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Livelihood and Institutional Transformation Along the Daua River Basin the Mandera Triangle

HANAANO LEARNING BRIEF
Overview of the Scoping Study for the Hanaano Programme

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Despite ongoing humanitarian efforts, acute malnutrition (AM) rates in The Daua Basin in the Mandera Triangle remain critically high, often exceeding emergency thresholds. Addressing AM effectively requires investment beyond treatment to prevention, **using a systems approach that tackles the root causes**.

The first in a series of learning briefs, this summary draws on findings from two scoping studies conducted as part of a new research initiative, in the Daua River Basin the Mandera Cluster. The research is part of the Hanaano programme , led by Concern Worldwide (in partnership with RACIDA, Lifeline Gedo and Pastoralist Concern and IGAD) and is a collaboration between Tufts University, Kenyatta University with funding from Irish Aid. The scoping study identifies five key messages that highlight critical components of a system's approach to preventing malnutrition.

Cover Image: *Newly cultivated farms by the trained groups in Mandera.*
Photo: Concern *Worldwide*

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Key Messages

1. ***Livelihoods are Interdependent and shaped by a complex process of transformation***
   Due to a range of structural pull and push factors, most of the households who settled in the past decade in the Daua River Basin, are adapting and diversifying, shifting from pastoralism to cultivation, but to varying degrees and at different paces. Resilience for the wider population in the Mandera Cluster depends on their pastoralist principles – particularly the management of variability, alongside livelihood diversification and adaptative strategies, and interdependence among diverse producers, markets, ecosystems, and social networks. Enhancing food security and nutrition in this region requires strengthening support of the entire livelihood system—one that is rooted in pastoralism yet evolving with ecological, social, and economic change.

2. ***As livelihoods transform, so do the risks***
   Communities along the Daua and Ganale Rivers are adapting by combining settled cultivation with livestock production. However, this transformation comes with new challenges and new vulnerabilities, such as the need for new skills and resources, lack of knowledge about crop pests and diseases, limited market access and transportation, climate variability, increased labor demands on women with impacts on childcare practices, and reduced access to animal milk. Programs and policy need to prioritize supporting sustainable and integrated livelihoods focused on crops and livestock as well as strengthen women's economic inclusion and protection.

3. ***Informal institutions are strained but central to resilience***
   Informal institutions remain central to community resilience but are under increasing strain in the communities shifting from nomadic pastoralism to a mix of cultivation and livestock ownership. These customary mechanisms are limited in their ability to address sedentarization, associated land disputes, and changing social structures. However, they are adapting through expanded social support networks and collaboration with formal actors, offering vital, context-responsive local governance where state systems remain weak. Programs need to work with and strengthen – as opposed to ignore or undermine – these informal institutions.

4. ***Climate variability Is increasing, heightening risks for communities***
   Rainfall patterns are becoming more erratic, with short rains increasing and long rains declining, leading to greater flood risks for newly settled farmers and worsening drought conditions for pastoralists. Rising climate unpredictability complicates livelihood adaptation strategies, putting Daua River Basin households and their women and child nutritional status at risk.

5. ***Future policies and programs must be evidence-based and context-specific***
   Effective policies and programs must reflect local realities, support inclusive livelihood adaptation and diversification, consider women's economic inclusion, promote crop-livestock integration, and work with informal institutions. Continued research is needed to guide context-specific strategies for long-term resilience. Uptake and research dissemination can then further enhance the knowledge and capacity of all stakeholders engaging with dryland livelihood systems.

Introduction

The Problem of Persistent Global Acute Malnutrition in the Mandera Triangle

In the Mandera Cluster child acute malnutrition (AM) rates frequently exceed the humanitarian emergency threshold of 15% of the population, signaling a persistent crisis despite the efforts of local, national, and international actors.[1] While significant progress has been made in treating AM using Community Management of Acute Malnutrition (CMAM), up to 60% of treated children relapse within six months: this illustrates the temporary nature of the current solutions.[2] Failure to address these high levels of AM undermine Sustainable Development Goal (SDG) 2.2, which aims to reduce child AM to less than 3% by 2030. Without sustainable solutions, millions of children will remain at risk of life-threatening malnutrition, perpetual cycles of poor health, reduced cognitive development, and economic vulnerability.

