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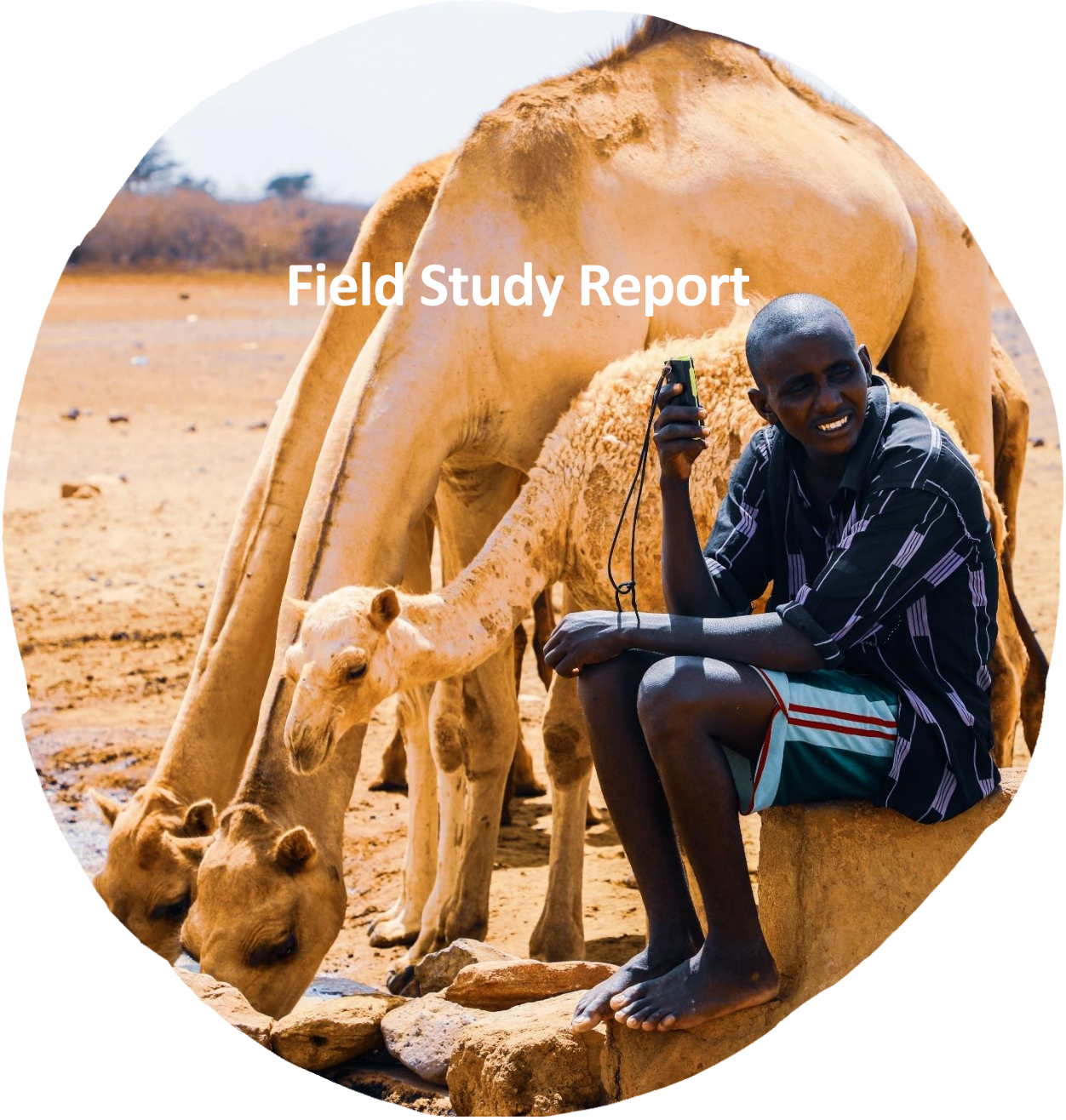

Understanding the Role and Potential of The Private Sector in Addressing Acute Malnutrition in Isiolo and Marsabit Counties

Field Study Report

USAID FROM THE AMERICAN PEOPLE

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Acronyms

AP	Area Programme
ASAL	Arid and Semi-Arid Land
ATM	Automatic Teller Machine (used in the context of milk Dispensing)
BDD	Bule Dogo Dambicha (Dairy Unit and commercial-level livestock feedlot in Isiolo)
BDS	Business Development Services
BMZ	Federal Ministry for Economic Cooperation and Development in Germany
CHW	Community Health Worker
COVID-19	Coronavirus Disease 2019
ECDE	Early Childhood Development and Education
ECHO	European Commission Humanitarian Office
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
FEWS NET	Famine Early Warning Systems Network
FGD	Focus Group Discussion
GAIN	Global Alliance for Improved Nutrition
GBV	Gender-Based Violence
IDI	In-depth Interview
IFPRI	International Food Policy Research Institute
II	Individual Interview
IO	Intermediate Objective
KCC	New Kenya Cooperative Creameries
KES	Kenyan Shilling
KG	Kilogram
KII	Key Informant Interview
KNBS	Kenya National Bureau of Statistics
KSH	Kenya Shillings
LMA	Livestock Management Association
LMS	Livestock Market Systems
LTD	Limited
LVIA	Lay Volunteers International Association
MSME	Micro, Small and Medium Enterprise
MT	Mount
NDMA	National Drought Management Authority
NGO	Non-Governmental Organization
PACIDA	Pastoralist Community Initiative Development and Assistance
PARS	Pan African Research Services Limited
QA	Quality Assurance
QC	Quality Control
SBC	Social Behaviour Change
SME	Small and Medium Enterprise
TOC	Theory of Change
UHT	Ultra-High Temperature
UoN	University of Nairobi
USAID	United States Agency for International Development
VSF	Vétérinaires sans Frontìeres

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Executive Summary

This report presents a synthesis of findings from a field study conducted in Marsabit and Isiolo counties for the Nawiri program. The study aimed to understand the role and potential of the private sector—specifically, local micro-, small-, and medium-sized enterprises (MSMEs)—in addressing acute malnutrition in Isiolo and Marsabit counties**.** Given that this area is dominated by pastoralism**,** the value chains explored by the study first included meat, milk, fish, and poultry; followed by maize, beans, fruits and vegetables.

Data gathering methods: The study employed a two-pronged approach using 1) a desk review and 2) qualitative data collection methods, including Focus Group Discussions (FGDs), Key informant Interviews (KIIs), and Individual In-depth Interviews (IDIs). The main stakeholders engaged in this study included food producers; market managers; traders; leaders of unions or trade groups; non-governmental organization (NGO)'s representatives; and County Ministries of Agriculture, Livestock, and Trade.

Main staple foods: In Marsabit County, main staple foods were maize and rice; milk was also commonly consumed, while more occasionally eaten foods included beans, meat, and wheat. Other foods consumed included macaroni/pasta, vegetables (e.g., kale, cabbage, potatoes, and spinach), eggs and fish (mainly in Loiyangalani and Marsabit Town). Similarly, the staple foods in Isiolo County were milk, rice, maize, and beans, while more occasionally eaten foods included meat and wheat. Other foods consumed included green grams, peas, and vegetables (e.g., kale and tomatoes). Sugar (as part of tea consumption) and fat/cooking oil (in preparation of meals) were commonly consumed within the two counties.

Foods were prepared at the household level by the women and consumed by all members (both male and female) of the households except babies and in some special cases, pregnant women. The foods consumed were dependent on numerous factors such as availability, production levels, accessibility (both physical and financial factors) and cultural norms and taboos.

Market access: In the two counties, households accessed most staple foods mainly from the markets since crops were not commonly grown in these counties. Maize, maize flour, rice, wheat, cooking oil and pulses, processed milk and vegetables were all sourced from Meru and Nairobi, sold through wholesalers to retailers, and then to local vendors. Availability in the two counties is highly influenced by production in the source areas, i.e., if production is low in the source counties, the two counties will receive a low supply. Isiolo, due to its proximity to Meru and Nairobi, had better supply; on the other hand, Marsabit County (especially Moyale), had access to food commodities from Ethiopia. Due to affordability challenges in both counties, foods were packed into smaller quantities that could be easily accessed by the community.

Notably, milk—which was a staple food in Isiolo County and commonly consumed in Marsabit County, and meat—which is commonly consumed in both counties, were both locally produced and available in the local market. However, their availability was dependent on seasons. Based on a long-term (2007–2020) average, household milk production per day in Marsabit County was 1.6 litres, while in Isiolo it was 1.8 litres. Camel milk is the primary milk produced in both counties, followed by cattle milk and goat milk. The production levels were deemed low by the community members, especially during the dry seasons when the livestock was taken to fora (grazing zones far from settlements). Milk was mainly consumed fresh, however, due to low production, packaged milk from Meru and Nairobi was also consumed within the households.

Goat, cattle and camel were the primary types of meat and were mainly sourced in small quantities from butcheries. Meat was mainly consumed fresh but sometimes consumed as *Nyirinyiri.*[1] Nyirinyiri is consumed mainly during the dry seasons when fresh meat is in low supply.

Fish was commonly consumed along Lake Turkana in Marsabit County (Loiyangalani, El Molo and Ileret) and along Ewaso Ng'iro River in Isiolo County (Merti). The main types of fish in Lake Turkana were Nile Tilapia and Nile Perch; the main types of fish in River Ewaso Ng'iro were clarias, common carp, lungfish, tilapia, barbus and labeo. Fish was consumed both as fresh and sun dried. In Marsabit, fish consumption was mainly among the fisher folks; consumption among pastoralists and agro-pastoralists communities was hindered by cultural norms and taboos.

Local market: Within the local markets of the two counties, camel milk, cattle milk and goat milk were produced locally and sold directly to consumers fresh (raw) or fermented. Conversely, ultra-high temperature (UHT) treated and packaged milk was sourced from Nairobi and Meru and sold in retail shops/kiosks within the local market. In Marsabit County, fresh raw milk (camel, cattle, goat) normally retailed at Kenya shillings (Ksh) 60–75 per litre. In Isiolo County, fresh raw milk (camel, cattle, goat) normally retailed at Ksh 60, 50, and 40, respectively, per litre. In both counties, packaged milk (UHT) retailed at Ksh 110 per litre (sold in 500 millilitre quantities).

Even though camels, cattle and goats were primarily owned by men, women were more dominant in marketing the milk, serving as key bulkers and retailers of milk in both counties. In Isiolo County, women's cooperatives, and groups (such as the *Tawakal* women and *Anolei* women) aggregated and distributed camel milk. The United States Agency for International Development (USAID)-funded classic dairies were supported under the Livestock Market Systems (LMS) project to process and package camel milk. At the time of the study, they were not operational. In Marsabit County, the Moyale camel milk dairy cooperative, funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) was aggregating and processing camel milk. Under the LMS programme, Korkora Dairies in Karare received funding for bulk cow-milk storage making, with value addition and selling as their main business. Notably, most aggregation groups for milk were women-owned, inclusive of young mothers. The retailers/vendors were mostly young women and men. The young men were mainly distributors who used motorcycles to deliver the milk.

The livestock market remained the main source of goat, cattle and camel meat. Once sourced from producers in the counties, these animals were slaughtered in abattoirs. The meat was retailed raw and in small quantities in butcheries. Most of the butcheries were operated by men; women often engaged in retail. Butcheries were accessible to both male and female community members, but male-headed households could afford to consume meat more frequently than female-headed households. Like the milk value chain, young men transported meat from abattoirs to butcheries using motorcycles and metal boxes.

Camel meat was the only type of meat processed in both counties. In Marsabit County, camel meat was processed by women groups into Nyirinyiri[2] and consumed at the household level while some (smaller quantities compared to Isiolo County) was sold in the local market. In the *Jua Kali Nyirinyiri* cooperative in Isiolo County, Anolei and Tawakal women camel dairy cooperatives were producing it for commercial purposes. Traders in Isiolo mainly targeted the Nairobi Eastleigh Market, while minimal quantities were sold in Isiolo County. One kilogram of *Nyirinyiri* retailed at Ksh 1200 compared to Ksh 400 for fresh meat at the butcheries. Most consumers found fresh raw meat affordable compared to

[1] Sun-dried camel meat fried and stored in fat that can last up to six months.
[2] Ibid.

Nyirinyiri. However, the shelf life of fresh raw meat was low and its availability during the dry season was very scarce.

Fish was mainly sold raw within the areas close to the fishing zones and sun dried for areas further away from the lake. In Loiyangalani, some traders had portable ice chests that they used to transport fresh fish to Marsabit Town. In Merti, however, fisher folks had temporary holding ponds that they used to keep their fish after harvesting and for later sales. Apart from sun drying, Loiyangalani fisher folk's cooperative were processing fish into fish fillets and supplying to the hotel industry in Marsabit Town and Loiyangalani. Despite most fisher folks being male, women were very active in the retail of fish. They purchased fish at the shore and sold them as dried, fresh or fried in the local markets. Dried fish retailed between Ksh 30–40 per piece at the shore while fresh retailed between Ksh 50–100.

Trading relationships: These relationships were primarily between individual producers and aggregator groups; contracts for the sale of milk were generally payable on a monthly or half-monthly basis. Trading relationships had been largely deemed successful by both producers and aggregators. Direct milk sales from retailers to consumers were on a cash basis. Packaged milk (UHT) was sourced and retailed mostly on a cash basis. The main barriers to the integration of producers and traders in the milk value chain were seasonality and the lack of preservation technology.

In both counties, the relationship between livestock producers and traders was on a cash basis. Raw meat was sold mainly on a cash basis while the value-added *Nyirinyiri* was sold on a one-week credit basis to traders/suppliers. Direct sales to consumers were on a cash basis only. The integration between traders and producers in the meat value chain was more streamlined than other value chains but faced challenges—such as poor transport systems where only traders who owned lorries or those who could afford to hire were more advantaged in sourcing for livestock. During the dry seasons, the distances covered to source animals increased due to livestock migration, which increased costs.

Local fish traders in both counties purchased from producers on a cash basis and then sold on a cash basis directly to consumers; sometimes fish was sold on credit to other traders. Fish trade between Kisumu and Loiyangalani fish traders was on mutual agreements and trust. The producers transported fish to Kisumu on credit and then waited weeks for payments from the traders.

Key Challenges

Production: The main challenges crop producers faced within the two counties included frequent droughts and inadequate rain, pastoralism culture, poor access to finance, poor access to inputs, intercommunal conflicts, poor extension services/access to production technology and poor access to preservation technology to overcome the hurdle of post-harvest losses.

In milk production, droughts in both counties affected rangeland, where some livestock died, and production declined. During the dry season, livestock were taken to fora (grazing zones far from settlements) by men. This affected access to milk for women and children who mainly remained at home. During the rainy season, production was high, but due to a lack of proper preservation mechanisms, the milk was wasted. Other challenges included poor access to finance, conflicts and livestock rustling, livestock diseases and poor access to extension services.

Likewise, meat production faced challenges—such as poor access to finance, drought, conflicts and livestock rustling, poor preservation methods and poor access to extension services. During dry seasons, some livestock died, and others transported to fora were difficult to access. Thus, during the dry season, accessing livestock for slaughter was a challenge, as was finding livestock healthy enough for butchering.

Fishing was mainly confined to Lake Turkana in Marsabit County and Ewaso Ng'iro River in Isiolo County. In Isiolo County, the poor fishing capacity (knowledge and equipment) and poor preservation methods and appropriate transport systems were the main challenges. These challenges were also present in Marsabit County. Additionally, fish production in Marsabit faced challenges, including conflicts in the waters of Lake Turkana, climate change, strong waves, and crocodile attacks.

Markets: The milk, meat and fish markets in both counties faced challenges, such as low supply (especially during dry seasons), poor preservation measures, poor aggregation systems, lack of value addition options, poor capacity of traders (knowledge and equipment) and poor access to finance. Aggregation was mainly done for milk and by women groups in the two counties. Main preservation methods for fish were sun drying, and only a few fisher folks had ice chests for storage. Freezers for meat storage were owned by very few meat traders. Traders therefore only provided small quantities of meat to the public to avoid risks of unpurchased meat being spoilt due to lack of proper storage.

Value addition and processing: The two counties lacked processing and value addition facilities. In both counties, milk was not processed even among milk aggregators (such as Anolei and Tawakal cooperatives) and pasteurizing equipment was not affordable. Processing of ghee in Marsabit was done at the household level by women trained by NGOs. Similarly, meat was transformed into Nyirinyiri by women and was only done commercially by women groups (such as Anolei and Tawakal cooperatives in Isiolo); in Marsabit it was done for household consumption. Fish processing was minimal, since only a few fisher folks in Marsabit County were processing fish fillets. At the time of this assessment, the county government was setting up a fish processing plant in Loiyangalani, but it was not yet operational. Other value addition challenges in for milk, meat and fish in the two counties included lack of education and technical expertise to do value addition and processing, expensive power costs, frequent power outages and poor access to water.

Opportunities

Production: Opportunities in crop and livestock production include improving access to agricultural extension and training services, adoption of improved agricultural technologies and practices (promotion of drought tolerant crop varieties, soil, and water conservation as well as water harvesting practices and rangeland management) and improving access to finance/inputs and preservation measures.

Markets: In the supply of milk, meat and fish, proper aggregation mechanisms for milk and meat needed to be instituted. Cooperatives already undertaking aggregation of milk and traders selling milk, meat and fish within the counties needed to be supported with access to finance and capacity-building to improve their reach within the counties. Aggregation groups and traders provided an opportunity to improve supply of milk, meat, and fish in the counties. Additionally, aggregation and support of traders would improve relationships and mutual benefits between producers and traders.

Options for value addition: Value addition options included safe processing of meat into Nyirinyiri, using preservation and processing technologies to increase shelf life. Milk value addition options included processing (pasteurization, fermentation, UHT and ghee). Fish value addition processing options included fillet and sun-dried fish, using preservation options such as solar powered refrigeration, electrical refrigeration and use of charcoal coolers at the household and small and medium enterprises (SMEs) level. Supporting SMEs and households to process and add value to raw food products could improve the use of surplus raw products (e.g., milk and meat) during the rainy seasons, and with proper storage, these goods could be sold back to the community (or consumed at

household level) to enhance food supplies during the dry season. Similarly, sun-dried fish had improved shelf life and could be transported deeper into the counties.

