both genders, and a handful of women with children below school age who migrate with the animals. When the herds are very far from Koya, the number of women and young children with the animals diminishes further. In particularly severe drought periods, participants reported that the herds (and herders) returned to the villages approximately once every two years. These and other evolutions are in part due to push factors such as the loss of livestock but also indicate the pull factors of urban and peri-urban settings, including access to school for children and ready access to markets. Despite the high effectiveness of strategic mobility, numerous barriers exist and can hinder the ability of pastoral systems to successfully balance opportunity and risk. These barriers include conflict with other groups, the expansion of settled agricultural communities, restrictions due to gazetting of lands for wildlife and nature reserves, and geopolitical boundaries such as internal and international borders.

Rangeland fragmentation and boundary formation have replaced communal access to rangelands with exclusive rights to parcels of land, leading to limited access to vital resources such as water and seasonal forage, and increased exposure to more significant risks.⁷ In addition, large-scale infrastructure and conservation projects are expected to alter pastoralists' access to and control over land, increase resource-based conflicts,

and create significant obstacles to critical dry season pastures and migration routes, further constraining pastoral mobility.⁸ Moreover, the combination of rangeland fragmentation, population growth, and loss of dry season reserves will likely steepen restrictions to seasonal mobility and reduce resilience to drought and adaptation to climate change. Despite these myriad barriers and challenges, study participants in all sites described movements of animals and humans between homesteads and grazing areas (*foras*).

Mobility benefits the nutrition of people as well as livestock

The benefits of livestock mobility for animals translate directly to human nutrition, in terms of diet and food security, childcare and the situation of mothers, and child and maternal health and disease. There are clear parallels and linkages between the health and nutrition of animals, and the health and nutrition of children, some of which are explored here.

Within a pastoral system, healthy, well-fed animals produce more milk and meat, can be bled as needed,⁹ and bring in more cash if sold, which allows households to meet both food and nonfood needs. In Laisamis, women in villages will normally let their husbands or sons in the *fora* know —via mobile phone or a passed message—that cash is needed at home. *Fora* animals can be sold to other herders in the *fora*, to traders who visit *fora* to sell commodities and buy animals, or in the nearest market town. The male relative will then send the money to the village, either with someone making the journey or via M-PESA (a financial mobile app).

For infants and young children, the food-related nutritional benefits of livestock mobility are primarily linked with the greater seasonal smoothing of milk consumption that is possible by moving with the mixed herds¹⁰ to



Photo by Elizabeth Stites – Camels on the move near Garbatulla town, Isiolo County.

the *fora* in the dry season. From a nutritional perspective, the major advantage of mixed species is increased possibilities of obtaining more milk and animal-source foods, as well as income. Management of mixed herds can also contribute to the seasonal smoothing of milk consumption given the varied reproductive cycles and lactation periods of different livestock species. For example, the availability of milk for human consumption can be extended to fifteen or eighteen months for each lactating female camel.¹¹ The drought resistance of camels combined with their longer lactation period explains why—after two years of drought—camels in Kiltamany *fora*, near Kalama Conservancy, were still providing milk (albeit in small amounts). In contrast, in Laisamis, milk production by goats had ceased, and women were struggling to keep the few young kids alive by collecting wild foods for fodder and sharing family meals.

Livestock mobility, and especially travelling to new grazing areas, contributes to animal health by lowering the risk of animal disease transmission associated with overcrowding and build-up of livestock waste/excrement. In the villages, livestock fecal contamination is frequently evident, especially after several failed rains. In contrast, the *fora* environment is relatively pristine and unspoiled. An additional nutritional benefit for *fora* infants is the better quality of childcare by mothers whose dry season *fora* duties are fewer compared to those in the village. In the villages, childcare is often shared with secondary carers (grandmothers, other wives, siblings, and neighbors) given the increasing time women dedicate to diversified but marginal economic activities. Many of these duties—such as firewood and water collection, charcoal production, and domestic casual labor in towns—force them to leave their children for many hours of the day. The reduction in many of these tasks for women in the *fora* means that breastfeeding is less likely to be interrupted or stopped prematurely in the *fora*, compared to the village.