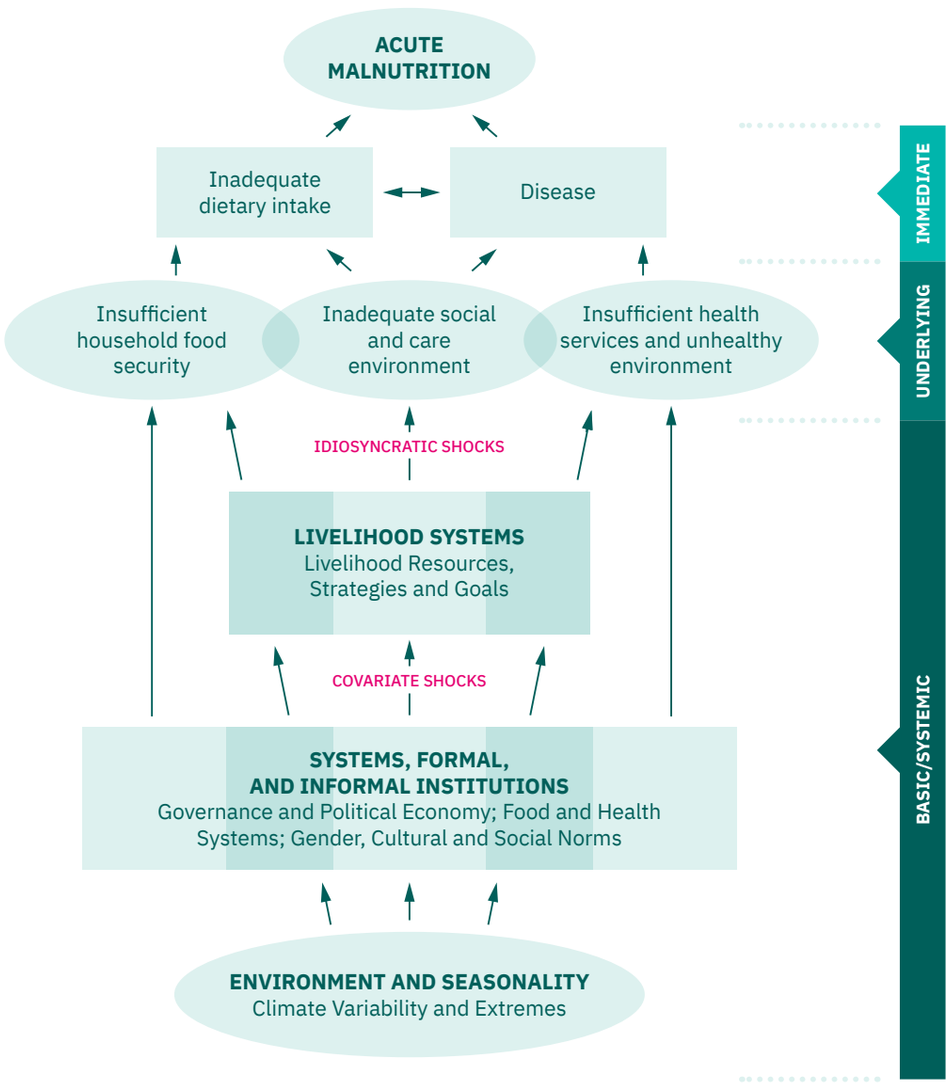


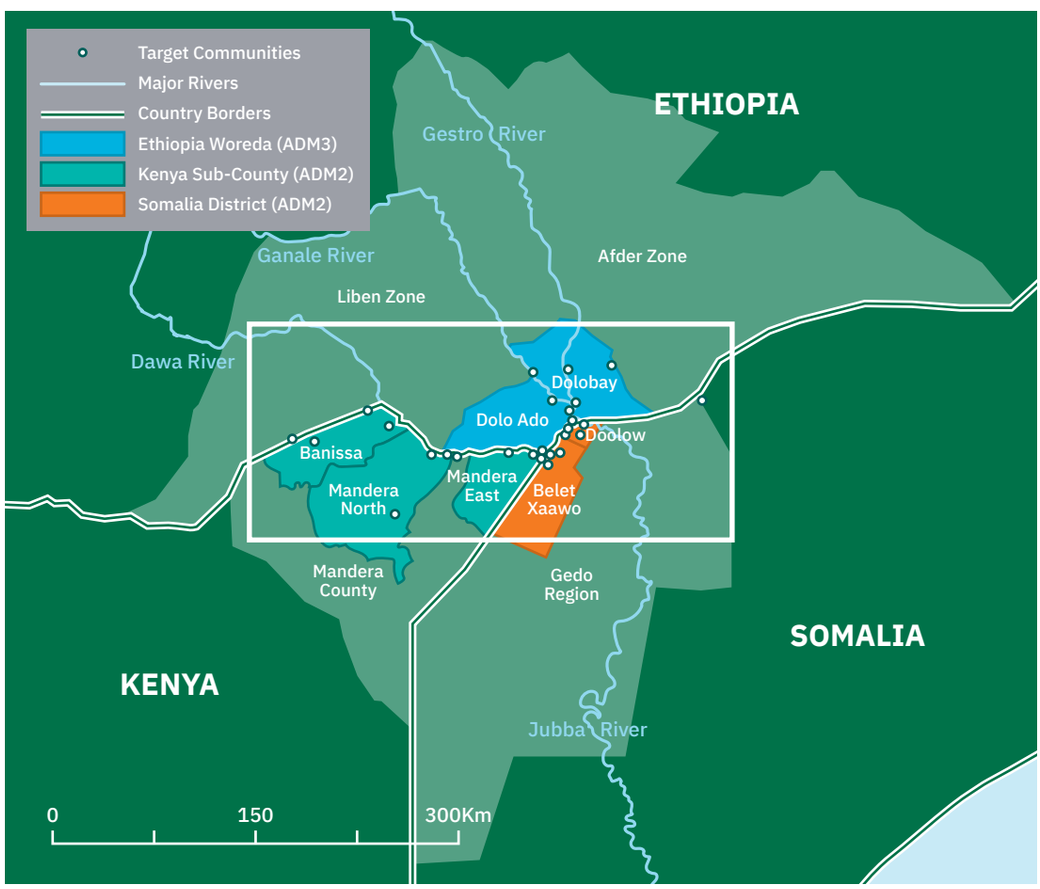
Figure 1: *Adapted Conceptual Framework for Acute Malnutrition in Drylands*