There were several barriers to locally processed/value-addition of goods. Local goods faced strong competition from cheaper imported processed goods, i.e., from other counties. Additionally, there was generally a lack of technical expertise; limited financing; some culture/norms (which deterred people from buying processed goods); and misconceptions around processed foods being considered harmful. The costs of processing were high in this part of the country due to the costs of basic services; there were also frequent power outages which meant that manufacturing could only be done when there was electrical power, availability of other energy sources (such as solar and biogas) or generators.

Storage and preservation of food products was limited due to lack of modern storage for both producers and vendors/processors. There were prospects for improving or scaling storage and preservation for milk, meat and fish products but this would have required major upgrades in technical and management, e.g., the widespread use of solar-powered refrigeration.

Recommendations

Pastoralism was the main source of livelihood in the area and therefore interventions in the milk and meat value chains would have most benefits in Isiolo and Marsabit counties. Meat and/or milk (which were highly nutritious and accessible) were consumed daily by most of these households. Fish (which was plentiful in Lake Turkana and River Ewaso Ng'iro) was the main staple for fisher folk communities in the area. Fish is one of the healthiest foods and has important nutrients—such as protein, vitamin D and omega-3 fatty acids. Thus, interventions in the fish value chain would be key in tackling malnutrition among the fisher folk community in this region.

Interventions in these three value chains could increase consumption and contribute to reducing levels of malnutrition, poverty, and food insecurity.

In targeting food MSMEs, Nawiri should consider:

MSME capacity building—provision of technical support services. Technical support should be tailored to each individual businesses, given that not all traders are not the same nor face the same challenges. This should include training on bookkeeping and financial management, logistics management, appropriate technology, preservation mechanisms, business plans and compliance. Training milk, meat, and fish MSMEs on essentials—such as product handling, processing and/or preservation, packaging, storage and supply—will increase their output. Developing entrepreneurship skills—such as merchandising, branding, customer care, pricing and displays—will draw attention to their business. Given the established roles of women in the supply of milk and retail of fish, building these skills would improve their individual businesses and provide better access to nutritious foods for their counties.

Small and medium enterprises (SMEs) capacity building—provision of support to process and add value to food products like milk, meat, and fish. This support will ensure utilisation of surplus raw products during the rainy seasons, longer shelf life of the food products and enhance market access/ supply of food products during the dry season. Value addition would aim to reduce production costs and make products affordable by using local labour and increasing production during rainy seasons. Women cooperatives already successful in aggregating can build their capacity by adding milk and meat products to their deliverables; fish cooperatives and fish traders can build their capacity by adding other fish products.

Business Development Services (BDS)—access to finance facilities. Currently, MSMEs/traders (for milk, meat, and fish) have limited or no access to financial support via loans

or grants; therefore, those must become accessible. Grants would provide businesses with a level of economic security, giving other partners confidence to further finance them. Those funds could be used to acquire productive assets, such as transport trucks, processing plants and preservation facilities/equipment. The assets should be acquired through asset financing systems, which also need to be developed. The funds could also be used to support preservation mechanisms for the fish value chain.

SME—promotion of appropriate preservation and storage technologies*.* Preservation and storage methods are necessary to obtain the benefits of improved produce shelf-life and market availability. Some preservation methods are already being used in the community, such as Nyirinyiri in fat; sun-drying of fish/meat and fermentation of milk would also be useful. Similarly, ghee has a higher shelf life and is primarily made by women in the counties.

MSME—establishment of market linkages*.* Linking MSMEs to both producers and traders to develop long-term business relationships would increase food availability and affordability. These linkages may simply involve working with aggregators/bulk suppliers to minimise business costs by reducing the distances travelled to collect produce directly from individual producers. Currently, most producers and traders work directly with one another, as only a few women cooperatives are available to manage aggregation. The main challenges that aggregator groups face include high transportation costs, lack of negotiating power and price drops at harvest-time. If more market linkages are done, the quantity of produce available in the market for processing will increase, lowering the costs of processing and transportation. The business will, therefore, enhance economies of scale while at the same time have direct market of their produce. Through linking aggregator groups with the processor businesses, the aggregator businesses will have direct market for their food products. The aggregator can then negotiate stronger prices for their food products, while at the same time reduce transaction costs—thus enhancing economies of scale.

MSME—proper equipment. Butcher vendors could be equipped with electronic weighing scales to facilitate the sale of smaller meat quantities. This would allow low-income earners to purchase and consume the meat in small quantities. Food vendors could be supported with technical assistance and trained on hygienic food handling/public health requirements for food handlers and operators.

SME—develop nutritious food consumption by educating the community on nutrition-focused topics. The communities need nutrition education along with social behaviour change (SBC). This need is evidenced by the high production and low consumption of fish in Marsabit County. Offering SBC on good nutrition, nutritional values of locally available foods, growing, preparing, processing, and consumption would enable them to make informed choices to ensure healthy eating and lifestyles.

Recommendations specific for the county governments include such things as:

- *Continuously maintain/improve road conditions in the counties to enable access to sub-counties, especially malnutrition hot spots. This addresses poor road conditions that affect the transportation of foods to rural areas of the counties.*
- *Improve sustainable access to clean water for households and processers to enhance hygienic handling of food products; improve water harvesting and water collection/water pans. Poor access to water was noted as a challenge to processing and value addition.*
- *Improve household access to solar and electrical energy for production, storage, preservation, and processing. This includes alternative energy sources (Biogas, briquettes) and would counter frequent power outages in the counties. It could also be used for preservation of milk and meat and solar drying of fish.*

- *Facilitate SME registration and attainment of needed certification for optimal operations.*
- *Enhance school feeding programmes, via county governments and Ministry of Education, using surplus milk.*
- *Improve security in Laisamis, Loiyangalani and North Horr to boost commerce and production.*
- *Develop capacity building and connect extension officers to producers. This can also include training on rangeland management.*
- *Promote community participation in the development process with the aim of influencing, challenging, changing, and modifying the situation for the benefit of all community members.*
- *Identify, train and support nutrition champions—including Community Health Workers (CHWs) and Early Childhood Development and Education (ECDE) teachers—at sub-county levels to be nutritious food agents and advocates for the inclusion of nutrition-focused policies in county government policies. Nawiri can help support training the champions on different aspects of these policies.*

Introduction And Background

Study Background

Food availability in the arid and semi-arid lands (ASALs) remains a major challenge, especially during the dry seasons. Locally produced food and livelihood sources include livestock (goats, sheep, camels, and cattle) meat and milk. Long supply chains are evident for cereals, beans, fruits/vegetables, and processed commodities—such as sugar, oil, maize meal and pasta; these supply chains are dominated by middlemen (often local traders or assemblers) and wholesalers from within and outside the counties. Wholesalers outside of the counties can strongly influence the market by offering transport for the goods and setting the price of foods. Local actors are forced to take the price set by wholesalers, and local traders and retailers lack the negotiating power to influence the price of foods. Also, because of the perishability of fruits and vegetables, there are few wholesalers for these food commodities and the vegetable market remains largely informal. Local traders are probably best suited to expand food access to remote areas, but they lack access to capital and storage facilities to expand the reach of their business.

Among pastoralist households, milk availability was highly seasonal, dropping off sharply in the dry season, linked to a dramatic reduction in lactating animals and decline in milk production per head. Seasonal migration also has implications for access to meat and milk, especially for household members who do not move with the animals (mostly women, children, and the elderly). Some households may diversify their food sources by growing leafy-green vegetables or raising chickens for eggs, while others may also seek opportunities for off-farm income to improve their access to food via markets. Some NGOs create opportunities for off-farm income while others, including the government, support cash transfers to improve household food access for the most vulnerable.

Against this backdrop, food availability, accessibility, affordability, and acceptability remained a direct determinant of household intake and the quality of household diets in the ASALs. *Food availability* is defined as availability of sufficient quantities of food, appropriate quality, and diversity (supplied through domestic production and imports, including food aid that meets the people's dietary needs) and food preferences for an active and heathy life. *Accessibility* of food means individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community in which they live (including traditional rights such as access to common resources).; *affordability* of food means
that an individual has enough money to buy sufficient, safe, and nutritious food to meet one's dietary needs.
; *acceptability* of food means it fits the tastes and preferences of consumers. including other factors such as contextual factors, an individual's culture, physiological status (i.e., hunger, thirst, and presence/absence of illness), and many other variables.

While there was a good understanding of the overall market structure and dynamics, the value chain structure, and dynamics for nutritious foods (such as vegetables, fruit, eggs, and fish in Marsabit and Isiolo) were less well understood. Nawiri also sought to understand whether/how household-level producers (especially for meat and milk, which is mostly done by women) are integrated into existing supply chains. Such information would be used to refine the design of the work planned under Nawiri Theory of Change (TOC), Intermediate Objective (IO) 1.2.1 (increased market availability of high quality, affordable nutritious foods). More information about these nutrient-dense value chains would

enable the Nawiri team to devise sustainable approaches so that existing private-sector actors can fulfil their role in improving food availability and year-round access to vulnerable communities.

About the Study/Study Justification

This field study builds on desk research which aimed to improve the understanding of nutritious food value chain dynamics in Isiolo and Marsabit counties. This information also expands and complements the Famine Early Warning Systems Network (FEWS NET) Kenya Enhanced Market Analysis, which explored the marketing context of key food staples (e.g., maize/maize products, wheat, lightly processed products, sorghum, dry beans, edible oil, wheat-soya blend, and livestock; and the availability of infrastructure and supporting services required for the success of a range of modality options. In addition, the study complements the Village Enterprise Market Assessment (concurrent to this assessment) which explored the market structure for various commodities (including food) from a household-market entry point-of-view.

Thus, data from this study and existing knowledge on market systems in the ASALs aimed to contribute to the cross-sector solutions to enable private sector participation in Isiolo and Marsabit.

In this study, the "private sector" included actors in the food supply chain who are essential to provide and move food to consumers—including producers, market vendors (e.g., *mama mboga,* vegetable vendors, milk vendors) distributors, aggregators, processors, packers, and retail food outlets who ensure availability of food in these areas. This study focussed on local and national MSMEs as opposed to larger or foreign firms). "The market" refers to the entirety of local food retail options as opposed to only the primary, secondary and tertiary markets—including the relevancy of vendors in open-air markets and kiosks, small shops, butchers, and door-to-door sellers ("last mile" distribution).

Study Aims and Specific Objectives

Study aims

The aim of this formative research was to understand the functionality of the nutritious foods value chains and household access (as consumers or producers) to these value chains.

Specific objectives

The objectives were to understand the structure and dynamics of the nutritious foods value chains and the opportunities and barriers for private sector actors in the ASAL food system to:

- Improve availability of nutritious foods (e.g., milk, meat, fish, vegetables, fruit, and eggs).
- Reduce food shortages due to seasonality.
- Understand the barriers to more effective integration between producers and private-sector food processors and vendors within these value chains.
- Establish the greater use of the market by households to purchase food products, including how these are influenced by gender norms.

Research Questions

The study focused on the following three key research questions:

What are the opportunities and barriers faced by private sector actors in the ASAL food system toward improving the availability of nutritious foods and reducing shortages due to seasonality?

How do products flow from producers (e.g., smallholder farmers) to other actors within the food systems including within Isiolo and Marsabit and to/from other counties? Where are the

weaknesses within these value chains? What is the capacity and/or barriers of food value chain players to reach the most vulnerable populations in Isiolo and Marsabit?

- Which businesses are (or have the potential to) supporting the production, processing and sale of nutritious food products? Who owns them?
- What specific types of activities occur for storage, processing and retail of nutritious foods? Which technologies are used for processing and storage?
- Who (i.e., women, men, youth) is involved in these activities (storage, processing and retail) and how does this differ between men and women actors? Are there opportunities for these activities more gender-equitable?
- How have the companies adjusted their business model to attempt to overcome the previously identified barriers (e.g., increased production, lowered price or shelf-life issues)?
- What supports are needed to overcome these barriers, including those specifically needed by women producers/women-owned companies?
- How do environmental factors and disasters influence each of these types of private sector actors, with regards to providing affordable nutritious foods?

What are the barriers to more effective integration between nutritious food producers and private-sector food processors and vendors?

- To what extent and through what types of relationships or contracts do nutritious food producers sell their products to processors or vendors? What (from the perspective of both producer and purchaser) prevents these producers from doing so at a larger scale?
- What supports are needed to overcome these barriers, including those specifically needed by women producers/women-owned companies?

What are the barriers to greater access and use of the market for the purchase of nutritious food products by households?

- How do local households interact with markets? What types of foods are purchased, how often and where?
- What factors influence local demand for nutritious foods?
- Are market practices and barriers to purchasing nutritious food products influenced by gender norms? If so, how?
- What are local household members' preferences for nutritious foods products?

Approach And Methodology

The study began with a comprehensive document review, which included reports from the Kenya National Bureau of Statistics (KNBS); County Ministries responsible for agriculture, livestock, fisheries, finance, planning and trade; the National Drought Management Authority; statistical abstracts; trade cooperatives and agencies; and abattoirs. It also used previous research reports, such as peer-review studies and several developments' project reports, including those from international and regional organizations—such as the Food and Agriculture Organization (FAO), International Food Policy Research Institute (IFPRI) and World Bank and FEWS NET were also reviewed. A full list of sources consulted is included in the Bibliography.

Data Collection Phase

In addition to a desk review, a primary data collection in the counties of Marsabit and Isiolo was conducted. The research design was primarily qualitative and included KIIs, in-depth interviews (IDIs) and FGDs/mini groups.

Respondents to IDIs were relevant food producers, SMEs, household members and some government/non-governmental entities at the county level. Respondents to KIIs included government and non-governmental entities at the county level and below. These included market managers; leaders of unions or trade groups; representatives of local government; NGO representatives; and county ministries responsible for agriculture, livestock, and trade. FGDs were carried out with members of households as well as producers of key nutritious foods.

All interviews used semi-structured guides with optional probes/follow-up questions and sufficient flexibility to pursue emerging topics. Interviews were facilitated in English, Kiswahili, and local language(s); audio-recorded; and transcribed into English.

Sampling and location analysis

Location analysis based on the thematic areas of the study, which included the malnutrition status of children/women and roles in the production/supply of nutritious foods in the respective counties, was used to determine locations and communities of focus. Purposive sampling was used to select SMEs in the market to be interviewed. Thus, from FGDs and household IDIs, SMEs through which the community members accessed foods were identified. The most cited SMEs were targeted for interviews and were based on the types of nutritious foods they dealt with as well as their ability/potential to supply nutritious foods. In terms of potential to supply, SMEs were initially identified from interviews with households and FGDs. This directed the study to the key suppliers of food commodities in the areas of study.

Data collection (Table 1) began with FGDs and IDIs at the household level; then IDIs with vendors, producers, and processors; and finally, KIIs with market managers and government/non-governmental entities.

Table 1: List of interviews conducted

Location	***Interviews Conducted***
Moyale, Marsabit	
FGDs	1 with producers—male 1 with household members—female
IDIs	2 with traders/MSMEs—1 male, 1 female 3 with producers—2 male, 1 female 3 with household/consumers—All female

Location	*Interviews Conducted*
	1 with processor (posho mill)—male
KIIs	1 with Chief—male 1 with Department of Trade—male 1 with Department of Livestock—male
Marsabit	
IDI	3 with IDI with household members—2 female, 1 male 3 with IDI with suppliers—2 male, 1 female
FGDs	1 with producers—male 1 with household members—female
KIIs	1 with market manager—male 1 with nutrition officer—female 1 with Ministry of Agriculture—male 1 with Department of Fisheries—male 1 with Chair, Chamber of Commerce—male 1 with Pastoralist Community Initiative Development and Assistance (PACIDA) manager—male 1 with Marsabit Cereals Board (the depot)—male 1 with Livestock Market Systems (LMS) manager, Marsabit—male
North Horr, Marsabit	
FGDs	1 with producers—mixed 1 with household members—female
IDIs	3 with traders/MSMEs—2 male, 1 female 3 with producers—1 female, 2 males 3 with households—3 female
Loiyangalani, Marsabit	
IDIs	1 with producers—male 3 with household members—2 female, 1 male
FGDs	1 with producers—male 1 with household members—female
KIIs	1 with fish cooperative leader—male
Laisamis, Marsabit	
KIIs	1 with Public Health Officer—male 1 with sub-county Deputy County Commissioner—male 1 with World Vision Area Programme (AP) manager, Laisamis—male
FGDs	1 with producers—mixed 1 with household members—male
IDIs	4 with traders/MSMEs—2 male, 2 female 3 with producers—2 male, 1 female 3 with households—2 female, 1 male
Kinna, Isiolo	
FGDs	1 with group of producers (farmers and pastoralists)—male 1 with household members—female
KII	1 with World Vision—male
IDIs	4 with traders/MSMEs—2 male, 2 female 5 with household members/producers—3 male, 2 female
Merti, Isiolo	
FGDs	1 with producer—mixed 1 with household—female
KIIs	1 with Chief—male 1 with goat market manager—female
IDIs	2 with wholesalers (general food stuff)—male 1 with butchery—male 2 with household members—female
Isiolo Town	
KIIs	1 with Director of Fisheries—male 1 with Deputy Chair Chamber of Commerce, Isiolo Chapter—male 1 with Deputy Director of Health and Nutrition—male

Location	*Interviews Conducted*
	1 with Director Livestock—male 1 with Director, Economic Planning—male 1 with Director of Agriculture—male 1 with Market Manager, Isiolo Livestock Market—male 1 with Anolei Cooperative Society—male 1 with Tawakal Cooperative Society—female 1 with Nyiri Nkulan Group—female 1 with LVIA (Lay Volunteers International Association)—male 1 with Galesa Self-Help Group—female 1 with LMS representative—male
IDIs	6 with vendors—3 male, 3 female 3 with processors—2 male, 1 female 4 with household—2 male, 2 female
FGDs	1 with producers—mixed 1 with households—mixed
Garba Tulla	
FGDs	• 1 with producers—mixed 1 with household members—female
IDIs	• 1 with producer - male • 2 with households —2 female 2 with Traders (wholesalers/ retailers — 2 males
KIIs	1 with Chief - male
Organizations/Institution	
KIIs	1 with Mercy Corps—male 1 with LMS—male 1 with Dr. Oliver Wasonga University of Nairobi (UON)—male

Data collection team

Due to the qualitative nature of the study, two trained experts from Pan African Research Services Limited (PARS) were assigned to each county. Additionally, the team recruited two additional enumerators per county at the local level to aid in data collection. The five additional team members (3 female, 2 male) were trained by the PARS team and were key in mobilization, translation, and note-taking. The qualitative data was collected by senior staff; GAIN staff supported the consultant to secure appointments with key stakeholders.