Some female study participants opted to remain in the *fora* with their infants and younger children to take advantage of the better conditions; they sent school-age children to the villages to stay with other female relatives, especially mothers-in-law and co-wives. Other women explained that they moved regularly back and forth between the *foras* and villages. Children who don't attend school may live in the *fora* full time or nearly full time to assist with herding, including both boys and girls. As with herd mobility, these human migrations between *fora* and village are dynamic and allow households to smooth consumption over time and location, and take advantage of different nutritional and livelihood opportunities.

In the context of the recent protracted drought, there are also potential nutritional disadvantages for older children who remain in the village while their mothers and younger siblings are in the *fora*. In the village, older children are more likely to be left in the care of secondary caregivers—grandmothers, siblings, or neighbors—which might limit the quality of care they receive or of the food provided, given the lack of milk in the village and limited income to buy (processed) milk or alternative nutritious foods. Furthermore, older children who lived in the village were more likely to be exposed to environmental pathogens compared to infants and young children in the *fora* because they play in areas slightly farther from their homes, which are more likely to be contaminated by livestock excrement.

Living in the *foras* and migrating from *foras* to villages are not without risks and drawbacks for human populations. *Foras* are often far from towns and associated services, which means that health care is limited and access to formal education is nonexistent. Insecurity is more likely to be a problem at the *foras* than in villages, as these are places where multiple groups often come together, including those with hostile relations. Livestock raiding is not uncommon and always carries a risk of human casualties. An additional threat as drought persists are the risks brought by human-animal interactions, including reports of hyenas attacking people and

livestock. The basic living conditions in *foras* offer little protection, and night guards are needed. Some *foras* require traversing the territory of potentially hostile groups and the need to negotiate access to shared water resources. Sanitation and hygiene at *foras* are limited, and human and livestock populations are more likely to share a water source, which potentially increases the likelihood of transmission of water-borne diseases.

Implications

Strategic mobility is the cornerstone of the resilience of pastoral production systems. Mobility of both people and livestock allows households and communities to take advantage of the shifting opportunities—nutritional and economic—that exist within a highly variable climate and ecosystem. The dynamic and flexible nature of the mobility regime is also key to mitigating risk in these environments. By moving, animals are able to benefit from pasture and water resources that would be quickly exhausted if herds were to remain for extended periods in one location. Multiyear drought places great strain upon pastoral systems, but resilience remains inherent in these systems when mobility is allowed to take place, because even in extreme drought there are small areas or pockets of pasture as a result of rainfall variability.

Strategic mobility, while essential for successful pastoralism, creates complications for national and international actors seeking to deliver services and implement programs. Location-specific and fixed models of programming run counter to the dynamic ways in which household and community members utilize different geographies for sustenance and survival. However, the widespread adoption of mobile phones by pastoral populations means that informal social support networks remain largely intact, with, for instance, women in villages contacting male relatives in the *foras* when assistance is required. This network is also used to pass on information about programming. For instance, while in Koya location in January 2023, the research team met a young woman who had two children enrolled in the USAID Nawiri longitudinal study. She had been in the *fora* near Waso Nyiro and had received a call from her mother-in-law informing her that the USAID Nawiri enumerators were in the ward taking measurements of the study participants. This young woman, a female friend, two donkeys, one infant, and two toddlers walked for three days from the *fora* back to their village in order to have her children weighed and measured. This example illustrates not only how deeply entrenched mobility is in the livelihood strategies of the local population, but also how practitioners and service providers might build upon existing networks of information and exchange to reach mobile populations.

Mobility and access to services

There is a great need to adapt service and programmatic delivery systems to the realities on the ground. Practices of mobility may constrain access to services (health, education, markets, etc.) and programs for many pastoralists, and there are both practical and financial challenges in adapting delivery models to be more appropriate for mobile populations. However, the frequent practice of providing fixed-place delivery of services and programs in areas that are predominantly pastoral can result in not only exclusion of certain groups but also potentially negative externalities for livelihood systems. The sinking of boreholes and establishment of schools and health centers in permanent settlements exclude mobile groups and can also induce sedentarization, thereby undermining the system of strategic mobility that underpins resilience in the drylands.