1. Young, H. and A. Marshak (2017). "Persistent Global Acute Malnutrition." Boston, Feinstein International Center, Tufts University
2. King, Sarah, Marshak, Anastasia & D'Mello-Guyett, Lauren & Yakowenko, Ellyn & Chabi, Sherifath & Samake, Salimata & Bunkembo, Magloire & Diarra, Samou & Mohamud, Feysal & Omar, Mohamed & Lamwaka, Nancy & Gose, Mesfin & Ayoub, Khamisa & Olad, Ahmed & Aliou, Bagayogo & Trehan, Indi & Cumming, Oliver & Stobaugh, Heather. 2024. Relapse Rates Among Children Recovered from Severe Acute Malnutrition: Results from a Multi-Country, Prospective Cohort Study in Mali, South Sudan, and Somalia. *Lancet Global Health*. Volume 13, Issue 1, e98–e111

Addressing persistent acute malnutrition in the Mandera Triangle—and beyond—requires a stronger focus on its fundamental drivers, as outlined in the Drylands Malnutrition Causal Framework (**Figure 1**).[3] This framework expands on the UNICEF causal model, emphasizing the interconnected roles of immediate, underlying, and basic drivers of child malnutrition at local, national, and global levels. The basic drivers include climate, environment and seasonality, systems and institutions, and livelihoods. Despite widespread adoption of the UNICEF framework, these fundamental factors receive far less attention than immediate and underlying causes, which align more directly with nutrition-specific and nutrition-sensitive interventions. Additionally, because immediate and underlying drivers are often examined at the individual and household levels, there is a risk of overlooking broader community-level influences that perpetuate malnutrition. Without a shift in focus toward these systemic and institutional factors, efforts to combat acute malnutrition will remain reactive rather than preventative, leaving children in vulnerable regions at continued risk.

The Daua Basin in the Mandera Triangle: a Unique Context

The Mandera Triangle is a vast tri-border region where Kenya, Somalia, and Ethiopia converge. It includes Somalia's Gedo region, Ethiopia's Liben Zone, and Kenya's Mandera County **(Map 1)**. The area is hot, arid, and predominantly rural, populated by ethnic Somalis organized along clan lines. Rainfall is low, unreliable, and highly variable, making the region prone to droughts and floods that exacerbate food insecurity, acute malnutrition, and conflict risks.



Map 1: *Hanaano Program Area*

3. Young, H. "Nutrition in Africa's Drylands: A Conceptual Framework for Addressing Acute Malnutrition" (Feinstein International Center Working Paper, Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston, MA, 2020)

The region hosts both permanent and seasonal rivers. The Ganale, a permanent river, joins with the seasonal Daua River at the border with Somalia to form the Jubba River. The Dawa River forms a natural barrier between Ethiopia and Somalia.[4] Major clans, including Degodia, Garre, and Marehan, extend across national borders. Communities have long adapted to the dryland ecology, integrating pastoral economies with riverine and urbanized areas. While most residents of the Mandera Triangle rely on pastoral livestock production, agropastoralists cultivate land along the Daua and Ganale Rivers. Expanding urban centers and refugee (from Somalia) camps have also spurred peri-urban settlements, where households engage in retail trade and casual labor.

The Daua River sub-basin is ecologically distinct and more varied compared to the broader rangelands (which compromise the majority of the Mandera Triangle), featuring pastureland, seasonal and permanent rivers, and diverse soil types. This landscape presents unique risks and opportunities which shape food security and nutrition. Historically, communities in this region have had cultural, social, and economic ties to pastoralism, relying on mobility to access water, pasture, and trade opportunities within the vast Mandera Triangle.[5] However, one of the most significant shifts over the past 50 years in the Daua sub-basin is the transformation of pastoralist livelihoods.

Livelihood transformation refers to the adaptation (i.e. changing existing activities) and diversification (i.e. adding new activities) of livelihood strategies in response to economic, social, and environmental changes. In pastoralism, this transformation may lead to long-term changes in livelihood capital, structure, and mobility patterns, including shifts in livelihood activities, such as transitions into cultivation and market-based activities, or adopting multi-spatial strategies to optimize opportunities and manage risks.[6] In the Daua River sub-basin, push and pull factors shape this transition. Push factors include drought-induced livestock losses, conflict, displacement, insecurity, and violence from non-state actors like Al-Shabaab and clan militias. Urbanization and population growth, as well as a large influx of refugees from Somalia, further drive sedentarization and livelihood diversification. Meanwhile, pull factors—such as access to cultivable land, government investments, improved services, and cross-border trade—encourage settlement and alternative livelihoods. Crop farming, limited to the Daua and Ganale riverbanks, rely on irrigation water from the river, making these areas distinct from the surrounding pastoralist region that is representative of the Mandera Triangle. Infrastructure improvements have also strengthened connectivity to major urban centers like Nairobi and Addis Ababa, fostering agricultural commercialization, but primarily only for wealthier households.