Data collection method. For time efficiency, and after obtaining informed consent, all interviews and discussions were recorded and later transcribed. Note taking was also employed.

Quality control

Quality Assurance/Quality Control (QA/QC) procedures were developed and applied to all data collection and management activities—including interviewing and processing—to ensure data quality, integrity, completeness, and comparability throughout the exercise. The research team was thoroughly trained on QA/QC aspects prior to data collection. The following QA/QC processes were undertaken interviewers were trained by PARS staff and mock interviews conducted to test the tools. This improved the quality and flow of the tools as well as the skills of the interviewers. Additionally, all key informant interviews were conducted by senior staff at PARS, recorded using digital recorders (where respondents gave informed consent) and later transcribed. The team members were also trained on ethics in research and conducting gender-sensitive interviews. The importance of informed consent, confidentiality, rights of interviewees and guidelines to interviewing gender-based violence (GBV) survivors were emphasized. On the first day, accompaniments were done to ensure interviewers followed all instructions/procedures and conducted interviews according to standards

specified. During the data collection, staff from PARS supervised the trained enumerators and checked the data collected daily, allowing collective reflection on the information gathered. The daily analysis also helped triangulate data from different sources and offset any tendency toward bias and fragmented data at the end of the survey.

Safety precautions against COVID-19

In consideration of the Coronavirus Disease 2019 (COVID-19) pandemic and restrictions posed on mass gatherings and meetings, the research team observed government guidelines and protection. The following guidelines were observed during data collection:

- All interviewers were equipped with hand sanitizers and masks.
- Interviewers did not enter respondents' private houses—interviews were outside the house. Interviewers always maintained a 1.5-meter distance.
- No physical stimuli were used during interviewing (i.e., paper cards).

Synthesis, Report Writing and Feedback Phase

Information and data collected were analysed, collated, and compiled into an initial draft report.

Qualitative data analysis

Qualitative data was analysed and validated within the PARS team daily, allowing collective reflection on the information gathered. The daily analysis helped triangulate data from different sources and offset any tendency toward bias and fragmented data at the end of the survey. Since the study had clear objectives, the consultants employed deductive analysis technique to analyse the data. This technique required a structured or predetermined approach; in this case the consultants built some of the categories/themes in advance while others developed as the analysis progressed. At the inception phase, during literature review, key themes were established in the study, such as foods consumed at the household level and their value chains, sources of the foods, availability of the foods, MSMEs in the processing and supply of the foods, challenges faced by the MSMEs, opportunities and markets. After this process, mapping of connections in the data to the specific categories was done. Analysis launched on NVivo, but due to technical difficulties with the software and time constraints, analysis was switched to Microsoft Word.

Individual processes

Transcription of all the interviews

Transcription is the process of transferring voice recordings to written text. This was done primarily by the PARS in-house staff with a small portion done by an external transcriber PARS has used on numerous occasions. All the transcripts were proofed and checked vis-à-vis the recordings. A transcript was only cleared once it was certified to be as accurate as the recording.

Read the transcripts

After all the transcripts were done, the team writing the report started by browsing through the transcripts and making note of their first impressions, including common themes. Next, the team read through each transcript carefully as themes became stronger, which also helped generate important insights. The team also worked to identify and neutralise any bias that was present in the data.

Annotation of the transcripts

Annotation is the process of labelling relevant words, phrases, sentences, or sections with codes. These codes help identify important qualitative data types and patterns. We made labels about the value chain stakeholders, market, food systems (constraints and opportunities), nutritious foods (produced, sold/supplied, and consumed), market facilities, challenges faced in various value chains, value addition and storage—among others. Annotations helped in organizing the data for dissemination.

Conceptualization of the data

Conceptualization of data is the process of aligning data with critical themes that one aims to use in the report. Here, the team created categories and subcategories by grouping the codes we created during annotation. The final categories included foods consumed at the household level and their value chains, sources of the foods, availability of the foods, MSMEs in the processing and supply of the foods, challenges faced by the MSMEs, opportunities and markets. The team eliminated some codes and combined others. Only the codes that were relevant to the analysis were used.

Segmentation of the data

Segmentation is the process of positioning and connecting the categories of data. The team made grids that allowed the evaluation of the bulk data in a wholesome and cohesive way. Here, the team started by labelling the categories, then described the connections between the categories. The main segments explored were food consumption, production, processing, and distribution.

Analysing the segments

In this stage, the researchers took a deep dive into the data segments. The team started by determining if there was a hierarchy among the categories. The team determined the importance of a category in respect to another and arranged the categories in order of importance.

Writing the results

This was the last stage of the consultant's analysis process. Here, the findings were transitioned into the report. The team used insights to answer key questions of the study and validate the aims and objectives of the study.

Findings And Discussions

Nutritious Foods and Consumption Habits

Overall, foods consumed in Marsabit, and Isiolo Counties were dependent on numerous factors, such as availability, production levels and accessibility (both physical and financial factors). The views of community members were centred on foods that keep the body healthy and the specific food types that they consumed. Below is what they had to say:

"Nutritious foods are foods that keep our immune system healthy and fight diseases…such as fruits, e.g., oranges, passion fruits, watermelon; and vegetables, e.g., kale, cabbage, tomatoes, spinach…meat and milk…"

"…Nutritious foods are foods that contain carbohydrates, proteins and vitamins…" —Women FGD with consumers, Garbatulla

"…Well balanced foods…" —Women FGD with consumers, Garbatulla

"…Yes, like Sukuma Wiki, maize, beans, ugali, eggs, milk, meat, honey, rice, wheat flour and cereals…" —Women FGD with consumers, Merti

Foods consumed and consumption habits in Marsabit County

The staple foods in **Marsabit County** were maize and rice, followed by milk, beans, meat and wheat. Other foods included macaroni/pasta; vegetables, e.g., kale, cabbage, potatoes, spinach; eggs and fish (mainly in Loiyangalani and Marsabit town). Cooking oil, sugar and salt were commonly consumed as part of other foods. The main types of meat consumed in the county included goat, beef, camel and mutton. Fish was mainly consumed along Lake Turkana in Loiyangalani, Illeret, El Molo Bay, Moite and Telesgaye.

"…Maize, ugali, rice and vegetables (cabbage, potatoes, kale and spinach) …" —Women FGD, North Horr

"…We only produce milk and meat in our area. Milk is sold mostly during rainy seasons since the animals are far away from home grazing areas…" —Male FGD, Laisamis

"…There is milk, camel, sheep, goat and camel milk…" —KII, Laisamis

"…we have milk, meat, eggs, fish, maize, legumes, fruits and vegetables…" —KII, Marsabit

"…Mainly it is ugali, milk, rice, maize and vegetables. Beans are consumed occasionally…" —KII, Laisamis

"…I think the main type of food is ugali; you go to the shops you see them carrying flour the 10 kilogram (kg) and 5kg packets…" —KII, Laisamis

"… Fish consumption is taboo in their culture, and they have a mindset that they don't need to eat fish or anything that is not livestock—except for a few things…" —KII, Laisamis

"…when the rains are high, milk production is also high because there is plenty of food for the animals. During drought seasons, and we get a very small amount of milk…" —KII, Moyale

Table 2 shows the types of foods consumed in Marsabit.

Table 2: Main foods consumed, sources and availability in Marsabit County

Main Foods Consumed	Product Source	Availability Periods	Consumption Patterns and Accessibility3
Meat (goat and beef)	Livestock sourced from pastoralists and agro-pastoralists and mainly sold butcher shops in buildings	Mostly available all year but in insufficient quantities, especially during the dry season when the livestock is in the grazing areas (fora)	Consumed at least 3 days per week in a household. *Challenges:* high prices and poverty; unavailability of meat in butcheries, especially in North Horr and Loiyangalani.
Milk (camel, cattle, goat and packed)—powdered milk consumed by very few people	Camel and goat milk is sourced mainly from personal households while the packed milk is sourced from the market in towns and/or formal shops	Camel, cattle and goat milk is available mainly during the rainy seasons (January, March, April and November); UTH milk is available in towns throughout the year, mainly sourced from Isiolo, Meru and processed in Nairobi	Consumption is high, at least 5–6 days a week. *Challenges:* Dry season, which means low availability of milk from owned animals and packed milk is expensive (a packet of "Pascha long-life milk"[4] 500ml retails at 55 shillings).
Beans, maize, maize flour, rice, macaroni/pasta, anjera (wheat flour)	Maize and beans are produced in Moyale for household consumption, although, since production is not sufficient, most come from Meru and are sold at the local retail and wholesale shops and village kiosks Fortified processed maize flour (from Nairobi) is also available in wholesale and retail shops at Ksh 220 per 5kg bag, but most were accessed through village shops/vendors Macaroni pasta were sold in wholesale and retail shops and kiosks in the villages, sourced from Nairobi, through Meru	Available in the main markets all year, but with fluctuating prices Zar macaroni retailed at Ksh 160 per 400 grams, Santa Lucia pasta retailed at Ksh 250 per kg Ajab and Exe Ndovu wheat flour retailed at Ksh 120 per 2kg packet	Rice is consumed 6–7 days in a week, beans and maize (Githeri) is consumed at least 3 times a week, Ugali (maize flour) is consumed at least 4 days in a week, Anjera is consumed at least 4 days a week, and macaroni and pasta are consumed 2 times a week. All these foods are accessible, but consumption levels are affected by high prices especially during dry seasons.
Vegetables (e.g., kale, cabbage, potatoes, spinach)	Mainly from village markets (consisting of wholesale and retail shops); some from a	Rarely available and at most times insufficient for the community	

[3] The consumption patterns were determined based on an average from FGD respondents who responded about the household-level only. The data was aggregated at household level.

[4] Processed by Uplands Premium Dairies and Foods, Ltd in Nairobi.

Main Foods Consumed	Product Source	Availability Periods	Consumption Patterns and Accessibility3
	few women who used irrigation to plant		
Eggs	Mainly from the market (kiosks and retail shops); a few women kept chicken and sold eggs	Newly introduced but available most of the times with varying prices	
Fish (mainly in Loiyangalani, El molo, Illeret, Merti—along Ewaso—and Marsabit town)	Sourced from Lake Turkana	Available all year but primarily one community (Turkana) consumes	

Includes North Horr, Loiyangalani, Laisamis, Moyale and Marsabit Town

Foods prepared at the household level were consumed by members of both gender with a few exceptions. In female headed households, consumption of meat was lower compared to male headed households due to lower levels of income among women. Cultural taboos such as those against the consumption of fish and chicken for pastoralists was also a barrier to consumption. Additionally, during dry season, men would take the livestock to fora (grazing zones from the settlement), leaving children and women at home. Although women would occasionally visit fora to obtain milk, meat and milk consumption for women and children was lower compared to men in the fora.

Through triangulation, these findings were further validated by the food consumption score (FCS) within the month of August 2020[5] in the County, which showed that 50.9% of households consumed staples every day, regularly accompanied by oil, pulses and sugar, and occasionally meat or dairy products. The FCS was acceptable across all livelihood zones. However, the areas of Heillu, Manyatta and Loiyangalani wards fell in the borderline food consumption band.

Food Consumption Score (FCS)

The FCS is an indicator of a household's food security status. The FCS aggregates household-level data on the diversity and frequency of food groups consumed over the previous seven days, which is then weighted according to the relative nutritional value of the consumed food groups. For instance, food groups containing nutritionally dense foods, such as animal products, are given greater weight than those containing less nutritionally dense foods, such as tubers. Based on this score, a household's food consumption can be further classified into one of three categories: poor, borderline, or acceptable. The food consumption score is a proxy indicator of household caloric availability. The cut-off scores for the three FCS categories are shown below:

Poor Score: 0–21
Borderline: 21.5–35
Acceptable: 35.5 and above

However, for European Commission Humanitarian Office (ECHO), the FCS's target value should be greater than 80 percent. It should be noted that FCSs are prone to seasonal variation. Going by ECHO's target, the mean FCS were all below the target (Table 3). Additionally, the 6-year average was also below the recommended target as shown below. This amplifies the need to promote food and nutrition security in both Marsabit and Isiolo Counties.

[5] National Drought Management Authority (NDMA), Early Warning Bulletin for August 2020.

Table 3: Household FCSs in Marsabit County

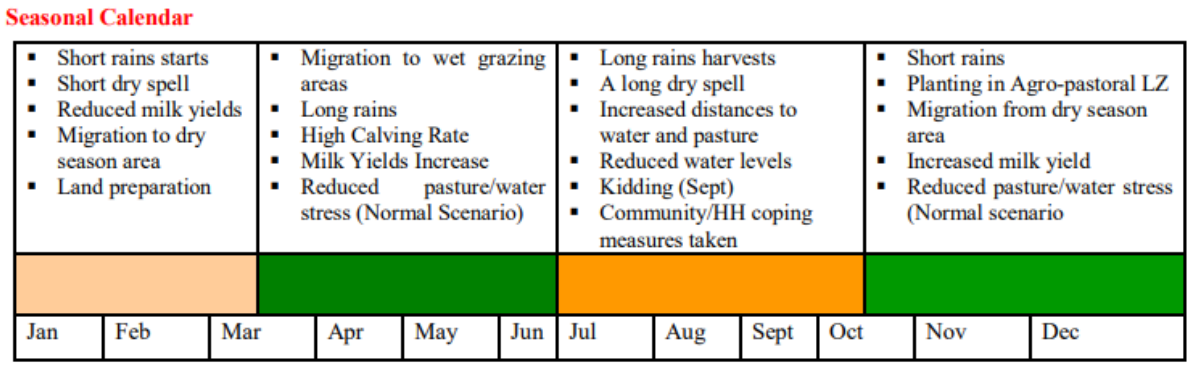
Wards	FCS Mean	Poor FCS	Borderline FCS	Acceptable FCS
6-year mean (2015–2020)	33%	7%	31%	63%
August 2020	43.5	2.2%	46.9%	50.9%
Dukana	42.2	1.1%	15.5%	83.4%
Golbo	39.9	0.5%	51.4%	49.7%
Karare	56.6	0.0%	12.5%	87.5%
Korr	37.7	0.0%	33.3%	66.7%
Loiyangalani	30.3	6.7%	80.0%	13.3%
Logologo	48.6	0.0%	18.9%	81.1%
Turbi	36.8	0.0%	78.3%	31.7%
North Horr	46.9	2.7%	10.2%	87.1%
Heillu Manyatta	28.5	0.0%	94.0%	6.0%
Sagante	36.4	5.5%	41.3%	53.2%
Uran	48.7	0.0%	4.5%	95.5%

Source: NDMA Marsabit County Early Drought Warning Bulletin—August 2020, n=360

Foods Consumed and Consumption Habits in Isiolo County

Seasons greatly determined food availability and the respective quantities. During dry seasons, the supply of milk products and vegetables is generally very low. The first months following the long and short rains, i.e., January and July, are characterized by high maize production because it is the harvesting season in the two counties. However, as the months go by, the harvest and the pasture decrease, impacting the supply proportionately and pushing maize and milk prices upwards. The Table 4 illustrates the seasonal calendar of Isiolo and Marsabit counties.

Table 4: Agriculture and pastoral seasonal calendar—Isiolo and Marsabit Counties



Adapted from NDMA, Isiolo County: Drought Early Warning Bulletin for August 2020; and NDMA, Marsabit County: Drought Early Warning Bulletin for August 2020

The study found that the foods consumed in Isiolo County were similar across **all sub-counties.** In Merti sub-county, the common foodstuffs were maize, beans, maize flour, rice, vegetables (kale and tomatoes), fruits (watermelon, oranges, passion, and mangoes—which are available seasonally and in small quantities in November and December) and goat milk. The foods consumed in Isiolo Town and Garbatulla sub-counties were like those of Merti; camel milk was widely used by many in both the two sub-counties. Cooking oil and sugar were used in preparation of meals. Most of the foods in Isiolo County were consumed throughout the year in varying quantities as a large part of the diet and was based on dry processed foods that were imported into the county from Meru and Nairobi counties.

Varying quantities were supplied in the two counties due to fluctuating production levels in the food origin counties, and this impacted the price accordingly.