Conflict sensitivity and conflict resolution

Across the study sites, the research team encountered evidence of constrained mobility patterns because of rangeland fragmentation, urbanization, and territorialization. This was occurring at the same time that pasto-

ral groups needed to increase their migratory trajectories in order to access resources that were scarce due to the prolonged drought. The combination of these dynamics—increased need for mobility and constrained mobility—drives conflict between mobile groups over dry season water and pasture as well as creates tensions between migrating groups and permanent settlements. For example, in January 2023, study participants at *foras* in Kiltamany in Samburu who migrated from Laisamis explained that the local host community had turned them away from accessing water from the local borehole. This meant that they needed to push onward to locations that lacked sufficient browse and pasture for their herds. In May 2022, other participants in Kombola explained that about ten households were forced to leave their homes near Belgesh wells because of active conflict between migrating Somali herders from Garissa County and the locals; this conflict had its roots in dry season water access. Such sharing between potentially hostile groups increases the likelihood of violent intergroup conflict. Understanding the socioeconomic, political, and other dynamics of the context is, thus, necessary for conflict-sensitive programming and ensuring that interventions do not intentionally or unintentionally cause harm or create negative impacts. In addition, incorporating local customary mechanisms for conflict management and peacebuilding remains crucial, as constrained resource use and access can continue to drive conflict.

Nutrition and health outcomes

It is important for decision-makers to understand the limitations of currently available nutritional data on drylands and the fact that the data are somewhat misleading. The nutrition and health benefits associated with livestock mobility in terms of nutritional (anthropometric) outcomes are rarely assessed, because surveys are generally based on samples of children from settled communities only. Thus comparisons between settled and more mobile households are seldom made.¹² The implication of this practice is that data available from pastoralist areas (such as the SMART surveys in northern Kenya) do not represent the population of the area because mobile households are missing. This point also applies to estimates of program coverage, which are usually based on a settled population sampling frame. Year 2 of the USAID Nawiri longitudinal study will provide data that allow comparisons of children in villages compared to *fora*, and it is hoped that other assessments and studies will follow suit and incorporate mobile pastoralists into their samples and analyses.

In conclusion

This paper presents some of the arguments and evidence that explain how livestock mobility benefits the nutrition of people as well as livestock. These arguments are based on an established understanding of the dynamic relationship between people, their livestock, and the environment, which has a fundamental influence on the drivers of child malnutrition. An important aspect of this relationship is the management of livestock mobility (whether the longer-distance travel mobility or the shorter grazing mobility), and the wider systems and institutions that govern and influence this mobility. Taken together, the mobility regime and associated institutions influence environmental entitlements (access to rangeland resources), social relations at multiple levels, environmental conservation, and livestock productivity. This broader perspective of the complex and varied interaction between livestock mobility and nutritional benefits inevitably challenges a narrower, siloed sectoral viewpoint and instead looks towards a multisectoral approach that incorporates systems thinking and accounts for critical institutions as entry points for positive systemic change.

For some decision-makers it will be important to understand the science that underpins the nutritional benefits of livestock mobility. In essence, livestock mobility extends the time animals are able to graze on nutri-

tious, fresh green pastures, as compared to animals that remain in one spot and graze plants that are at the same stage of senescence or plant aging. Mobility also allows livestock to take advantage of a greater diversity of seasonal plant species, which enhances their diet and imparts particular qualities to milk and other animal-source foods. The strategy of keeping a mix of livestock species leads to less competition for limited grazing resources, because of the diverse preferences of different species. Mixed pastoralism also provides opportunities for increasing income through sales of different animals and animal products. In combination, these strategies contribute to healthier animals, which in turn translates to nutritional benefits.

A wide range of programs need to adapt to the demands and dynamics of pastoralist mobility, just as pastoralists adapt their mobility to environmental variability. A livelihood system that exploits variability necessarily needs a response that is flexible and capable of integrating variability. Practitioners in pastoralist areas must ensure that their programs incorporate this flexibility, especially in consideration of livestock and human mobility. It is only through a flexible and context- and conflict-sensitive response that pastoralist systems can be appropriately supported.

¹ A. Marshak, A. Ezaki, E. Odundo, J. Munga, A. Gargule, E. Stites, S. Ochola, and H. Young, "Nawiri Quantitative Longitudinal Study Report (Year 1). Part 2: Factors Associated with Child Acute Malnutrition and Seasonality Analysis" (United States Agency for International Development (USAID) Nawiri program, Catholic Relief Services, and Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2023); H. Young, "Nutrition in Africa's Drylands: A Conceptual Framework for Addressing Acute Malnutrition" (Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2020).