The Hanaano Research

Our study specifically focuses on the population along the Daua and Ganale Rivers to understand the role of livelihood and institutional transformation, along with climate variability – the basic drivers of AM – on child acute malnutrition. The findings in this brief come from two scoping studies (June 2024 and April 2025). The broader Hanaano research builds on and takes forward the evidence and learning from a mixed methods longitudinal study in Isiolo and Marsabit County, Kenya: the USAID-led Nawiri Study.[7] The selection of sites in the Daua River sub-basin intentionally captures the spectrum of formal and informal services and communities in different phases of livelihood transformation, from those who still rely primarily on long-distance livestock migration but with some rainfed agriculture, to

4. Elmi Moamed, A. (2014). Comparing Africa's shared river basins–the Limpopo, Orange, Juba and Shabelle basins. *Universal Journal of Geoscience*, *2*(7), 200–211.
5. Amutabi, M.N., Hamasi, L. (2023). Pastoralism and the Northern Kenya Economy. In: Nasong'o, W.S., Amutabi, M.N., Falola, T. (eds) *The Palgrave Handbook of Contemporary Kenya*. Palgrave Macmillan, Cham.
6. McPeak, J. G., Little, P. D., & Doss, C. R. (2011). *Risk and social change in an African rural economy: livelihoods in pastoralist communities*. Routledge.
7. Young, H., Ochola, S., Marshak, A., Stites, E., Gargule, A., Odundo, E., Ezaki, A., & Awonon, J. (2024). Back to Basics: Understanding the Problem of Persistent Global Acute Malnutrition. Feinstein International Center, Tufts University

their neighbors along the river, who primarily carry out cultivation and casual labor, with a strong emphasis on small livestock holdings.

Despite these livelihood distinctions, it is important to note that the communities across the livelihood transformation still are part of an overall broader system, that benefits from diversification and exchange with other livelihood specializations. The Mandera Triangle exemplifies a dynamic and structurally complex non-equilibrium system characterized by persistent variability and uncertainty. Characterizing households/communities in binary terms—such as pastoralist versus non-pastoralist—is erroneous. In capturing the role of livelihood and institutional transformations on child acute malnutrition and its immediate and underlying drivers, we analyzed these aspects within this broader systemic context of the Mandera Triangle, including evidence and lessons from other dryland systems, regionally and globally, and across historical and contemporary contexts. Adopting a systemic and historically informed analytical lens enables a deeper understanding of livelihoods' structural characteristics and transitional dynamics. In the following analyses, we go beyond narrowly defined livelihood activities, localized geographies, or short-term temporal frames to examine the evolving relationship between livelihood strategies and a broader set of drivers across time and space. This approach allows us to explore how households navigate and adapt to prevailing risks and emerging opportunities while maintaining linkages to wider production systems such as pastoralism.

While the study sites are not representative of the Mandera Triangle as a whole, the livelihood shifts taking place in the Hanaano programme areas are not unique. Across the Horn of Africa, there are similar examples of livelihood transformation, as pastoralism is adapting and integrating with other forms of agricultural production and livelihood diversification. Similar communities diversifying across livestock, cultivation, and other livelihood means are emerging due to climate stress, economic marginalization, and displacement. However, there is limited understanding of how these transitions affect child nutrition and food security, for the better or worse. By studying the drivers of acute malnutrition within these communities, the Hanaano programme research will provide valuable insights applicable to the Mandera Triangle as well as other dryland regions. Findings will guide evidence-based decision-making, whether for interventions, or national and local initiatives tailored to supporting adaptive and emerging livelihoods, shifting gender roles, and evolving economic structures in dryland contexts with the ultimate goal of preventing persistent acute malnutrition. Importantly, the evidence will also be used to foster a shared understanding among local and other stakeholders on the context-specific drivers of AM.

Key Findings

The following sections present observations from the scoping studies on livelihoods, systems, institutions, and historical climate and environmental data. We conclude with reflections on programming implications and details on the upcoming research to further inform the understanding of drivers of acute malnutrition.

Livelihoods: Continuity and Adaptation

Pastoral production relying on strategic mobility of livestock herds remains the core livelihood strategy for the majority of the population in the arid Mandera Triangle. Pastoralism is highly adaptive and dynamic by nature in order to respond to annual and seasonal variations and uncertainties in precipitation, vegetation and resource access. These traits make pastoralists highly adept at taking advantage of the variable climatic environment characteristics of the drylands.

The adaptability of pastoralists is particularly visible in the crop cultivation occurring in our unique study sites along the Daua River. While still culturally and socially identifying with Somali pastoralist groups, these populations are primarily settled and engage in

little to no mobile animal husbandry. Instead, households depend primarily on cultivation, either through casual labour on the farms of others or working in their own plot. However, despite this shift in livelihood activities and the accompanying settlement expansion along the riverbed, households still strongly value livestock ownership. We found that most households own goats and cows, that remain in the community or graze nearby on a daily basis. These animals serve as both an important source of milk and as a form of savings or investment. Similar to those households practicing "pure" pastoralism, households practicing cultivation frequently described selling a goat if they need cash to purchase food. The relatively recent nature of the shift towards settled cultivation is visible when comparing the main livelihood strategies that provide food and income today to the primary livelihood strategies practiced "in the time of your grandparents" **(Figure 2**).