There was also fish (mainly fresh) consumption in Isiolo County, albeit in low quantities. Fish was consumed mostly in Merti and Isiolo, but the larger proportion was exported to other counties, including Nairobi and Busia. Among the Borana community in Isiolo County, there were traditional barriers to fish consumption. According to the Director of Fisheries in Isiolo County, some members of the Borana community believed that if they ate fish their livestock would perish. Education was reducing these traditional beliefs, and it was noted that those with formal education were changing their consumption habits. Community members had the following to say on foods:

"…mostly, we consume rice and beans…" —Women FGD Respondents, Merti

"…Githeri is also consumed. We also consume vegetables…" —Men FGD Respondents,Isiolo

"…Ugali (maize flour), spaghetti, meat, wheat flour, Sukuma wiki, spinach, green grams, peas…" —Women FGD Respondents, Merti

"…maize/beans is the food that can't be out of use in our community—it's the main meal…" —Women FGD Respondents, Moyale

"…For the poor ones, even if they are in Nairobi, they still don't get nutritious food, just what is available…" —Women FGD Respondents, Garbatulla

"…For the green vegetables, it will also depend, as there are those who can afford but there are those who stay outside to look for money for almost a week. So, when they come back, they can buy those green vegetables…" —Women FGD Respondents, Garbatulla

"…due to exposure to education, over time they are changing and have started consuming other products like fish…" —KII, Isiolo

"…Food that is mostly consumed here is vegetables. Some are available here and some are not. Other food items we consume include Ugali (maize flour), rice and wheat flour—whenever there are means to buy. Everyone consumes the food they can afford…" —FGD Respondent—female, Isiolo

In Isiolo food was sourced from various areas, including Ethiopia, as noted by a County-representative:

"…we get food from our neighbours; we have milk that is the main food, followed by meat. We also grow some crops using machines in areas of Burat, Gambera (e.g., tomatoes, potatoes, kale, oranges), but most of agricultural products we get from Meru; we also get beans and tomatoes from Ethiopia…" —KII, Isiolo

Food consumption was affected by taboos as well as religious beliefs. Pastoralist communities believed consumption of fish or birds (chicken) and eggs was a taboo. This also highly affected pregnant women who were prohibited from consuming these foods. Other foods pregnant women were prohibited from consuming included cabbage, pumpkin, milk/milk products, sugar cane, and fruit (such as banana and avocado). The only restriction to meat consumption was religious. Muslim law restricted people from eating meat products slaughtered by non-Muslims. It also prohibited people from eating dead animals (carcasses) and pork. Below are opinions from both the KIIs and FGDs:

"…There are no limitations. Except for human beings and pigs, we feed on almost all food varieties ...others don't eat eggs, but those are just preferences, not culture…" —Male FGD Respondents, Merti

"…There is none because we do not get pork meat here, which is not allowed…" —Male FGD Respondents, Garbatulla

In summary, the foods consumed in Isiolo's three sub-counties and Kinna Ward are illustrated in Table 5:

Table 5: Main foods consumed in Isiolo County

Main Foods Consumed	Product Source	Available Periods	Consumption Patterns and Accessibility6
Meat (camel, beef, goat)	Butcheries typically performed secondary butchery to prepare fresh cuts of meat for sale	Throughout the year	In Isiolo Town at least once a week but in other parts only twice a month. *Challenges:* affordability and market unavailability. Meat was sold at Ksh 400 per kg, however, butchers lack electronic weighing scales that can enable the weighing and sale of quantities based on what the buyer is able to pay.
Milk (cow, goat, camel, packaged milk)	Local market (mid- and small-scale shops) and vendors (street and kiosks in villages)	Throughout the year, with decreased production during dry seasons. UHT milk was available throughout the year, but price increased during dry seasons	At least 3 days a week. *Challenges:* affordability and perceived high prices of packet milk (Daima and Brookside—Ksh 60; Pascha—Ksh 55) per 500ml UHT pack.
Maize, beans, rice, pasta, wheat, green grams, peas	Maize, beans, green grams—personal production and vendors (rice, pasta, and wheat)	Throughout the year, with declining supply during dry seasons (supply mainly from Meru)	Rice, more than 3 days a week; maize, more than 3 times a week; beans, more than 4 times a week; wheat, grams, peas—seldom. *Challenges:* affordability and market unavailability.
Maize flour	Processed in locally available posho mills by consumers or sold by retailers in the local market; fortified processed maize flour also available in wholesale and retail shops at Ksh 220 per 5kg bag, but mostly accessed through shops/vendors	Throughout the year	Over 3 days a week. *Challenges:* affordability and market unavailability.
Vegetables (kale, tomatoes)	Domestically produced for household consumption; also sourced from Meru and Nyahururu and retailed by "mama mboga" (vendors) at the local market	Throughout the year, with sharp declines in production and availability during dry seasons	More than 5 times a week. *Challenges:* affordability and market unavailability.
Fruits (watermelon, mango, oranges, passion fruit)	Local market, domestic production of watermelon, mangoes	Availability was dependent on the season	Once a week in Isiolo Town, but rarely in other parts; highest during harvest season, especially mango). *Challenges:* mainly affordability and market unavailability.
Chicken and eggs	Domestic production, shops and vendors, chicken farmers (for broilers and layers)	Domestic production declined during drought and windy seasons when most	Chicken, rarely consumed; eggs, rarely (once every one or two weeks in Isiolo town, and

[6] Ibid.

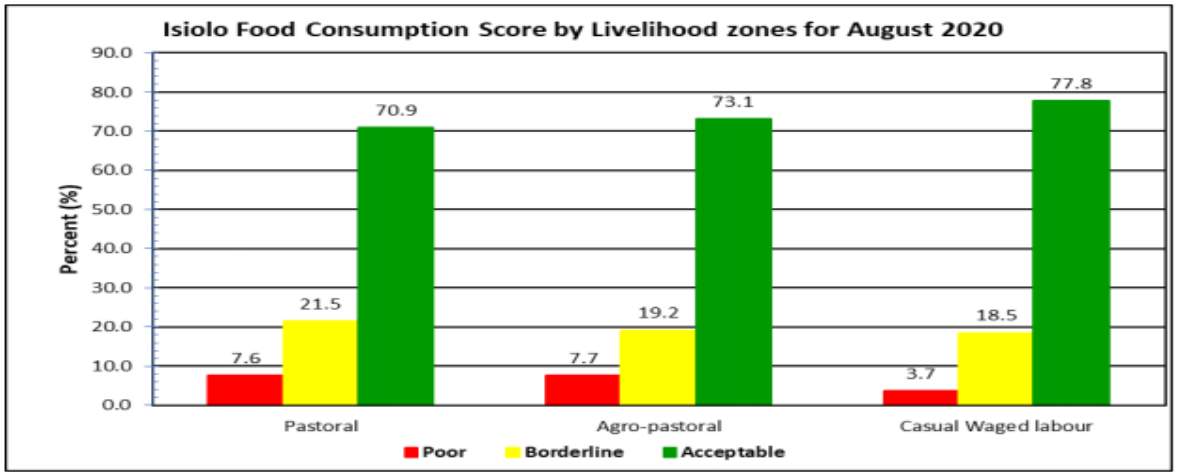
Main Foods Consumed	Product Source	Available Periods	Consumption Patterns and Accessibility6
		chicken died; broilers and eggs from layers were available all year	consumption among pastoralists was close to non-existent. *Challenges:* drought and windy seasons killed chickens and affordability (Ksh 15 per egg).

Includes Merti, Kinna, Garbatulla and Isiolo Town

Food Consumption Score in Isiolo County

The FCS for Isiolo County was composed per livelihood zones as opposed to wards. At the time of the study, an average of 74 percent of households had acceptable food consumption as opposed to six percent who had poor and 20 percent who had borderline food consumption. Notably, this was still below the European Commission Humanitarian Office (ECHO)'s recommended FCS target value of greater than 80 percent.

Figure 1: Isiolo FCS by livelihood zones



Communities' Food Security and Nutritional Status

Most of the stakeholders interviewed agreed that food security and nutrition status were poor. Foods produced in the counties were deemed insufficient for satisfying the counties' needs. Given the low crop production, community members traded animal products to buy crop-based food. Thus, they relied on food from other counties as well as aid from NGOs and the government, especially during the dry seasons. Children were the most affected by food insecurity. In the month of July 2020, 16.5 percent[7] of children in Marsabit County below the age of 5 years were at risk of malnutrition. As of August 2020, in Isiolo County 3.2 percent of children were moderately malnourished with 2 percent severely malnourished.[8] y Stakeholders and government representatives claimed that malnutrition was mainly attributed to poverty, poor food consumption habits, cultural taboos (prohibited consumption of chicken, eggs and fish among pastoralists in the counties), drought and poor access to food. The areas most affected by malnutrition in Marsabit County were North Horr, Loiyangalani,

[7] Marsabit County Drought Early Warning Bulletin, July 2020.
[8] Isiolo County Drought Early Warning Bulletin, August 2020.

Golbo, Sagante and Dukana. In Isiolo County, the areas most affected by malnutrition were Kinna, Garbatulla, Oldonyiro, Kulamawe, Eldera and Sericho.[9]

"There is a big challenge of malnutrition. Currently we are talking 18 percent malnutrition, which is acute. It's a recent occurring malnutrition prevalence—we don't have the severe cases, but we have mild and acute." —KII, Marsabit County

"Malnutrition is brought about by high levels of poverty and poor practice by the community. For instance, leaving children under caretakers, others sell eggs to buy bread or other cereals. There are also other taboos (such as the belief that consumption of soy products could lead to the baby being fat and hence difficulties during delivery). We tell them what to take when pregnant and we are discouraging some taboos." —KII, Isiolo County

"The nutrition status of Laisamis is low. This is because there has been drought, which has led to livestock lacking enough food. Hence no milk, which is the main source of nutrients the community depends on." —KII, Laisamis

The Main Value Chain and its Stakeholders

This section describes the value chains for the widely consumed nutritious foods in Marsabit and Isiolo counties. Out of the foods consumed, only livestock, fish and a small portion of food crops were produced in the two counties. The main livestock products included milk and occasionally meat, while the main food crops included maize, peas, teff, beans and millet. In Marsabit, crop farming was practiced around Mount (Mt) Marsabit and Moyale, while in Isiolo, small-scale agriculture was practiced by most households in the surveyed areas. Under the value chains, this study discusses the two main ones (milk and meat) and the fish value chain, whose products are consumed along Lake Turkana and River Ewaso Ng'iro. The three are produced and consumed locally and have the potential to be available year-round if properly supported.

Meat value chain

The main meat products were beef, goat meat, camel meat, and mutton. Camel meat was rarely sold in the villages, and camels were mostly slaughtered during social functions—such as weddings. Livestock was primarily sourced from pastoralists and agro-pastoralists through the main livestock markets and occasionally outside the markets at households or grazing zones.

Production Challenges

Meat production faced challenges such as:

Poor access to finance**.** Farmers lacked sufficient funds to improve their stock (both in numbers and genetic potential), access fodder during dry seasons, transport of animals to various markets and to employ labour needed for fattening livestock for slaughter.

Drought. During the dry seasons, production of livestock was low as some died, their health deteriorated, and some farmers sold their livestock prior to droughts to avoid losses.

Conflicts and livestock rustling led to loss of livestock in the counties. Both counties had incidences of intra-community conflicts and livestock rustling.

Poor access to extension services. Without the needed veterinary services, some livestock died due to disease outbreaks.

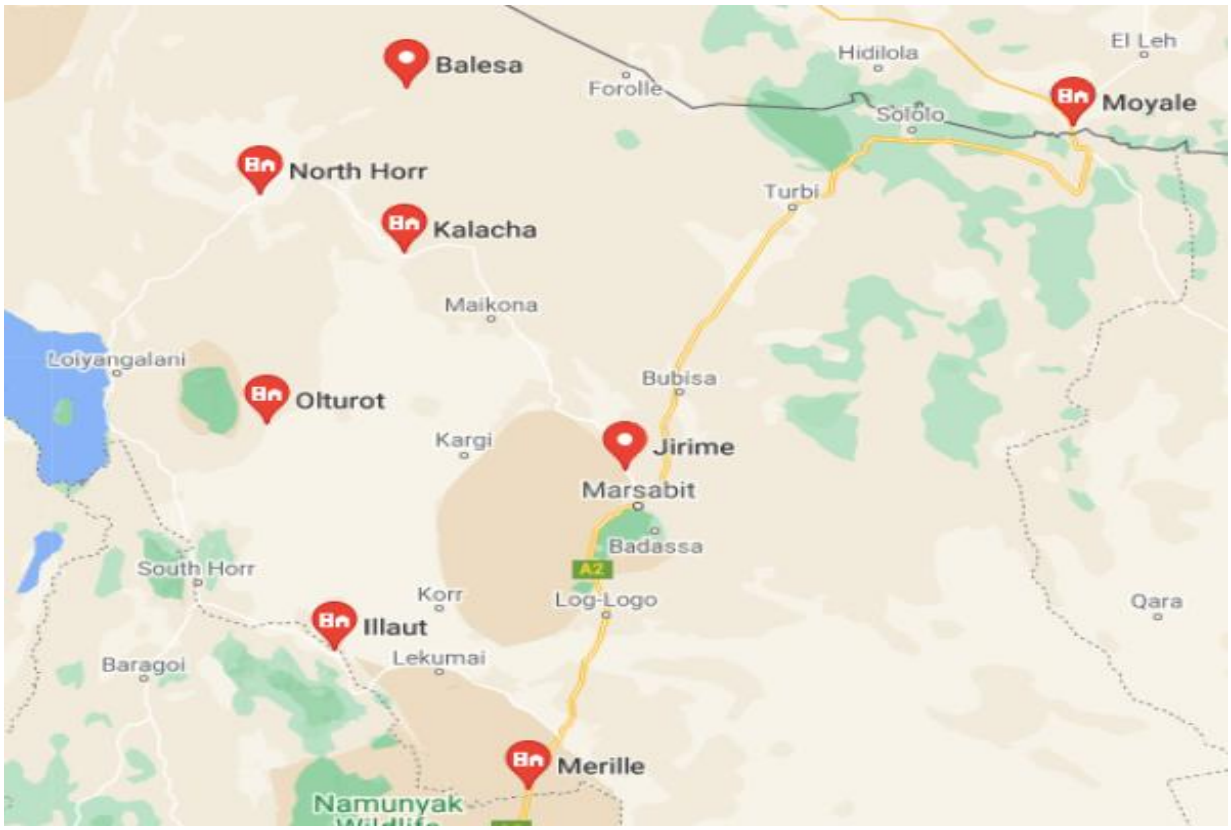
[9] NDMA drought bulletin for Marsabit and Isiolo counties, August 2020.

Degraded rangeland in both counties, especially during dry seasons. Some of the causes of rangeland degradation were overgrazing and unsustainable fuel wood (including shrubs) use in the counties.

Livestock Trade

The livestock marketing system was comprised of a series of primary, secondary, and terminal markets[10] that were interlinked through trade routes where seasonal and cross-border mobility played a key role. In Marsabit County, secondary markets were Moyale and Jirime; primary markets were Dirib Gobo, Merile, Kalacha, North Horr, Illaut, Dukana, Turbi, Korr, Olturot and Odda; open bush markets were Dukana, Moyale Town goat market, Balesa, El had, Gas, Saru, Loiyangalani, Ngurunit, Loglogo, Dabel, Maikona and Godoma.[11] Some of the markets are shown in Figure 2. The open bush markets were usually located near reliable water sources, riverbeds or in town centres characterised by no market structure. However, they were active in the trade of small stocks of goats.

Figure 2: Livestock markets in Marsabit County



Pastoralists preferred to trade their livestock away from the established markets in open bush markets due to poor location of markets or lack of basic infrastructure at the markets (e.g., shade, water and sanitation).

The main market actors were butchers, local petty traders, national traders, export traders and brokers. At times brokers, traders and butchers sourced animals directly from pastoralists at the foras

[10] Primary markets: animals sold by producers or small traders are bought by other producers, medium-scale traders and livestock collectors for fattening, breeding, onward sale to secondary and terminal markets and slaughtering. Primary markets are usually located in district towns. Secondary markets: transit markets where livestock is sold by medium-scale traders to large traders who purchase animals for onward sale in terminal markets. Terminal markets: final markets located in major cities and capitals, where large traders sell animals either to middlemen or butchery agents for slaughter in local abattoirs, or to export traders who purchase animals for further fattening and export of live animals to overseas markets.

[11] RPLRP_Report-on-Mission-Findings-and-Results-on-Mapping-and-Geodatabase-Development.

(grazing areas). This was sometimes encouraged to avoid fees paid at the markets. During the study, most of the markets were closed in late 2020 due to COVID-19, while Merile was inaccessible due to bandits. Thus, most traders opted for open/bush markets and sourcing animals directly from pastoralists.

In Isiolo, the main livestock markets were Oldonyiro, Charri and Isiolo Town. Occasional disruption of peace and order/conflicts adversely impacted livestock markets—leading to closures. During the data collection period, all the markets were closed due to the government's mandatory COVID-19 closure.

Cattle

According to the NDMA Bulletin for both Marsabit and Isiolo counties (August 2020), August's average cattle prices were higher than those of July. In Marsabit at the time of the study (August), cattle were selling at Ksh 26,580, having improved from Ksh 23,150 in July. During the same period, cattle prices in Isiolo increased to Ksh 27,700 from Ksh 26,700. The highest cattle price recorded in Isiolo County was in Isiolo Town market at Ksh 31,000, while the lowest was Ksh 25,300 at Oldonyiro market.