² H. Young, A. Gargule, E. Stites, A. Marshak, E. Odundo, J. Munga, and S. Ochola, "Vulnerability, Risk and Resilience: The Implications for Nutrition in Isiolo and Marsabit Counties, Kenya," USAID Nawiri Longitudinal Study Learning Brief No. 3 (USAID Nawiri program, Catholic Relief Services, Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2023).

³ S. Krätli and N. Schareika, "Living *Off* Uncertainty: The Intelligent Animal Production of Dryland Pastoralists," *European Journal of Development Research* 22 (2010): 605–622. <https://doi.org/10.1057/ejdr.2010.41>.

⁴ R. H. Behnke and I. Scoones, "Rethinking Range Ecology: Implications for Rangeland Management in Africa," in *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, ed. R. H. Behnke, I. Scoones, and C. Kerven (London: Overseas Development Institute, 1993).

⁵ *Fora* is a Swahili word; these locations and systems are also known by local names. In Rendille and Borana, it is *foorr*; in Samburu, it is *laale*; and in Turkana, it is *nabor*. We use *fora* in this learning brief for consistency.

⁶ S. Krätli, C. Hulsebusch, S. Brooks, and B. Kaufmann, "Pastoralism: A Critical Asset for Food Security under Global Climate Change," *Animal Frontiers: The Review Magazine of Animal Agriculture* 3 (2014): 42–50. In years or seasons with limited vegetation, mobility enables herds and herders to access whatever vegetation is available.

⁷ N. T. Hobbs, K. A. Galvin, C. J. Stokes, J. M. Lockett, A. J. Ash, R. B. Boone, R. S. Reid, and P. K. Thornton, "Fragmentation of Rangelands: Implications for Humans, Animals, and Landscapes," *Global Environmental Change* 18, no. 4 (2008): 776–785.

⁸ A. Pas, "Governing Grazing and Mobility in the Samburu Lowlands, Kenya," *Land* 7, no. 2 (2018): 41.

⁹ Muslim groups do not bleed animals, but other groups may do so as needed, but only when the animals are healthy.

¹⁰ Pastoralist systems in Isiolo and Marsabit Counties are predominantly based on mixed herds, although patterns of herd composition vary in different areas and are changing.

¹¹ R. T. Wilson, A. Diallo, and K. Wagenaar, "Mixed Herding and the Demographic Parameters of Domestic Animals in Arid and Semi-Arid Zones of Tropical Africa," in *Population, Health and Nutrition in the Sahel*, ed. A. G. Hill (London: KPI, Routledge, and Kegan Paul, 1985), 116–39.

¹² A nutritional study of pastoralist children in Marsabit during a drought year (1992) found that the nomadic sample had significantly lower rates of wasting compared to the sedentary samples (Ngurinit and Korr), which the authors attributed to the very different diet of nomadic pastoralists, which was based largely on milk and meat. M. A. Nathan, E. M. Fratkin, and E. A. Roth, "Sedentism and Child Health among Rendille Pastoralists of Northern Kenya," *Social Science and Medicine* 43, no. 4. (1996): 503–506.

About the Nawiri Longitudinal Study

The Nawiri longitudinal study is a mixed methods research study titled “The Seasonality of Child Acute Malnutrition and its Drivers in Marsabit & Isiolo.” This collaborative study took place in Ngaremara and Garbatulla wards in Isiolo County and Laisamis, and Loiyangalani wards in Marsabit County between September 2021 and September 2023. The quantitative component entailed twelve rounds of data collection (including anthropometric measurements) with a cohort of households with children under five years of age and two annual surveys. The qualitative component consisted of iterative rounds of data collection using participatory approaches in all study sites. The goal of the study was to increase the understanding of the causes of persistent acute malnutrition in the counties through a collaborative learning and research process which involved local actors, including communities, county institutions, civil society, and the private sector. More details on the research study can be found at <https://fic.tufts.edu/research-item/research-and-capacity-building-support-to-the-nawiri-project/>



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