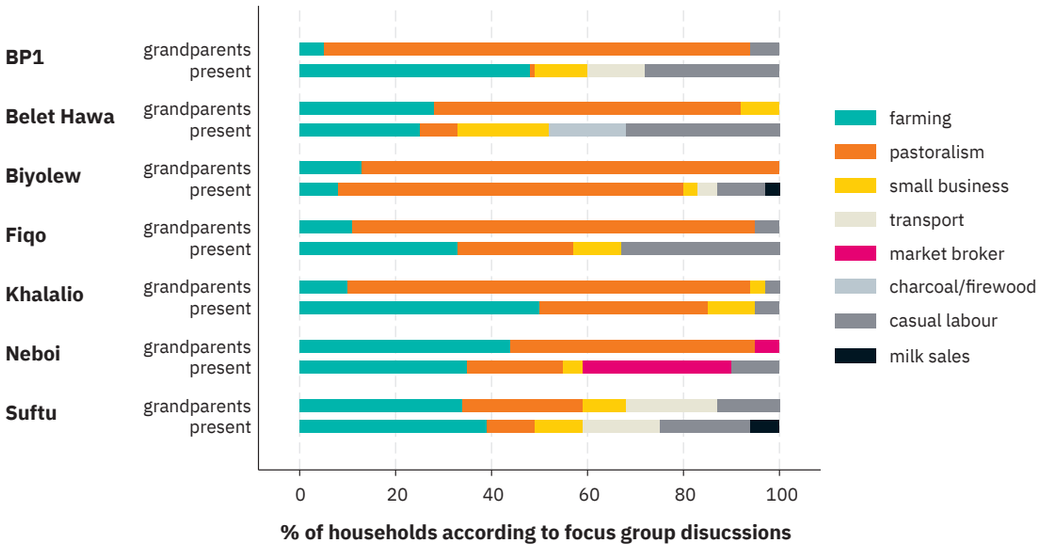


Figure 2: *Current household livelihood primary activity versus primary activity by grandparents, in the scoping study sites*

The above figure illustrates both the extent of reliance on pastoralism two decades ago in most sites and the relative degree of livelihood diversification and adaptation in these same sites today. Most notable is the rise in agropastoralism and crop cultivation or farming. Some activities—such as transport, casual labor and small businesses—are closely linked to the growth in crop farming, while others—milk sales, market brokers, and some forms of transport—are likely more closely integrated with livestock husbandry. This shift has been driven both by the challenges of livestock loss, climate change and conflict and by the unique opportunities created by economic growth, urbanization, the availably of arable riverine land, and the expansion of services (technology, education, financial institutions, and infrastructure) in the border zone along the Daua River.

This livelihood transformation, including both adaptation and diversification, has important implications for health and nutrition. For instance, a critical finding from the Nawiri longitudinal study in Isiolo and Marsabit Counties was that there is an important difference between sustainable and maladaptive forms of diversification and in who within a household is engaged in these different activities.[8] In the Nawiri analysis, we found that women in Kenya were more likely than men to be engaged in marginal, high-risk and extremely labor-intensive activities (such as resource exploitation and sale) which increase their time burden and hence limit child-care. Many women were spending extremely long hours engaged in these activities in order to replace the food and income that had in previous generations been provided through (male-dominated) animal production;

8. Young, H., Ochola, S., Marshak, A., Stites, E., Gargule, A., Odundo, E., Ezaki, A., & Awonon, J. (2024). Back to Basics: Understanding the Problem of Persistent Global Acute Malnutrition. Feinstein International Center, Tufts University

the extremely marginal returns offered through these activities further exacerbated the time burden. As a result, mothers were often separated from young children for 12 or more hours per day, leaving these children under the supervision of neighbors, co-wives, grandmothers or siblings. Similarly, in Ethiopia, women who work in cultivation reported that they can only bring their breastfeeding children with them to the field, while younger children, particularly ages 3–5 years, remain at home to be taken care of by older siblings. Sharing of childcare is an important and long-standing aspect of the informal social safety net in such communities. However, we posit that the extremely long hours combined with the widespread food insecurity mean that these secondary caregivers do not have adequate food resources to feed these children, and that this may be a basic factor contributing to the high rates of persistent acute malnutrition.

In the Ethiopia sites, in communities balancing long-distance livestock migration with rainfed farming, the women and children tend to remain in the settlement while the men and livestock move with the rains. The result is that women and children, particularly during the dry season, are separated from the main herds and thus only have limited access to milk from the animals remaining in the village. Prior to sedentarization, these women and children would have travelled with the animals, thus having more consistent access to animal-based products throughout the year. On the other hand, the settled community is within half a day's walk from the hospital and health posts, as well as a market in a refugee camp where malnutrition treatment can be purchased if not available at the health centers. The decreased access to animal protein coupled with the better access to services illustrates some of the trade-offs inherent in these livelihood transitions.

The Daua River study sites highlight a series of challenges and vulnerabilities related to livelihood transformation and diversification in this region. Many of the households that have shifted from mobile livestock herding to cultivation in recent years appear to be struggling with inadequate capital to support this transition. The scoping studies highlight limited human capital as a central problem, with an absence of skills for cultivation and limited knowledge regarding flood control, riverine land management, marketing of farm produce, or pest management. At the time of the scoping studies, households reported not wanting to plant onions, the main cash crop in the area, because an unknown disease devastated the onion crop the previous year. Connection to markets and transportation are serious constraints for respondents in the Ethiopia site, due to limited infrastructure (including very few bridges over the crocodile-infested Ganale River), making communities outside of towns (Dolo Ado, Mandera Town, etc.) generally unable to access markets or services in the rainy season. Land access itself is another constraint to successful cultivation, as there is limited acreage along the riverbed; these prime plots are mostly held by those with more financial resources and political or social capital. Lastly, crop farming is much more vulnerable to erratic and variable climatic conditions than pastoralism for the simple fact that crops cannot be moved to more favorable locations in response to annual and seasonal fluctuations. Thus, most households settled near the Daua River cannot consistently rely on subsistence farming as the sole source for their food and income. The data from the scoping studies, although limited, indicates that while many of these farming households have dropped out of mobile livestock husbandry, they still show a keen interest and desire to remain invested in and grow their livestock herd. This form of diversification could help to mitigate the risks associated with cultivation.