Figures 3 and 4 illustrate the cattle prices in Marsabit and Isiolo counties:

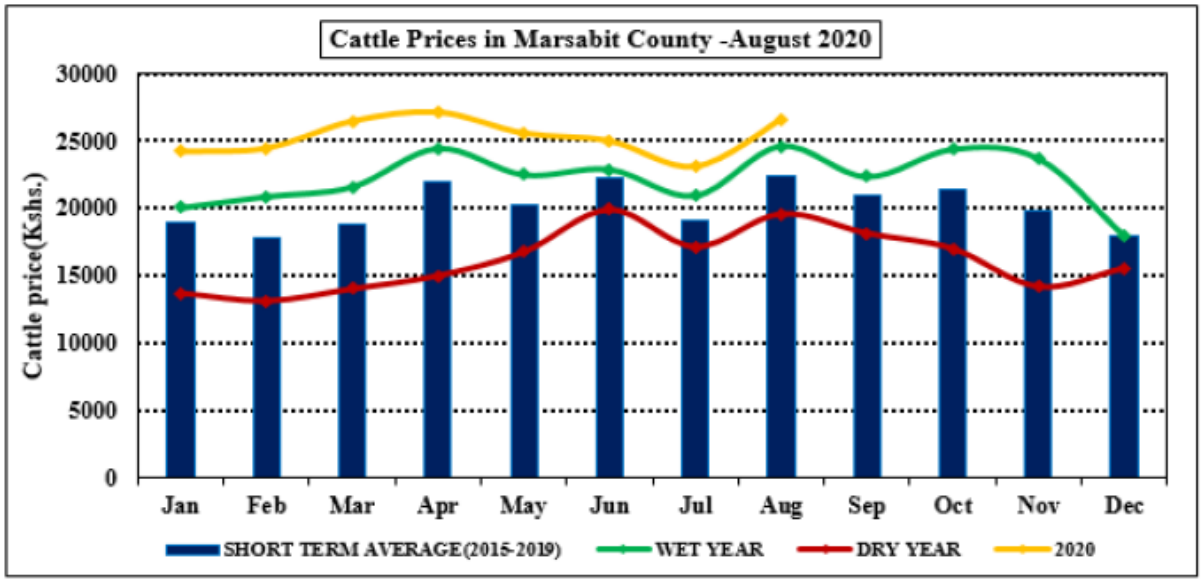
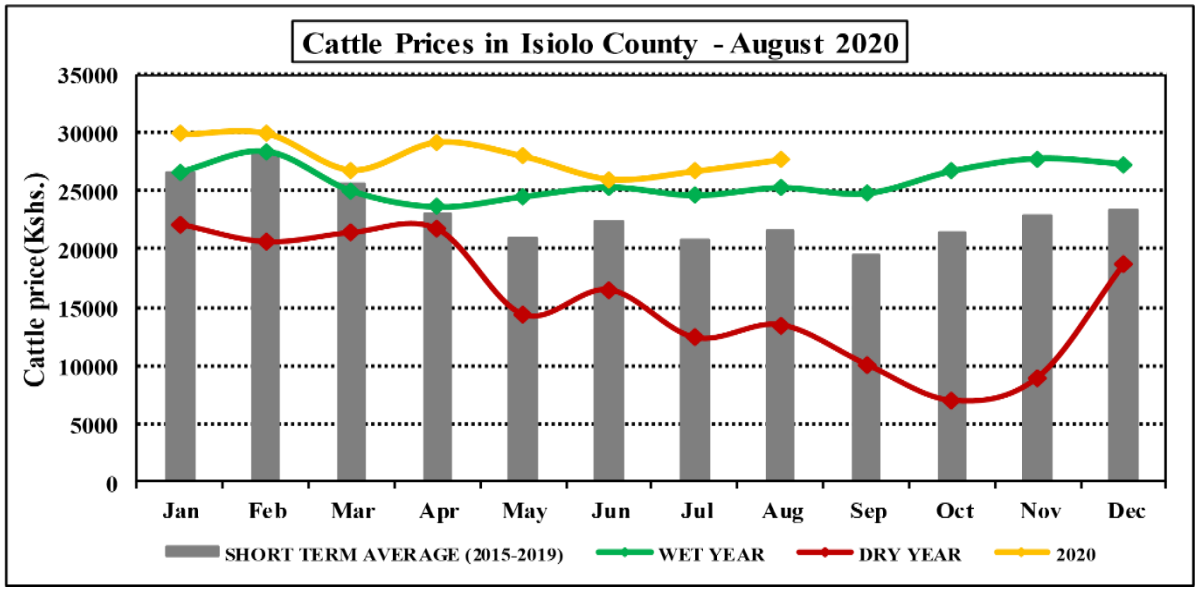


Figure 3: Average cattle prices in Marsabit County
Source: NDMA, Marsabit County Drought Early Warning Bulletin for August 2020

Figure 4: Average cattle prices in Isiolo County

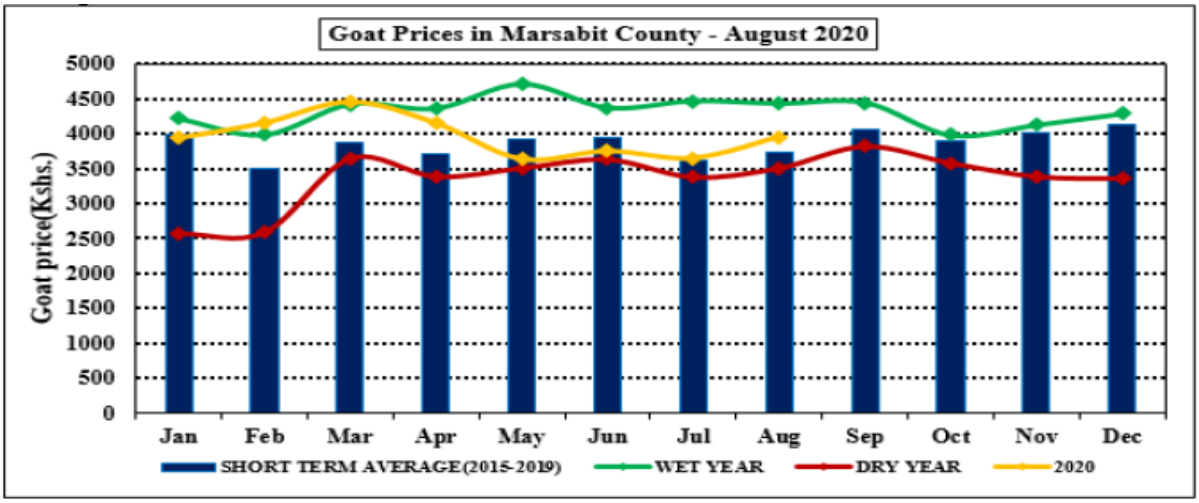


Source: NDMA, Isiolo County Drought Early Warning Bulletin for August 2020

Goats

During the time of the study, goat prices in Marsabit ranged from Ksh 3,500–4,000. In August, goats sold at an average price of Ksh 3,955, with the high prices attributed to good body conditions. However, only average prices were received in the Laisamis and North Horr sub-counties major livestock markets due to supply chain disruptions. The Moyale livestock market recorded better prices of Ksh 4,000–4,500 with daily traded volumes at a low of 100–120 goats compared to normal daily volumes of 150–200 goats.

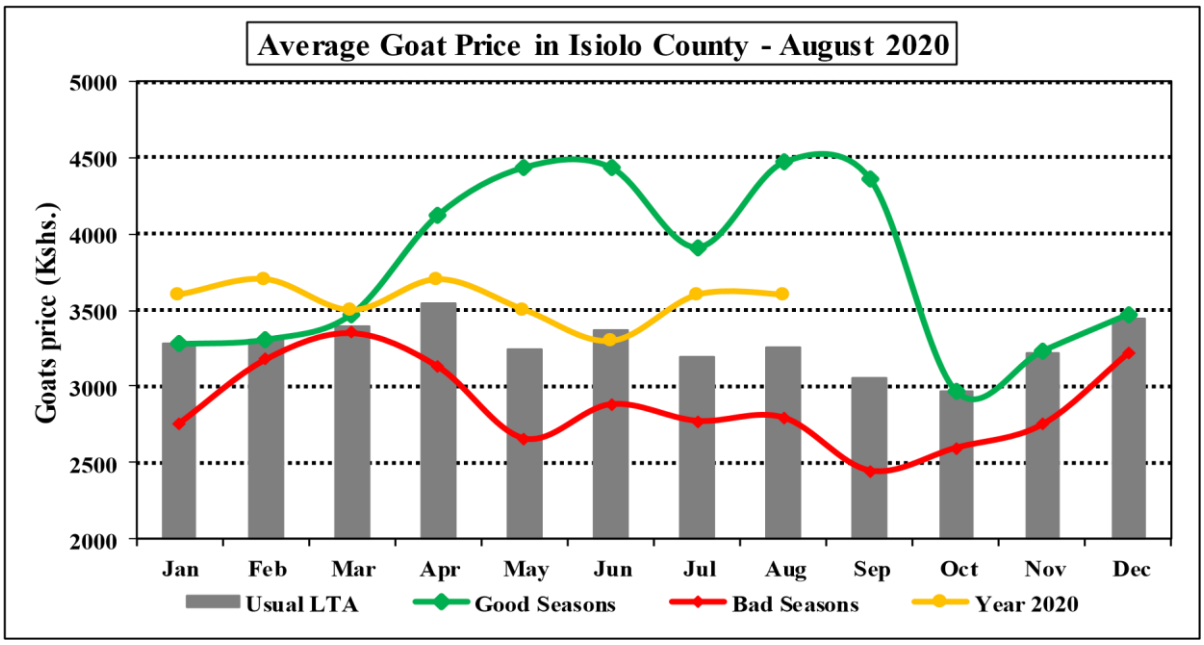
Figure 5: Average price of a goat in Marsabit County



Source: NDMA, Marsabit County Drought Early Warning Bulletin for August 2020

In Isiolo, goat price stabilized at Ksh 3,600. This can be attributed to both the local demand and the external markets' demand. The least and the highest market prices recorded in the county were Ksh 3,400 in Charri and 4,000 in Isiolo Town.

Figure 6: Average goat prices in Isiolo County



Source: NDMA, Isiolo County Drought Early Warning Bulletin for August 2020

Sheep

Like the goat prices, the average sheep prices from January–August 2020 were slightly below the wet year averages and slightly above dry year averages. The sheep price at the time of the study was Ksh 3,110, which was considered normal, given the 5-year average of Ksh 3,066. Likewise, the fair goat prices were because of good body conditions.

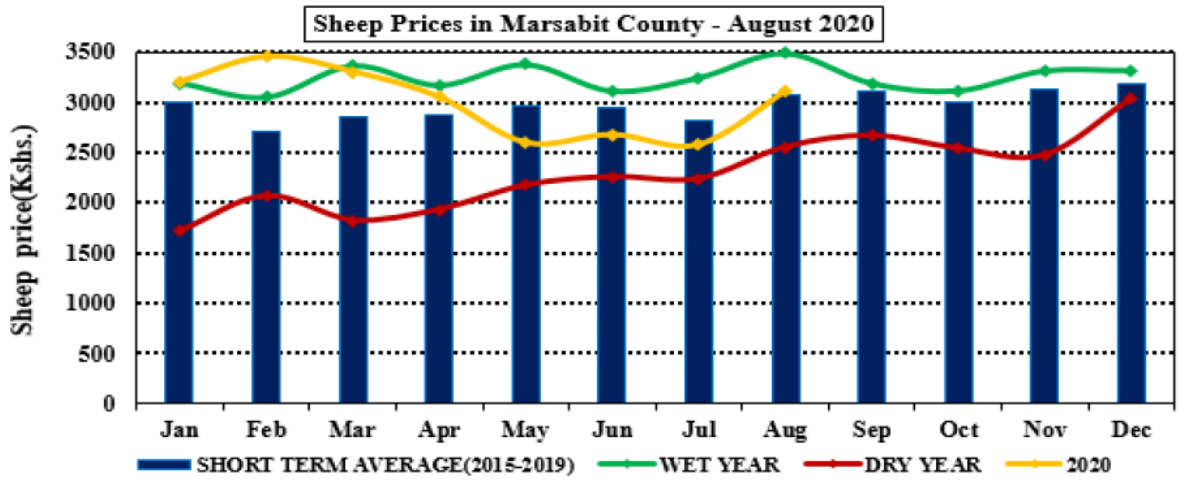


Figure 7: Average sheep prices in Marsabit County

Source: NDMA, Marsabit County Drought Early Warning Bulletin for August 2020

Overall, the main factors that influenced livestock prices included season; body condition; wet and dry conditions; pastoralists holding their livestock in anticipation of better prices in the future; or prestige, access to markets and distances to foras.

Market access was affected by COVID-19, which caused market closure, long distances to the markets, lack of transport and banditry. Collectively, these factors had a negative effect on the supply of meat

in the two counties. It created unnecessary shortages, which then led to surging prices, translating intov decreased consumption of meat at the household level.

Processing

Processing refers to the application of technology to improve or maintain quality, extend shelf life (preservation), and the preparation of food for consumption. Various stages of processing are applied in the case of dried traditional meat, which is made from parts of muscles of sirloin and silverside steak, using beef or goat carcass. Processing and preservation techniques include forms of drying, use of heat and storing in fat. These techniques should be studied with the aim of identifying opportunities for upgrading the technologies and promoting them. Processing helps produce varieties of meat products to meet various lifestyle requirements.

The meat value chain in Kenya was both formal and informal. Along the formal value chains, the slaughter operation must be conducted in registered slaughterhouses. Meat is required to be inspected both pre- and post-slaughter by a qualified veterinary officer. Most slaughterhouses are certified by the government to provide slaughter services at a fee. Adequate measures are recommended/implemented to ensure hygienic handling post-slaughter through measures such as adequate water supply during slaughter, separation of by-products from main products and protective clothing worn by personnel. Usually, meat is transported in metallic boxes, specifically designed for meat products. Most meat is not differentiated based on grade or quality.

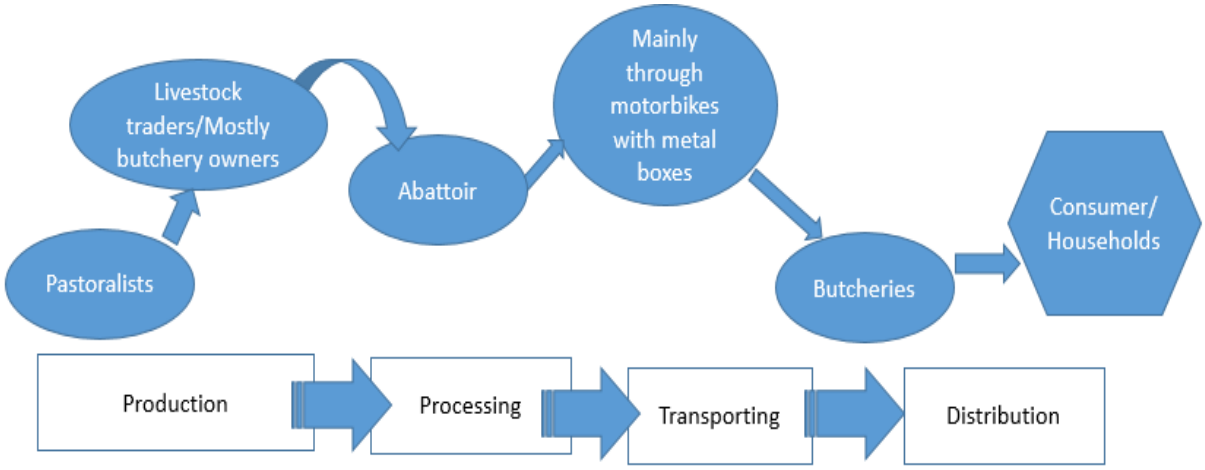
The data in Table 6 indicates charges in the slaughterhouses based on selected towns in Marsabit. In the pastoral areas, informal value chains were found further away from the major towns or at the household level. Slaughter operation was not inspected by a veterinary officer. Mostly, slaughtering of sheep and goats for home consumption was done at the home of the producer; part of it was sold fresh to neighbours while the rest was preserved for home consumption. Due to long distances and poor infrastructure, veterinary services were inaccessible.

Table 6: Slaughterhouse charges in Marsabit

Area	Type of Animal	Cost (Ksh)
Marsabit Town and Moyale Town	Cow and camel	Slaughterhouse fee: 400 Service fee: 400 Total: 800
	Goat and sheep	Slaughterhouse fee: 200 Service fee: 200 Total: 400
North Horr, Laisamis and Loiyangalani	Cow and camel	Slaughterhouse fee: 200 Service fee: 400 Total: 600
	Goat and sheep	Slaughterhouse fee: 120 Service fees: 200 Total: 320

In Isiolo County, goat meat was the most consumed meat, and the cost of slaughtering was Ksh 350. Notably, most of the slaughterhouses lacked records, and units produced were rarely available. From the slaughterhouse, the meat was transported to the butcheries and sold to consumers. In the two counties, a kilogram of meat (for all livestock) was sold at Ksh 400. The main meat value chain stakeholders are as shown in Figure 8. The relationship between producers and traders involved cash sales only, and no contracts existed between them. Goat meat and beef were the main types of meat consumed locally, while camel meat was transported to Nairobi and other urban areas for sale.

Figure 8: Meat value chain in Marsabit and Isiolo Counties



In Marsabit County, camel meat was processed into *Nyirinyiri* (Figure 9). The process of making *Nyirinyiri* involves taking fresh meat steak, cutting it into strips, hanging the meat for two hours to reduce moisture, cutting the meat into small cubes of 5mm, placing it in a cooking pan and allowing water to drain for 30 minutes; deep frying in ghee for ninety minutes; adding spices, cooling and packaging. Some *Nyirinyiri* was consumed at the household level in Marsabit and Isiolo but most of it was produced for commercial purposes. Oil used in the storage of *Nyirinyiri* was purchased at the local market. In Marsabit and Isiolo counties, low-income households usually processed *Nyirinyiri* after slaughtering a camel. However, *Nyirinyiri* produced for commercial purposes targeted the urban areas—such as Nairobi. The *Nyirinyiri* meat has up to six month's shelf-life. *Nyirinyiri* sold in Nairobi was Ksh 1,200 per kilogram. These local food preservation techniques may be upgraded to increase shelf-life and availability of meat products throughout the year.

Figure 9: Processing of Nyirinyiri

The MSMEs interviewed for the study in the supply of meat are shown in Table 7. The study covered most of the MSMEs in the meat supply value chain in the areas of study and included larger and smaller MSMEs.

Table 7: MSMEs interviewed for the study in the supply of meat and meat products

Name and Location	Product	Capacity
Northern Meats Products—Isiolo Town	Camel sausages	20–50kgs of sausages a week
Nyirinyiri Nkulan Group—Isiolo Town	Camel meat (Nyirinyiri)	Sells over 100kgs per week to Nairobi
Nyirinyiri Women Group—Isiolo Town	Process camel meat into Nyirinyiri	80kgs of Nyirinyiri per day
BDD (Bule Dogo Dambicha)—Isiolo Town	Aggregation and feed lots	Have at least 100 animals at any one time
Taboto—Isiolo Town	Aggregation and feed lots for cattle	Located in Garbatulla; have more than 50 animals at any given time

Name and Location	Product	Capacity
Junda's Butchery—Garbratulla	Retail of meat	On average, sells over 100kgs weekly
Robe Butcheries—North Horr	Retail of goat, cow and camel meat	Owns a butchery that supplies at least a goat a day (most of that is finished before noon); owns the only 20-liter freezer among meat suppliers in the area
Duba Diba—North Horr	Retail of goat, cow and camel meat	Lack refrigerators, thus limiting to 1 goat per day
Shudaa Market Butcheries—Moyale	Retail of goat, cow and camel meat	Currently one cow/goat is sold every 1–2 days, with the potential to supply more if there is the market

Challenges in the Meat Product Market and Processing

Meat market in both counties faced the following challenges:

Low supply, especially during dry seasons. Due to drought in both counties, some of the livestock died and others transported to fora were difficult to access. Thus, during the dry season, accessing livestock for slaughter was a challenge; additionally, the health of the livestock available was reported to be deteriorating.

Poor preservation practices. Raw meat's shelf life is low and meat traders/butcheries did not have proper preservation mechanisms that would improve shelf life and increase access to meat during the dry seasons. Preservation through sun drying and as *Nyirinyiri* was only done commercially in Isiolo County and by women groups. Freezers for meat storage were owned by only a very few meat traders, resulting in low quantities of meat. Furthermore, traders lacked technical, structural, and financial capacities to preserve meat. Thus, most did not know how to preserve, did not have the machinery needed and had poor access to finance.

Lack of processing facilities and capacity in the counties. Traders in both counties did not have the capacity to process meat and only *Anolei*, Isiolo *Juakali Nyirinyiri* and *Tawakal* women's cooperatives in Isiolo were processing meat into *Nyirinyiri*. Meat traders lacked technical, structural, and financial capacities to process meat and sold it raw in their butcheries.

Poor aggregation systems. Except for the three cooperatives in Isiolo, aggregation of meat was very low. This hindered bulk processing in the counties.

Lack of value addition options. The two counties lacked processing and value addition facilities; meat was only sold raw or processed into *Nyirinyiri*.

Opportunity for Nawiri to Intervene

Nawiri can support new and existing preservation methods, such as sun drying and processing meat into *Nyirinyiri*. This would improve access to meat during dry seasons. Supporting aggregation mechanisms would improve the supply to be processed, and due to economies of scale, reduce production cost—making it more affordable to consumers.

The programme can also support the traders and groups with technical, structural and financial capacities. This would be in the form of technical training for preservation/processing, support by means of processing/preservation machinery (or financial access to access the machines) and operational costs. This would ensure meat is processed, preserved, available and affordable in the market. Supporting women-led meat processing cooperatives would also enhance women's

empowerment; through the income- generating opportunities provided, they would be better able to improve access to nutritious foods for their families.

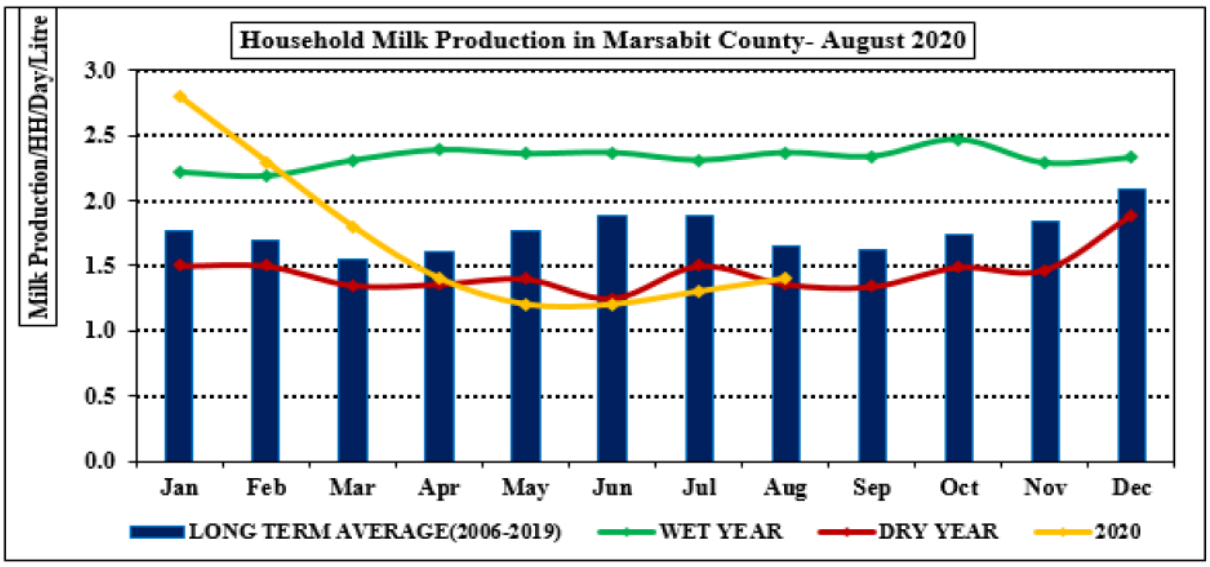
Milk value chain

Milk production in Isiolo and Marsabit counties fluctuates with the season. There are reduced milk yields from January–mid-March because it is a short dry season with inadequate pasture. Mid-March–June is the popular calving time, resulting in increased milk production. Long rains correspondingly increase pastures and water for domestic use and livestock. The long dry spell July–mid-October is characterized by traveling long distances in search of pasture and water; this decreases milk production and availability. From mid-October–December, short rains reduce the challenge of finding water and pasture, and the period is accompanied by increased milk yields.

At the time of this study, the milk production in Marsabit County was 1.4 litres/household/day (county average). In comparison to a 5-year average, the milk production of 1.4 litres was below normal by 18 percent when compared to the long-term average milk production of 1.7 litres. At the time of this study, production levels were affected because most cattle and camels were expected to calve in October and November. On average, the county produces 4,131,020 litres of cattle milk per year.[12] At the time of the study, most of the milk produced was from goats and sheep and primarily used for consumption within the household, while a smaller portion was sold by producers directly to consumers, i.e., neighbours and in the local market (street vendors and small shops/kiosks).

"I sell this milk to my neighbours, other villagers and also pack them in small bottles after boiling to be transported to Marsabit for selling and to other customers who make daily order of milk for hotel use."
—Female Milk Vendor, Marsabit

Figure 10 shows household milk production in Marsabit County:
Figure 10: Average household milk production in Marsabit County



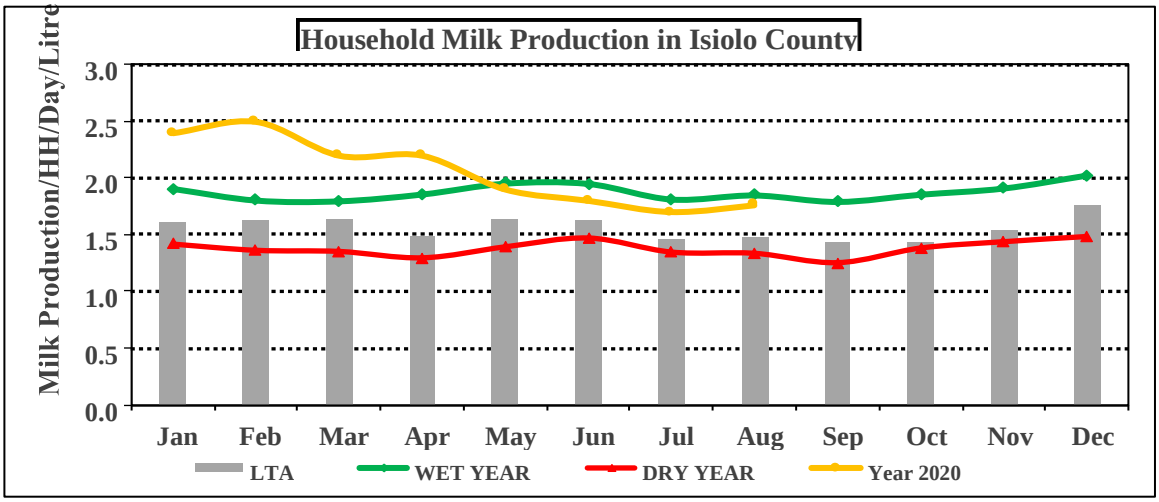
Source: NDMA, Marsabit County Drought Early Warning Bulletin for August 2020

Equally, in Isiolo County, during the study (August/September), milk production had stabilized at 1.76 litres per household per day. Garbatulla and Kinna were noted to produce the highest amounts of milk since they have the highest camel population.[13] The fluctuations in milk production impact its price in

[12] KNBS, county statistical abstract—Marsabit County.
[13] NDMA, Isiolo County Drought Early Warning Bulletin for August 2020.

the corresponding direction. In other words, during the rainy season, the prices fall while in the dry season, they increase.

The household milk production in Isiolo County was less than 2 liters, as illustrated in Figure 11 *Figure 11: Average milk production in Isiolo County*



Source: NDMA, Isiolo County Drought Early Warning Bulletin for August 2020

Challenges in Milk Production

Isiolo County

- Over-production of milk occurs during the rainy seasons, resulting in much of the milk going to waste. This is mainly because during the rainy season every household has access to milk from their own cattle, goat or camel or they can buy the milk at a cheaper price from their neighbours. Thus, there was an opportunity for processing into milk powder for later consumption but the existing processors in the counties did not have the capacity.
- During drought, the residents face a challenge of under-production, making it difficult for them to access milk. During this season, the prices are normally very high for the consumers. It was also noted that during the dry seasons, animals move to faraway places in search of pasture and water, forcing those who remain at home to go for months without milk.
- Diseases in animals are a major challenge. This is coupled with inadequacy of extension officers to tend to their animals.
- Degraded rangeland during drought causes a loss of grass cover to feed the animals.

Marsabit County

- Over-production of milk occurs during the rainy seasons, resulting in much of the milk going to waste. Because of frequent drought, pasture and water becomes depleted. Lack of food and water emaciates the animals and reduces milk production. Additionally, pastoralists move far away to inaccessible lands during these periods, which inhibits them selling the milk from their livestock.
- Diseases among the animals were another challenge. For example, in July 2020, 200 camels died in Marsabit County because of bacterial infection (mannheimia haemolytica).[14]

[14] https://smartfarmerkenya.com/mass-camel-deaths-not-caused-by-coronavirus/.

- Farmers complained about the lack of and inadequacy of extension officers, including veterinarians**.** As a result, when the livestock become sick, they are not attended to; sometimes the help comes too late, and the animals die. These eventualities affect milk production.
- Degraded rangeland during drought causes a loss of grass cover to feed the animals.

Consumption

Consumers bought unprocessed/raw, pasteurized, and powdered milk. In Isiolo, Merti, raw milk was purchased from shopping centres, street vendors, small shops and kiosks, whereas pasteurized and powdered milk were bought from wholesalers within the shopping centres. In Isiolo, the main available processed milk brands retailed were Brookside, Daima, New Kenya Cooperative Creameries (KCC), Meru Dairy, Kinangop Dairy and Pascha.

Most of the milk in Marsabit was sold in cups and bottles; at the time of the study, it was sold at an average price of Ksh 75–90 per litre. This is 20–25 percent above normal price of Ksh 60–75 and was attributed to low milk production. UHT milk from Nairobi and Meru retailed at Ksh 55 per half a litre (Ksh 110 per litre). The main available processed milk brands in Marsabit included Pascha, Brookside, Daima and New KCC. Yoghurt and most of the sour milk were brought in from other counties; cheese was rarely sold in these counties. The major private sector players in milk value chain in Marsabit include the Mount Marsabit Dairy cooperative located in Karare and the Moyale Camel Milk Dairy.

In Isiolo, the county produced about 13.4 million litres of milk (camel and cattle)[15] per year. The retail price for camel, cow and goat milk was Ksh 60, 50 and 40 per litre, respectively. However, these prices can dwindle significantly during the rainy season when milk production is high. For example, the milk price can drop to as low as Ksh 15 per litre. During the study there were no operational milk processing plants in Isiolo, but MSMEs, such as some hotels in the county, carried out small-scale yogurt production and sour milk to sale to their clients in their own shops. Some individuals sold sour milk at their homes and on the streets but not via retail channels. The retail price for yogurt was Ksh 200 per litre, although depending on the customer's preferred quantity, the litre could be broken into a quarter litre that retailed at Ksh 50.

There were large-scale milk collectors and vendors in Isiolo Town—such as Hussein Dairies, Classic Foods and the Anolei Women's Group—who were either in cooperatives or sole proprietors. These collected a range of 80–300 litres per day. The major milk (camel and cow) cooperatives were *Anolei* and *Tawakal*, which were largely owned by women. They only dealt in camel milk (collected from farmers) and primarily supplied the milk to Nairobi, reserving only some to sell locally. The milk was transported (mostly using motorcycles) from the producers in the interior of the county to the cooperatives, which were located within Isiolo town. They then refrigerated the milk and transported it to Nairobi every morning the following day. *Anolei* sold 3,500–8,000 litres per day to Nairobi whereas *Tawakal* sold 500–2,000 litres per day. *Anolei* has benefitted from the government and some NGOs (mainly USAID) who helped them construct their modern facilities and acquire freezers/refrigerators and a refrigerated vehicle to transport their milk to Nairobi.

The main challenges facing the cooperatives were noted as low milk supply during dry seasons, insufficient refrigerated transport and storage equipment, poor handling of the milk from the source (which caused the milk to spoil), lack of modern preservation technologies, expensive cost of power and poor roads.

[15] KNBS, County statistical abstract, Isiolo County.

The major individual-owned companies engaged in the milk business include Hussein Dairies, which collects pasteurized cow milk from processors in the Timau area of Meru[16] County and resells in Isiolo Town. He currently sells 500 litres of milk per day due to low supply. He has two cold rooms with a combined capacity of 3000 litres; however, these are not adequate to satisfy the market demand, which is higher than his supply and storage capacity. Having the proper pasteurizing equipment would enable him to brand and sell the milk more profitably. Other notable milk companies include Classic Foods Limited (Ltd) (not operational at the time of study) with a capacity of 30,000 litres of milk per day and Afro Natural Ltd with a capacity of 10,000–25,000 litres of milk per day. Classic was funded under LMS—a USAID-funded project.

Processing and packaging

Locally produced milk was sold fresh, boiled, or fermented. Boiling milk sterilizes it without necessarily destroying its nutritional advantages. The milk is packed in plastic containers and jugs while in rural areas, it is packed in gourds and calabashes. Tetra pack milk sold is mainly UHT and aseptically packed in a pillow pouch and tetrahedron pack.

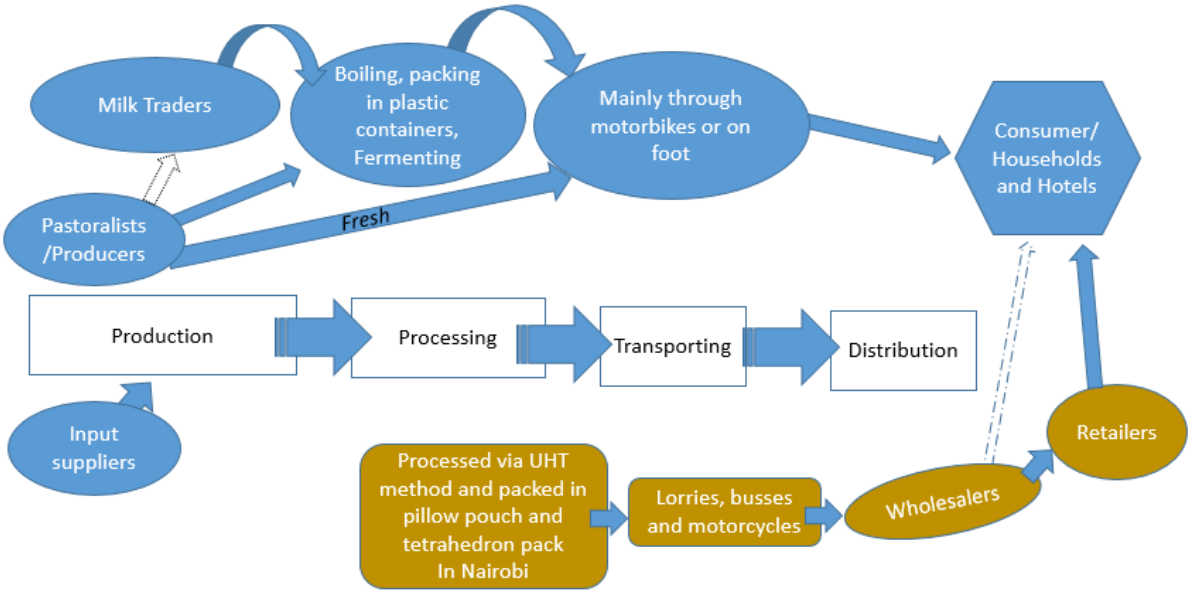
Figure 12: Milk processing at Anolei Women Camel Milk Cooperative

"Boiling and packing it in plastic bottles. There is no other form of improving quality of milk that I know." —Male Milk Vendor, Marsabit

The relationships between producers and traders are almost non-existent as most producers opt to sell directly to consumers. The few who sell to traders or hotels sell through agreements on monthly or daily payments. The main stakeholders are as depicted in Figure 13.

[16] https://www.google.com/maps/place/Timau/@0.0852298,37.2250699,14z/data=!3m1!4b1!4m5!3m4!1s0x1787fc5a193a9633:0x37f607c89a2397d1!8m2!3d0.0854987!4d37.2383506.

Figure 13: Milk value chain, Isiolo and Marsabit



Key private actors supplying milk in the counties are shown in Table 8.

Table 8: Private sector actors in the supply of milk and milk products

Private Actor/Location	Product/Activities	Capacity
Tawakal Cooperative Society—Isiolo Town	Milk products	Processing fluctuates with the seasons. High processing is done when the supply is high and lower quantities processed during low seasons (currently paused due to limited supply of milk).
Hussein Dairies—Isiolo Town	Purchase of milk from processors and supplies to retailers and consumers	Currently supplies 500 litres; has 2 cold rooms with a combined capacity of 3,000 litres.
Classic Foods—Isiolo Town	wholesale and retail of Fresh Milk	Capacity of 30,000 litres of milk per day (currently not operational).
Afro Natural—Isiolo Town	wholesale and retail of Fresh Milk	Capacity of 10,000–25,000 litres of milk per day.
Invems Agencies Ltd—Isiolo Town	wholesale and retail of Fresh Milk	Capacity of 25 litres of milk a day; has exotic cows.
MADOS Investment—North Horr	Supply of packed (UHT)milk- wholesale and retail	Has 3 shops and one main store. Supplies up to 20 cartons of milk per day to more than 20 retailers and the community within North Horr sub-county.
ARANO DC Ltd—North Horr	Supply of packed (UHT)milk	Supplies over 100 retailers. Has interest in processing and supplying camel milk through ATMs but lacks the technical and financial capacity.
Doris, vendor—Laisamis	Supply of packed (UHT) milk	Supplies the community, especially consumers from the Manyattas.
Digital Wholesalers—Loiyangalani	Supply of packed (UHT) milk	Is the largest supplier in Loiyangalani; supplies within Loiyangalani and surrounding villages, such as El Molo.
Al Habib Center—Laisamis	Wholesale and retail of packed (UHT) milk	Is one of the largest wholesalers in Laisamis.
Al Bashir Supplies—Laisamis	Wholesale and retail of packed milk	The other big food supplier in Laisamis; mainly sources supply from Isiolo and Nairobi.
Songa Women Group (now known as MT Marsabit Cooperative Ltd)—Marsabit Town	Ghee fermented milk, retail	During the rainy season they buy 60–80 litres of milk—but when milk is scarce, they buy 20 litres.
Lesukat, milk vendor—Marsabit Town	Fresh and fermented milk, retail	Milk is primarily sold to neighbours and other villagers. They are also packed into small bottles

Private Actor/Location	Product/Activities	Capacity
		(after boiling) to be transported to Marsabit Town to sell to other customers who order milk for hotel use.