Systems and institutions in livelihood transition: continuities and adaptation in the Mandera Triangle

Institutions are systems of established social rules and values that structure access to resources, shape crisis response, and influence external interventions in livelihood and environmental management.[9] In pastoral systems, formal and informal institutions play a

9. Hodgson, G. M. (2006). What are institutions? *Journal of economic issues*, *40*(1), 1–25; Haller, Tobias. 2007. Understanding Institutions and Their Links to Resource Management from the Perspective of New Institutionalism, second edition. NCCR North–South Dialogue, no. 2: Bern: NCCR North–South.

central role in regulating environmental resource access through local values of reciprocity and solidarity[10] but are also embedded in unequal power relations that affect vulnerability to risk and malnutrition.[11] How decision-makers, including external actors, understand these institutions shapes policy responses and can legitimize specific development pathways.

Key informant notes, like many dryland societies, Somali communities in the Mandera Triangle relied on kin-based customary institutions to build resilience and manage communal resources essential to pastoralism. Clan-based structures, led by respected male elders, regulated access to resources, supported vulnerable clan members, managed conflict resolution and facilitated mobility, forming the core of pastoral institutional systems. In the last three to five decades, however, livelihoods in the Mandera Triangle have undergone significant transformations. Driven by recurrent droughts, displacement, and new economic opportunities, particularly the potential for crop production in riverine areas—communities have shifted from mobile pastoralism to more diversified strategies with participation in non-livestock options such as farming, casual labor, and petty trade. There is a growing sense of loss among households with strong pastoralist roots, who emphasize that the shift away from pastoralism was not voluntary but driven by structural changes that have eroded its practicality and productivity.

Multiple community sources provided detailed insights into the evolving role of informal institutions in the Mandera Triangle amid shifting livelihood systems and local governance structures. Respondents highlighted significant challenges arising from the decline of customary authority and ongoing livelihood transformation, such as pastoralist households transitioning to crop farming due to livestock loss or herders settling in urban centers, shifts that have diminished the role of natural resource management institutions like clan-based reciprocal grazing agreements or seasonal water-sharing agreements. The transformation of these traditional institutions struggle to manage resources in settled livelihoods, resolve disputes over individualized farmland ownership, and navigate the complexities of increasingly mixed-clan settlements—issues they were not originally designed to handle. Respondents also noted that official government policies—particularly in Ethiopia and Kenya—have further undermined traditional systems by encouraging a shift from clan-based governance to formal state structures focused on administration and service delivery. Despite the increased presence of formal entities, a recurring theme was the persistent under-resourcing and limited reach of these institutions in the region, which remain disconnected from local realities. For example, a pastoralist study site in Ethiopia is not recognized as an official kebele, leaving it without access to essential nutrition screening and treatment services. Similarly, the weakening of customary protection mechanisms in Kenya has not been accompanied by adequate investment in social protection, security services, or law enforcement—leaving many inter-group conflicts unresolved and prone to recur. These cases underscore the significant governance and service delivery gaps in underserved areas like the Mandera Triangle—gaps closely linked to the underdevelopment and chronic under-resourcing of formal government institutions in these regions.

Despite these challenges, the findings suggest that informal institutions remain essential in the region, especially where they are adapting to support more contextually responsive and inclusive governance in livelihood transitions. Community-level perspectives highlight how food sharing, communal labor, mutual aid, and childcare have been extended beyond kinship ties to include neighbors and unrelated households, marking a shift toward broader, more inclusive social support systems. Knowledge exchange between experienced local farmers and community members without farming skills illustrates the continued importance of certain individuals – referred to in the literature as high-reliability professionals in the Mandera Triangle context. These individuals work within and through diverse social networks and processes which support various aspects of

10. Roe, E (2020). Pastoralists as Reliability Professionals. PASTES. Accessed July 2025: *https://pastres.org/2020/04/17/pastoralists-as-reliability-professionals/*
11. Young, H (2020). Nutrition in Africa's drylands: A conceptual framework for addressing acute malnutrition. Boston: Feinstein International Center, Tufts University.

the larger system in various ways and at different times. For example, in Aloley, Ethiopia, Hussein, a local farmer, bridges informal knowledge with formal programming through his support for fellow farmers and collaboration with the Hanaano programme. Through this, he helps households lacking farming skills, resources, or experience to take advantage of agricultural opportunities. Informal social support systems have also been adapted to address displacement challenges, with clan elders working alongside local government to enroll refugee children in schools, provide shelter for newly displaced households arriving in their locations, and coordinate emergency assistance for households affected by loss or crisis. These examples show that while informal institutions are under strain, they remain essential to community resilience and are actively evolving to meet new challenges.

Findings from the Hanaano programme scoping studies show that livelihood transformation in the Mandera Triangle—driven by conflict, climate shocks, and new opportunities—has shaped the current institutional landscape but represents only one part of a broader set of systemic drivers influencing food security and nutrition outcomes in the region. In addition to the significant impacts of conflict and climate shocks on systems and institutions, such outcomes are shaped by complex interactions between livelihood resilience, adaptive strategies, and the underlying causes of malnutrition.[12] Effectively addressing acute malnutrition in such dryland contexts requires a systemic, institutionally focused approach that recognizes their inherent complexity and unpredictability. As Young[13] emphasizes these must be grounded in local realities and driven by community knowledge, leadership, and ownership to ensure relevance, sustainability, and impact.