The cattle milk value chain faced several competitive disadvantages in Isiolo and Marsabit because of its weak linkages to the broader national market, the relative absence of collection and cold chain facilities, poor pastures, intense seasonality, rapid spoilage rate and scarcity of water. Cattle milk sales and processing could be promoted for household consumption in Isiolo and Marsabit as a low volume household enterprise.

Challenges in Milk Value Addition and Supply

The supply and value addition of milk in the two counties faced the following challenges:

Low supply especially during dry seasons. Low production due to low availability of fodder and vegetation for livestock affected the quantities of milk supply in the markets. Poor aggregation systems also hindered collection of milk, especially during the dry seasons.

Lack of enough processing facilities within the counties. Milk cooperatives like *Anolei* and *Tawakal* and companies like Hassan Dairies lacked processing (pasteurization, fermentation, UHT) equipment to enable them to process their milk. Equipment was expensive, and they were unable to afford it.

"We don't have a milk or fruit processing plant here; during high yields, a lot of fruits get wasted. A processing plant would really assist us…" —Male FGD Producers Kinna.

Lack of training and technical expertise on value addition and processing**.** In Marsabit, most of the producers interviewed did not aggregate their produce nor add value prior to sale. The processing of ghee was only done after NGOs (such as World Vision) trained women groups in the counties. In Isiolo, the processors' technical and structural capacity was lacking, yet vital to the expansion of processing.

Cultural hindrances and traditional beliefs**.** Some potential users are resistant to consume processed foods. Certain consumers in Kinna said they fear consuming packed milk due to chemicals and because most of the nutrients have been extracted.

Expensive power costs. Milk cooperatives criticize the lack of processing facilities and cite huge power costs as a hindrance to processing. Counties also had frequent power outages/poor access to water.

"…we experience power outages. Since they happen without notice, they bring the business to a halt; as a result of that, I lose some customers…" —Male IDI Processor, Isiolo

Poor access to finance**.** Given the high costs associated with processing, most processors and traders lacked the financial capacity to afford the key equipment for processing and preservation.

Poor preservation measures. Since most of the frozen milk was transported and stored using small, unhygienic plastic cans, the milk defrosted during transport. Increasing the shelf life of milk was a common challenge—even the existing milk cooperatives had structural and technical challenges in their pasteurization practices.

Poor access to finance. Processing and preservation required expensive machinery and the traders/processors had difficulty accessing funding to acquire the necessary equipment.

Opportunity for Nawiri to Intervene

Nawiri can support the formation of new and existing aggregators**.** This would improve milk collection even during dry seasons. Processing higher quantities would reduce the costs of production, potentially making the finalized milk products affordable to consumers. It would also improve the relationships between producers, traders, and processors.

The programme can support processors with technical and structural capacity to process (pasteurization, fermentation, UHT) milk. This would improve the shelf life of milk products and improve the accessibility of milk year-round. Ghee production at the household level can be supported through training. The programme can also support preservation measures undertaken by milk traders to improve accessibility of raw milk.

Fish value chain

In Marsabit County, fish is mostly consumed along Lake Turkana and in towns; in Isiolo County, it is mainly consumed in Isiolo Town and Merti. Fish in Marsabit County has high potential due to its high production capacity and year-round availability. Current fish production volumes for Marsabit County are estimated at 630 metric tonnes per year worth about Kenyan shilling (KES) 45.5 million.[17] An estimated 90 percent of the fish is sold outside the county. The main ports of production are Loiyangalani, Ileret, El Molo Bay, Moite and Telesgaye. More than three-quarters of all the fish produced from Loiyangalani (area of study) is sold to traders in Kisumu and Busia and later distributed in Kenya and Congo. This is mainly sun-dried fish. In contrast, fresh fish is sold only as a small portion within Loiyangalani sub-county and at Marsabit Town.

Isiolo County

Lack of good transport facilities. Most fisher folks in Isiolo transport live fish to government ponds and then sell from there. Lack of proper transport facilities causes losses to the fisher folks since some fish die and spoil in the process.

Lack of knowhow, training, and capacity in fishing. More training should be done on fish farming, fish farm management, storage and processing to improve the knowledge of fisher folks.

Fishing mainly is done along the River Ewaso Ng'iro and a few fish farms**.** This has hindered its level of production.

Marsabit County

Expensive transportation costs. Because most of the fish must be transported live, the cost of procuring a well-equipped vehicle is high.

Lack of training or capacity of the fisher folks to undertake fishing. There is limited fishing equipment, such as boats and nets. Rafts used for fishing are unsafe and cannot be used in the deeper parts of the lake. Recently, the county government and NGOs, such as Vétérinaires sans Frontìeres (VSF) Germany, have supported the fisher folks with engine-powered boats and modern fishing equipment, but they were deemed insufficient by the fisher folks.

[17] Climate Risk Profile, Marsabit County.

Conflict in the waters among the fisher folks.

Strong waves along the lake limits the number of fish that can be harvested.

Crocodiles that cut nets.

Climate change, which has caused increase volume of water in the lake. When there is more water in the lake, it affects the number of fish that can be caught.

Lack of refrigerated trucks to transport fish. They currently transport through public means, which is a problem since the fish spoil if not properly sun-dried.

Cultural factors that deter people from eating fish. This is further complicated by would-be consumers not knowing how to prepare the fish.

Dried fish sells for lower prices compared to fresh fish. It is also perceived that dried fish is of poor quality due to unhygienic processing.

Supply

The distribution of fish within the county is especially affected by the lack of established markets. Additionally, some food attitudes prohibit the consumption of fish. For example, the Borana and the Gabbra have the belief that when they eat fish, their animals die. This limits household dietary diversity. Also, a lack of knowledge of the nutritive value, preparation and use of fish has hindered its adoption among some pastoral communities. Raising awareness on the nutritive value of fish and appropriate preparation methods has the potential to improve dietary practices and consequently, its nutritional status. All community members who do not consume fish can be targeted to receive this information.

"You will be surprised because of malnutrition levels in these areas when the lake is full of fish, and it's so cheap. It's because of cultural orientation that most don't consume fish. They need sensitization." —KII, Loiyangalani

"We don't have an established market in the county and only a small one in Marsabit Town, but even here in Loiyangalani, we sell at the store. Our main market is in Kisumu and Busia." —Male fisher folks, FGD, Loiyangalani

The county government is in the process of developing cold rooms. Fresh fish is processed into the fish fillet and sold within Loiyangalani and transported to Marsabit. Fresh fish commands a higher price compared to dried fish. The relationship between fish producers and traders, especially from Kisumu and Busia, is volatile and based on mutual trust. In these two areas, producers sell to traders on credit and cater to their high transport costs, which leaves them with meagre profits.

Despite most of the fishers being men, women played a bigger role in fish trading. Retail of fresh and fried fish in the local markets was mainly undertaken by women, while men sold dried fish in other markets—such as Kisumu. Women fish traders purchased the fish at the shore and retailed them in the market either as fried or raw. Success in the fish trade even encouraged some of the women to invest in boats and hire fishermen. Notably, women sometimes faced the risk of GBV, especially along the shore whenever they went to buy fish early in the morning. The beach management unit was working to ensure their security, including setting up lights along the shore.

Dried fish was sold at Ksh 30 to traders and its transport costs about Ksh 3, leaving the producer with Ksh 27 per fish. This amount is usually paid out a week after receipt of the fish. This leaves the producers vulnerable, but their desperation (due to inadequate markets) pushes them to trust traders. Sometimes the traders (who sell the fish for Ksh 100–400 in Kisumu markets) do not pay, and the fish cooperative intervenes by pursuing the trader in their respective areas. Local traders buy from the

producers on a cash basis but suffer the same fate in the pursuit of markets. Fresh fish was sold at the shore to local traders at a price range of Ksh 50–100.

Figure 14: Drying fish in Loiyangalani

In Isiolo County, fish was consumed mostly in Merti and Isiolo, but the larger proportion was exported to other counties, including Nairobi and Busia. There were two types of fishing practiced in Isiolo County: aquaculture and riverine line-capture fishing. In aquaculture, the main farmed fish were tilapia and African catfish, in which the production system was semi-intensive and for subsistence only. For river-line capture fishing, the main activity was along River Ewaso Ng'iro. The main types of fish caught were clarias, common carp, lungfish, tilapia, barbus and labeo.

After fishing, the fish was either sold directly or taken to a government-owned fish farm for holding. There were 12 organized groups who took fish to the government's fish farm where there were 16 fishponds and hatcheries for storage of live fish. The government offered the fisher folks space to hold their fish as they looked for a market to sell their fish. Because live fish makes premium prices, farmers must transport the fish live to the ponds, which is very expensive. During transport, there were significant post-harvest losses (up to 50 percent of the fish died) because of the poor condition of the roads and lack of good transport facilities. In the year 2019, an estimated 20 tons of fish were sold from the government holding area.

During dry seasons there continued to be plenty of stock, and the price of fish ranged from Ksh 60–200 per kilogram. Most of the fish was sold outside Isiolo, with the traders taking them to the Busia and Gikomba markets in Nairobi.

Fish consumption in Isiolo was still low due to the traditional and cultural hindrances, but the government—through the Ministry of Fisheries—has been conducting awareness campaigns to improve this. Fish farming as a livelihood has not yet been fully accepted within the communities and the government is working to improve acceptance.

"… currently, the consumption of fish per capita in Isiolo County is half a kilogram per person per year. Our department is trying to improve this to one kilogram per person per year…" —KII, Isiolo

To promote fish consumption, there was need to undertake nutrition education and to demystify the traditions that hindered the consumption of fish. Fish farmers also need adequate extension and other support services.

Challenges in Fish Supply

Poor preservation measures and processing options.

The main preservation measure was sun drying, which had hygiene challenges given it was done on the bare ground and the storage facilities were not clean or have good standards. Sun drying took longer, causing it to lose value and sell at a cheaper price compared to a fresh fish. The fisher folks also did not aggregate and sell as a unit; this left individual traders/fisher folks vulnerable and at the mercy of the traders. Without proper cold-chain facilities, transport of fresh fish was only done by the few who had ice chests. Processing fish into fish fillets was done by just a few fisher folks, since most were not well-trained. Fish supply was low in the counties for both processed and unprocessed fish due to cultural and traditional barriers that prevented some communities from consuming fish. Poor access to finance also limited the value addition and preservation of fish, given the need for equipment.

Opportunity for Nawiri to Intervene

The programme could support technical capacity building, helping fish traders with value addition and processing—such as proper sun drying and cutting fish into fillets. Additionally, training on hygienic methods in both value addition and retail would improve uptake of fish and reduce losses.

The programme could also support traders with value addition equipment (e.g., solar sun dryer) as well as access to finance to traders to improve the supply of fish. Supporting fish traders via access to finance and technical capacity would improve the lives of women through an increase in their income—and as a result, provide access to improved diets for female-headed households. The programme could also support aggregation of fish to enable fisher folks to sell as a unit and improve trade relations.

MSMEs in Processing and Supply of Nutritious Foods

Annex A to this report is a list of 35 processors and MSMEs profiles in the processing and supply of nutritious foods in the two counties. ***The profile contains contact persons, their contacts, capacity, and the challenges they face in their operations.***

Market and Food System Constraints and Opportunities

Supply of nutritious foods

The main constraints in the supply of nutritious foods in the two counties of study include poor access to finance, poor transport system, poor storage facilities, high cost of labour/operating expenses and unfavourable weather conditions.

In addition to hindering the expansion of businesses, poor access to finance meant that MSMEs could not afford key transport assets—such as lorries for transport, the manpower needed, or the hiring of transport. Low financial capability was also a factor in determining the range and quantity of supplies due to the cost of transport and the cost of food. Fish suppliers could not afford cold chain trucks and thus ended up selling dried fish, which took longer to process and sold for lower prices. For milk MSMEs, transportation assets— such aluminium containers for milk—were few and farmers opted to supply the milk in unhygienic plastic containers. MSMEs also had challenges in logistical arrangements and bookkeeping. This contributed to operational inefficiency and sometimes led to closure of the businesses.

Unfavourable weather conditions affected the supply chain as it directly contributed to the availability or unavailability of food products in these counties. In the local milk and meat value chain, supply was affected by production levels, especially during the dry seasons when the animals were unable to

produce at their optimum potential due to shortage of feeds and water. In addition, they had to be moved long distances in search of grazing and water. To help resolve the water shortages, the project could assist in the harvesting/storage of water and transportation of water to the required areas.

The distances from the villages to the fora are usually long and suppliers either opted to engage motorcycles for transportation of milk from its production point to the market—or closed shop. In rural parts of the counties, the milk supply consisted only of long-life milk, which was reported to have a high propensity to spoilage due to the hot climate. In North Horr, one of the MSMEs supplying milk indicated that some of the milk spoiled five months *before* its expiration date due to high temperatures. The MSMEs also lacked adequate cold storage facilities, which hindered storage for the supply of fresh milk as well as storage for the long-life milk in the stores. In addition, vegetable and fruits were damaged by hot climatic conditions, resulting in significant post-harvest losses.

"The goods get damaged, especially milk. If you pack 500 boxes, 10 must get damaged. That translates to a loss on my end. The heat also spoils the milk" —Male MSME, North Horr

MSMEs play a crucial role in employment creation. However, high cost of labour and other operating costs were also cited as a challenge to the growth of MSMEs as highlighted by one of the MSME owners in North Horr.

"The challenge is manpower. Manpower in terms of cost of labour. For example, when offloading, the person would ask to be paid very expensively. Transporting goods to another location is also a high cost. You cannot have a fixed price for that." —Male Food System MSME, North Horr

Other challenges included price fluctuations, poor roads, armed robbery, tribal clashes and banditry—especially in North Horr and Laisamis.

"The Laisamis to Loiyangalani road has armed robbers who interrupt the supply of foods in these areas." — Male Food MSME, Loiyangalani

"The community who supplies milk from the hills don't do it if they have a problem with the other communities at Loiyangalani." —KII, Loiyangalani

Key Opportunities for Improving Supply of Nutritious Foods

Aggregation mechanisms: In the supply of milk, meat and fish, proper aggregation mechanisms for milk and meat needed to be instituted. This includes supporting existing cooperatives and the formation of new ones. Aggregation and support of traders would improve relationships and provide mutual benefits between producers and traders.

Access to financial, technical and machinery support. Cooperatives already undertaking aggregation of milk and traders selling milk, meat and fish within the counties need to be supported with access to finance and capacity building to improve their reach within the counties. Aggregation groups and traders provide an opportunity to improve supply of milk, meat and fish in the counties.

Technical support. This can be provided on preservation methods, value addition, processing, and hygienic practices.

Consumption of nutritious products

Consumption of nutritious food in both Isiolo and Marsabit counties is largely affected by the seasonality in production due to drought. During the dry periods, many households only eat one meal

a day or go without food altogether. People who live within the town consume nutritious foods to a greater extent compared to those who live in rural areas. This is largely due to availability of the foods and ability to afford them.

Challenges

Lack of enough food during dry season. It was noted that production periods/seasons in the two counties are always very short, and they are only able to produce what will last them for two to three months. This means that during the dry seasons, they do not have enough food. Existing gender roles meant that men would oversee grazing while women would take care of the children. During the dry season, men would take the livestock to grazing zones far from home, leaving the women and children at home. Sometimes they would leave one farm animal behind to help supply the women and children with milk. However, it was clear that men in fora had more access to milk compared to women and children at home.

Poverty. It was noted that most of the households—especially in the rural areas—were poor and thus had low purchasing power. Male-headed households had higher purchasing power compared to women-headed households; this meant the frequency of consuming nutritious foods was lower for women-headed households as compared to male-headed households.

Increase of food prices during these periods, which hinders the ability to purchase. Prices of goods were similar for both men and women in the community, but the purchase power differences between them influenced access.

"…the prices are high since it's from other counties and the sellers increase prices to cover their transport costs…" —Female IDI, Laisamis

Limited choice of foods/cultural factors. You find that some people still hold the belief that they cannot consume certain foods either due to cultural or religious beliefs. For example, the Muslims do not consume pork, others do not consume fish or chicken. It was also noted that due to the long distances between markets, vendors only offered a small variety of foods, which affected consumption of nutritious foods. Notably, foods were prepared at the household level by the women and consumed by all members (both male and female) except babies and in some special cases, pregnant women. Foods pregnant women were prohibited from consuming included cabbage, pumpkin, milk/milk products, sugar cane and fruits (e.g., banana and avocado). There was a belief among the pastoralist community that if the pregnant mother ate those items, the baby would be fat, leading to challenges during delivery.

Access to a variety of food in the market. The respondents reported that in most cases, by the time they were able to get to the market, some food stuffs—like meat and kale—were already sold-out. They were therefore forced to rely on what they could easily get.

"…We also lack diversified food (we recommend the 4 food groups) which is not there and also the adequacy of food is not there…" —KII, Marsabit

Opportunities

Poultry is a potential value chain in Isiolo. Poultry (meat and organs) and eggs can provide high-quality protein and micronutrients in bioavailable forms which, even in small quantities, substantially increase the nutrient adequacy of traditional diets based on staple crops. Women were recognized as key players in family poultry production systems (they led in production and marketing of chicken); successful engagement with this sector should incorporate gender-sensitive approaches. This would include tailoring support given to women given that challenges (such as access to finance) affected them differently than men. It has been shown that agricultural interventions which target women are more likely to lead to positive nutritional outcomes.