Climate and Environment: Increasing Variability and Shocks

Climate and environment underpin the livelihood systems of the Mandera Triangle. Using 44 years of remote sensing data on precipitation, temperature, and vegetation, we analyzed the annual and seasonal trends of these variables as delineated in **Map 1**. From a purely descriptive seasonal standpoint, the area constitutes a bimodal rainfall system with two rainy periods: a longer period in March through May and a shorter one in October and November. The temperature peaks tend to occur immediately prior to the rain, with the largest peak in March and the second largest peak in September. Vegetation, as measured by the enhanced vegetation index, peaks one month after each rainy season, i.e., in May and November (**Figure 3**). In addition to these localized climate effects, the Ganale River runs through the Highlands of Ethiopia, so the area is also affected by upstream rainfall.

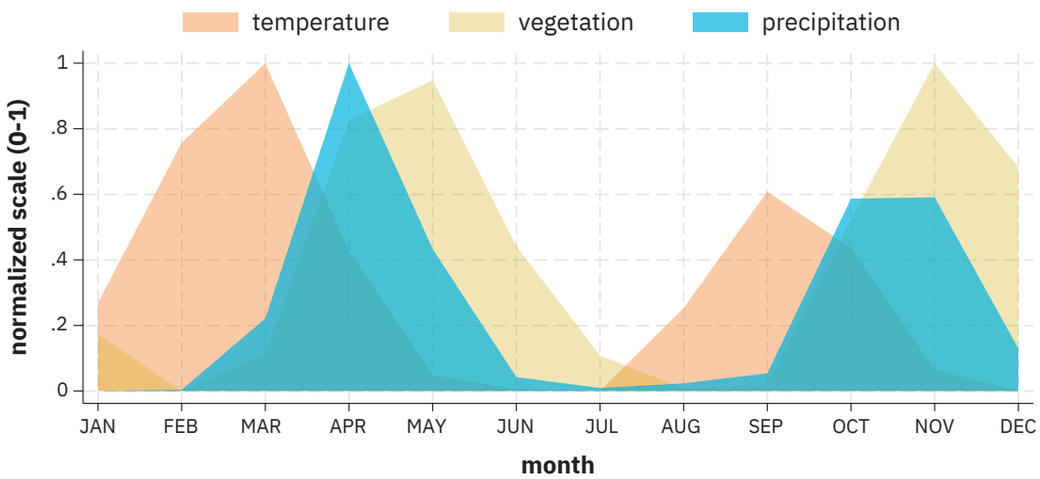


Figure 3: *Seasonality of Temperature, Vegetation, and Precipitation in the Mandera Triangle (44-year average from 2000–2024 normalized for easy visualization)*

12. Young. *Nutrition in Africa's drylands*
13. Young. *Nutrition in Africa's drylands*

Given climate variability and the role of climate change, the data indicates that these trends are unlikely to remain stable over time. Particularly with rainfall, we find that the amount of rain in the short rains (October – November) is increasing while the amount of rain during the long rainy season (March – May) is decreasing, with an overall significant increase ($p<0.05$) in the total variability of rainfall from 2000 to 2024. Our findings correspond with the most recent climate model projections for Eastern Africa indicating that the short rains will deliver more rainfall than the long rains by 2030–2040.[14] Communities echoed this perspective in the focus groups, saying that the long rains have been decreasing over time. At the time of the second scoping visit (April 2025), the rain had been delayed for weeks. These shifts in rainfall contribute to increased flooding, particularly affecting newly cultivating households that lack the skills, resources, and infrastructure to manage floodplain farming. Flooding brings rich nutrients and new soil but can also disrupt cultivation and cut off access to land. If unexpected (such as flash floods caused by rainfall in the Ethiopian Highlands), floods may cause loss of life to animals and humans. In addition, floods can exacerbate human and livestock diseases, with respondents describing increased diarrhea and intestinal problems during the rainy season.

Along with flooding, drought is a pressing environmental challenge to livelihoods and a key driver of herd loss and increased settlement along the Daua Rive over the past 50 years. While the remote sensing data analysis for the Mandera Triangle does not indicate significant changes in temperature, there is strong evidence of increasing drought frequency and rising temperatures for East Africa and the Horn on the whole.[15] If this trend persists, we expect continued increased settlement in this region as people lose livestock and look to other livelihoods. This is likely to increase the pressure on natural resources and government services. For example, respondents reported that the shallow wells in Biyolew no longer have enough water to support the growing population in the village. Since 2011, the community has depended on emergency trucking of water during droughts and prolonged dry seasons. In addition, our data show that temperature is becoming more variable, making weather patterns less predictable for communities reliant on natural resource-based livelihoods. Furthermore, changing climate conditions can bring new diseases and pests. An onion pest destroyed the entire crop last year, with the local administration having little information on how to identify or address this pest's impact on the man cash crop for these communities. This unpredictability and trend of emerging diseases complicate planning for water access, grazing, and crop cultivation, heightening the risks of food insecurity and malnutrition.

Implications For Programming

The Hanaano scoping studies examined a unique sub-set of communities along the Daua and Ganale Rivers in the Mandera Triangle. Unlike the pastoral majority in the region, these communities have been shifting gradually over the past 50 years from mobile pastoralism to more diversified and cultivation-based livelihoods, although still with an emphasis on livestock. Communities farther away from the river are less diversified and still rely heavily on long-distance livestock migration with sedentarization of women and children who invest in opportunistic rain-fed as well as irrigation farming where available.

Reducing household vulnerability requires a comprehensive approach that supports a broad spectrum of livelihood diversification, enhances key linkages across livelihood groups, and increases access to much needed services (health, water, education) while ensuring interventions align with governance, market, and sociocultural dynamics. A critical question for international development and humanitarian agencies is how to maximize the benefits

14. Palmer, P.I., Wainwright, C.M., Dong, B. *et al.* Drivers and impacts of Eastern African rainfall variability. *Nat Rev Earth Environ* 4, 254–270 (2023). Accessed July 2025: *https://doi.org/10.1038/s43017-023-00397-x*
15. Lyon, B. Seasonal drought in the Greater Horn of Africa and its recent increase during the March–May long rains. *J. Clim* 27, 7953–7975 (2014).

of the links to pastoralism while also supporting households whose livelihoods are in transition, and how this knowledge can inform sustainable, resilience-building programs and policies for malnutrition.

Support sustainable and integrated livelihoods focused on crops and livestock

While the majority of the population along the Daua and Ganale Rivers now rely heavily on cultivation-based livelihoods, livestock remains central, irrespective of where they are in the livelihood transformation. Livestock continue to be an important source of animal milk, savings – including easy cash in the case of a shock – and seasonal livelihood diversification. Interventions should prioritize better alignment between crop and livestock activities, particularly in response to seasonal variations (which will be covered in future briefs), as well as increasing traditional trade and market connections between pastoral, agropastoral, and the peri-urban communities. Misaligned interventions—such as restricting pastoral mobility, focusing solely on livestock markets, or solely on cultivation—is unlikely to support livelihood resilience in this region.

In addition, many newly settled households lack the skills and resources needed for crop cultivation and therefore require context-specific support. Programs should equip communities with skills, resources, knowledge, and innovations by working with existing community-level high reliability professionals and local institutions. Organizations should consider improving links between customary leadership, local administration, and national institutions for identification of and support with emerging animal-, crop-, and human-diseases.

Strengthen women's economic inclusion and protection

Women's roles have changed in conjunction with livelihood diversification. Many women find themselves without the social and cultural protections or year-round access to animal milk that exist within traditional pastoral systems. As women take a greater role in crop cultivation, non-breastfeeding children usually remain with a secondary caregiver for large portions of the day. Interventions targeting women should focus on expanding women's access to assets and animal milk, supporting secondary caregivers, enhancing their decision-making power, and safeguarding them against gender-specific risks. These may include interventions prioritizing improving women's landownership, access to skills and resources, trade, and entrepreneurship. Strengthening women's leadership in community-based organizations and cooperatives can help amplify their voices in household and community decision-making. Policies and programs should also integrate social protection measures, such as legal safeguards against exploitation, sensitization on child-marriage, gender-sensitive financial literacy programs, and tailored support networks to mitigate risks associated with livelihood transitions.

Leverage informal institutions and social networks

Livelihood resilience in a context of change and unpredictability requires adaptability – the potential to manage risks and exploit diverse and changing resources and opportunities. In dryland environments, adaptation depends on flexible and adaptable informal institutions and social support systems, including those that empower households to cope with and recover from the short and long-term impacts of shocks. In the Mandera Triangle, the role and potential of customary institutions, high reliability professionals and their networks, and social support systems often exceed the opportunities and support currently provided by formal institutions.

Given the importance of adaptive customary institutions and social support systems in managing critical aspects of livelihood transitions in the region, interventions should prioritize supporting these institutions to foster positive outcomes for poorer households and vulnerable groups. This includes bolstering the role of clan elders in cross-border

conflict resolution and market facilitation, further strengthening resilience, identifying and facilitating the supportive systems provided by high reliability professionals, and preserving the valuable functions of these institutions in cross-border trade. Additionally, collaboration with formal government institutions should be managed cautiously to prevent disrupting customary systems, a challenge that has previously occurred in the region and other similar dryland contexts.

Enhance knowledge and capacity for engaging with dryland livelihood systems

Most importantly, international development actors must strengthen their knowledge and internal capacity to engage with pastoral livelihood systems in various stages of transition, adaptation, and diversification. The understanding of pastoral livelihood transitions remains limited, and even less is known about the long-term implications for nutrition. Emerging evidence must be effectively translated into development practices, from project design to implementation and evaluation. Establishing a framework for engagement based on an improved knowledge base would be instrumental in matching programme delivery to the changing realities on the ground.

Next Steps in the Hanaano Research

Following the scoping studies that contributed to this report, we will be conducting a one-year mixed-methods study that incorporates research and learning to better understand and address the drivers of acute malnutrition in the Mandera Triangle. The one-year research component (July 2025 – June 2026) includes six rounds of quantitative data collection (every other month) following the same household and all their children under the age of five. The quantitative component will be complemented with two rounds of qualitative inquiry. We will also use remote sensing data – precipitation, temperature, and vegetation – to better understand the temporal context in which to place the research year. The longitudinal quantitative data along with the qualitative inquiry will further allow us to explore the seasonal dimensions of AM and its drivers. The research will be complemented with learning and research uptake activities to disseminate and confirm the research findings on the community, local, national, and international level.

NOTES

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