Factors that Influence Consumer Food Purchasing Decisions

- Food availability in the market. This can be through increasing production or imports. Consumers will tend to buy what is available in the market. Poor food availability causes malnutrition when households cannot get adequate caloric intake or a sufficiently diverse range of food. The food availability in the market can be affected by restrictions on poor access due to conflicts within the community or among communities, which may result in markets being closed or movements restricted. It can also be caused by poor infrastructure and inadequate logistics for food distribution.
- Prices. With high market prices, poor households are not able to access sufficient food because of low income. This makes poor households' food- and nutrition-insecure, resulting in rampant malnutrition and poor diets.
- Relationship of "price-to-quality." If a consumer's perception of a product's price-to-quality match their expectations, they will be satisfied and perceive high value for the product. The opposite is also true.
- Taste. Taste plays an important role in food choice; therefore, a better understanding of the links between the taste of foods, individual taste preferences, food choices and intakes will aid in our understanding of why some people might select and consume unhealthy foods. In most instances, nutrient-poor foods are sweet, salty, and fatty; their consumption leads to obesity.
- Social norms, attitudes, and behaviour. Family, cultural traditions and customs shape people's attitudes, consequent behaviour, and food choices. Eating norms are followed because they provide information about safe foods and facilitate food sharing. Norms are a powerful influence on behaviour because following (or not following) them is associated with social judgements. Social norms may affect food choice and intake by altering self-perceptions and/or by altering the sensory/hedonic evaluation of foods. For example, the Borana and Gabbra derive their foods almost entirely from their livestock—such as milk, meat, and blood. The meat is primarily from small stock, mostly goats and rarely from cattle or camels. In addition, pregnant women, their husbands, and mothers-in-law believe that certain foods should be avoided during pregnancy, as previously discussed.
- Income and economic status of consumer. Economic decision factors—such as food price and income—influence people's food choices. Food costs are a barrier for low-income families to purchase healthier food. People who change their diet pattern for economic reasons may develop a range of nutritionally related disorders and diseases, from so-called over-nutrition to under-nutrition. In male-headed households, men were responsible for providing money while women made the decisions on the type of food to prepare. In female-headed households, the women provided both the money and made the decision on foods. The differences in purchasing power meant women-headed households had irregular access to foods compared to male-headed households.

Market facilities

Isiolo County

Market facilities are present in major shopping centres within the counties, with the main one being Isiolo Town. Isiolo Town has many market outlets and shops—which include hotels, general shops, retail shops, kiosks, stalls, wholesale shops and supermarkets. In addition, there is also a farmer's market in the town that is designated to sell food from the farms. The county is sufficient in terms of meat and milk production and supply. However, due to frequent drought—which causes seasonality

in production—crops grown in the county are not sufficient to sustain it. The county relies on supplies from other counties—mainly Meru, Laikipia, Samburu and Marsabit. Other major market centres are Merti, Garbatulla, Kinna, Modogashe and Oldonyiro.

Livestock markets

There are modern livestock market facilities in most of the areas, including Isiolo Town, Merti, Kinna and Oldonyiro. Animals traded in Isiolo Town market are cattle, goats, sheep and camels in descending order by numbers. The livestock market in Merti only deals in goats, while the market at Kinna trades in cattle, goats and sheep.

Other markets

Produce markets are not as available as livestock markets. In Isiolo Town, a makeshift market operates throughout the week, although there is a new modern market that is under construction by the county government within the town. Garbatulla also has a modern food produce market that operates every day and sells grains (maize, beans), vegetables (kale, spinach, tomatoes, onions) and fruits (bananas, paw paws, watermelons). The trading centres within the county have shops, kiosks and stalls that sell processed food products and fresh produce, e.g., rice, maize meal, beans, milk, meat, fruits, and vegetables.

Challenges

- Most of the markets lack a water supply, which affects the traders and livestock. Only the Isiolo livestock market had access to permanent water, which they got from the county water supply system. If the county water supply is not available, water is pumped from a borehole that was constructed in the market by USAID.
- During rains, the markets become flooded and muddy, which affects the animals and the traders. Most markets lack modern structures and the few that have them are becoming dilapidated with time. Drought that is experienced in these areas emaciates the animals and in extreme cases results in death of the livestock. This reduces the number and the quality of animals being traded leading to huge losses to the value chain actors. The project could look at ways to support commercial destocking, particularly before the dry season. However, vigorous sensitization campaigns should be conducted within the community since most pastoralists have their livestock for prestige purposes other than commercial purposes.
- There exist few crop markets in the areas**.** The available ones are only found in Isiolo and Garbatulla, which are relatively small and cannot comfortably serve all the traders. This forces many traders in different areas and trading centres to sell either from their homes or in makeshift structures within the centres where they are prone to environmental disasters like wind, sun, rain, and floods.
- Some markets—like the Merti produce market—are situated outside town in an undesirable location, which inhibits access and usage by traders and consumers.
- Most markets are not operational daily, and some have been shut down altogether. These problems can be attributed to the COVID-19 situation and insecurity in the affected areas—like Kinna. These in turn affect the trading within these markets.
- Some buyers and sellers (especially of livestock) collude not to pay cess (tax) to the county government officials**.** This results in reduced revenue for the county. The county government offices responsible for cess should be petitioned to ensure the amount is affordable. The project could also work toward educating and training traders on the benefits of paying cess.

Marsabit County

All livestock markets are managed by the LMA, which also does the revenue collection. Seventy percent of the revenue collected goes to the government while the remaining 30 percent remains with the LMA to help manage the markets.

Livestock markets

Marsabit County has seven livestock markets: Moyale, Merile, Olore, Nabel, Turki, Ileret and Kor. The Moyale and Merile livestock markets are considered the major ones because of the number of animals sold and the number of people they serve. The Moyale market trades between 1,500–3,000 sheep every market day and at least 100 cattle and 100 camels. The Merile market also operates within a similar range.

Illeret and Kor are feeder markets to the Merile and Moyale markets. They trade hundreds of goats and hundreds of camels weekly. The remaining ones—Olore, Nabel and Turki—are occasional markets that do not have a regular schedule.

Other markets

Other foodstuffs are sold in shops, in makeshift stalls or in open grounds within the major trading centres in Marsabit County—which include Marsabit, Moyale, Sololo, Loiyangalani and Laisamis. In these centres, processed foodstuffs—like sugar, wheat flour, cooking oil, grains, vegetables and fruits—are sold.

Challenges

- Some markets do not have toilet facilities and others have inadequate facilities that cannot serve the whole market comfortably**.** For example, in Moyale, a toilet was constructed by the county government but had not yet officially been opened to the public. The newly built toilet facilities had gender distinct stands.
- Lack of enough market facilities to accommodate the traders and the consumers.
- Long distances between Marsabit and the counties from which it imports food stuff. This raises the cost of the goods.

Opportunities

- Undertaking campaigns and promotions to encourage stakeholders to use the existing market facilities. The project could partner with the county governments and other players to develop acceptable market fees and cess charges and development of suitable and affordable storage facilities within the markets to encourage their use.
- Improvement of infrastructure within the operational markets**.** Examples would be water, drainage, and toilets/latrines.
- Make certain proper storage facilities are available within the markets to ensure produce does not spoil.
- Form market linkages between different areas and counties. Merti and Kinna produce surplus vegetables and mangoes respectively but lack markets in which to sell them. This results in produce spoilage and low incomes, as farmers are forced to sell their produce at throw-away prices.

Market use by genders in both counties

Due to the low levels of production, markets are the main sources of foods for households. Most of the wholesale businesses are operated by male while the the retail of milk, fruits and vegetables is

mostly done by women—either in groups or as individuals. The livestock market is also dominated by male traders, but female vendors have opportunities to sell other products, e.g., women traders sell food and fruits at the Merile market. Although the markets are accessible to both male and female consumers, the long distance between markets and households hinders their use by female consumers. Other challenges identified from focus groups include perceived high market prices, unavailability of foods and insecurity. Female-headed households had lower access to foods in the market due to lower incomes compared to male-headed households. Thus, their households consumed some foods (e.g., meat) less frequently compared to male- headed households.

"The prices in the markets are so high and sometimes you can't even find products such as Sukuma wiki (kale)." —Women FGD, Loiyangalani

"Some of the traders who buy fish at the beach in the morning are women. They usually come in groups due to security concerns but now I think security has really improved in the beach areas." —Male FGD, Loiyangalani

"Sometimes you may wake up feeling like eating meat, but you do not have that money; you may see someone passing by carrying the meat, but you cannot afford." —Female FGD, North Horr

"There are times you can order vegetables from Marsabit. You have been told that kale is in the vehicle, so you prepare the ugali then the vehicle breaks down on the way. That means your plans are ruined." —Female FGD, North Horr

Recommendations

Actions to Improve Access to Nutritious Foods

Pastoralism was the main source of livelihood in the area and therefore interventions in the milk and meat value chains would have most benefits in Isiolo and Marsabit counties. Most households consumed meat and/or milk in their daily diets, which are highly nutritious and can be accessed by the communities. On the other hand, fish was plentiful in Lake Turkana and River Ewaso Ng'iro and was a main food for the fisher folk communities. Fish is one of the healthiest foods and has important nutrients—such as protein, vitamin D and omega-3 fatty acids. Thus, interventions in the fish value chain would be key in tackling malnutrition among the fisher folk community along Lake Turkana and River Ewaso Ng'iro.

Interventions in these three value chains could increase consumption and contribute to reducing levels of malnutrition, poverty, and food insecurity.

In targeting food MSMEs, Nawiri should consider:

Business capacity building—provision of technical support services. Technical Assistance support should be tailored to the specific trader given that not all traders are the same and not all face the same challenges. This should include training on bookkeeping and financial management, logistics management, appropriate technology, preservation technologies, business plans and food safety compliance.

Training milk, meat, and fish MSMEs on product handling, processing and/or preservation, packaging, storage, and supply. Provide entrepreneurship skills—such as merchandising, branding, customer care, pricing and displays. Given the roles of women, especially in the supply of milk and retail of fish, capacity building them with these skills would improve their businesses while also providing improved access to nutritious foods at the household level in the counties.

SME capacity building on value addition. Supporting SMEs to process and add value to food products like milk, meat and fish will ensure utilisation of surplus raw products during the rainy seasons and longer shelf life of the food products; it will also enhance market access and supply of food products during the dry season. Value addition would aim to reduce costs on production and make the products affordable by embracing use of local labour and increasing production during rainy seasons. Women cooperatives already successful in aggregating can be capacity built to value-add milk and meat products while fish cooperatives and fish traders can be capacity built to value-add fish products.

BDS access to finance facilities. Since the MSMEs/traders (for milk, meat and fish) have limited or no access to financial support in the form of loans or grants, they should be given this financial support. Giving them a grant will position the business at a level where other partners can finance them. The funds could be used to acquire productive assets—such as transport trucks, processing plants, preservation facilities and equipment. These assets should be acquired through asset financing systems, which also need to be developed. The funds could also be used to support preservation mechanisms for the fish value chain.

SME improvement of appropriate preservation and storage technologies. For improved shelf-life of produce and market-time availability, appropriate food preservation and storage technologies are necessary. Some of the preservation methods already used in the community—such as Nyirinyiri stored in fat, sun-dred fish and meat and fermentation of milk—

would be improved and done large scale. Ghee also has increased shelf life and is mainly made by women in the counties.

MSME establishment of market linkages. Link the MSMEs to both producers and traders to develop long-term business relationships rather than support ad-hoc sales. Producer-to-trader linkages may simply involve working to bulk supplies so that traders' costs may be minimised by reducing the distances travelled to collect the produce.

Proper equipment for MSMEs. The vendors, especially butcheries, could be equipped with electronic weighing scales to facilitate the sale of smaller meat quantities that would allow low-income earners to purchase and consume the meat in small quantities. The food vendors could also be supported with appropriate low-cost storage equipment, and they can be trained on hygienic food handling and public health requirements for food handlers and operators.

SME creation of nutritious food through capacity building the community on nutrition focused topics. The communities need nutrition education with an aspect of SBC. This need is evidenced by the high production and low consumption of fish in Marsabit County. Offering SBC on good nutrition, nutritional values of locally available foods, growing, preparing, processing and consumption would enable them to make informed choices to ensure healthy eating and lifestyles.

Recommendations Specific to the County Governments

- Continuously improve the road conditions in the counties to enable access to sub-counties, especially to malnutrition hot spots. This would aim to address poor road conditions that affect the transportation of foods to rural areas of the counties.
- Improve sustainable access to clean water for households and processers to enhance hygienic handling of food products; improve water harvesting and water collection/water pans. Poor access to water was noted as a challenge to processing and value addition.
- Improve access to solar and electrical energy for production, storage, preservation/processing and alternative energy sources (Biogas, briquettes) for households. These would counter frequent power outages in the counties. Solar energy could also be used during the preservation of milk and meat as well as the drying (solar dryer) of fish.
- County government/Ministry of Education can enhance school feeding programmes using surplus milk produced and explore meat and fish value chains as potentials for additional nutrition.
- Improve security situation in the areas (Laisamis, Loiyangalani and North Horr) to enhance commerce and production.
- Capacity building and availing extension officers to the producers. They can also provide training on rangeland management.
- Promote community participation in the development process with the aim of influencing, challenging, changing, and modifying the situation for the benefit of all community members.
- Identify, train and support nutrition champions (Community Health Volunteers, ECDE teachers) at sub-county levels to advocate for inclusion of nutrition in county government policies. Nawiri can support in training.

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Annex A: MSMEs/Processors, Capacity/Challenges

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
County Posho Mill and Cereals— Isiolo Town	Processing/retail Ugali flour, uji flour and maize for Githeri (removing husks)	Johnson Nyaga	*About/Capacity:* processes up to 50 bags of maize flour when schools are in session; currently does 50kgs of porridge flour, 1 bag per week (removing husks from maize) *Challenges:* power outages, fluctuation of prices of raw materials, discrepancy in quantity ordered and delivered	Interviewed
Isiolo Bakers— Isiolo Town	Processing/wholesale (to shops and hotels) and retailer Wheat products	Japheth Onchana	*About/Capacity:* primarily mandazi and kdf (a type of doughnut); 120 packets each for mandazi and kdf per day; averages the sale of Ksh 600,000 worth of products per month *Challenges:* stiff competition, hot weather (which makes products spoil	
Ansim Ltd— Isiolo Town	Wholesale and retail Chicken (mostly unprocessed but some freezing for specific clients)	Anne Simiyu	*About/Capacity:* mostly does not do value addition; slaughters chicken and sells immediately; only freezes chicken after every two weeks (depending on the ordered amount) *Challenges:* would like to start a baking factory but lacks funds to do so, broken eggs, poor quality of feeds, delivery of weak or dead chicks, delayed orders, high costs	
Tawakal Cooperative Society— Isiolo Town	Wholesale Milk products (currently they have paused due to limited supply of milk)	Amina Hassan	*About/Capacity:* only does processing of milk products when supply of milk is high *Challenges:* inconsistent supply of milk, expensive cost of power, transportation difficulties, i.e., vehicles breaking down	
Hussein Dairies— Isiolo Town	Wholesale and retail Purchase milk from processors and supply to consumers and retailers	Hussein	*About/Capacity* currently supplies 500 litres but has 2 cold-rooms with a combined capacity for 3,000 litres *Challenges:* lack of pasteurizing equipment	
Nyirinyiri Nkulan Group— Isiolo Town	Wholesale and retail Camel meat (Nyirinyiri)	Fatuma Omar Abdi	*About/Capacity* prepares Nyirinyiri from camel meat; sells over 100kgs per week to Nairobi	

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
			Challenges: unhygienic working conditions, lack of protective gear, lack of susitable working premises (works from home where there are a lot of disturbances), wind and dust, lack of training	
Ali Wholesalers— Isiolo Town	Wholesale and retail Sells household, processed foodstuff	Ali Kheir	*About/Capacity* sells 30–50 bags of rice, 50 bales of wheat flour and 50 bales of maize flour weekly; also sells to retailers from Marsabit and Samburu counties, who retailers come for the products *Challenges:* low sales while goods might be on credit, rent, county government cess, heat, rain getting into the business premises	
Classic Foods— Isiolo Town	Milk products	Mr. Wachira	*About/Capacity:* 30,000 litres of milk per day *Challenges:* not operational at the time of the study	PARS did not conduct interviews with these MSMEs. All information here was gotten from LMS (Livestock Market Systems)
Afro Natural— Isiolo Town	Milk products	Hassan Abdi	*About/Capacity:* 10,000-25,000 litres of milk per day	
Northern Meats Products— Isiolo Town	Camel sausages	Ibrahim	*About/Capacity:* 20–50kgs of sausages per week	
Invems Agencies Ltd— Isiolo Town	Poultry and milk	Agnes	*About/Capacity:* 3,500 eggs per day; 25 litres of milk per day; has exotic cows	
Nkamathi Ltd— Isiolo Town	Poultry	Lydia	*About/Capacity:* 1,500 eggs per day	
Nyirinyiri Women Group— Isiolo Town	Camel meat	Rehema	*About/Capacity:* 80kgs of Nyirinyiri per day	
BDD— Isiolo Town	Aggregation and feed lots	Yusuf	*About/Capacity:* have at least 100 animals at any one time	
Taboto— Isiolo Town	Aggregation and feed lots for cattle	Abduba	*About/Capacity:* located in Garbatulla; have more than 50 animals at any given time	
Four Silver Transporters/GANNA Stores— Merti	Wholesale and retail, has several stores Cereals (maize and beans), maize and wheat flour, uji flour, rice (local and exported), milk, fruits and vegetables	Abdullahi Kubundu	*About/Capacity:* both in retail and wholesale of food products *Challenges:* lack of storage machine for milk and perishable products like onions, tomatoes and milk	Interviewed

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
Junda's Butchery— Garbra Tulla	Retail Supply of meat	Abdi Kadir Hassan	*About/Capacity:* On average sells over 100kgs weekly *Challenges:* lack of freezer to store meat and a weighing machine to sell meat in smaller quantities, which would increase the consumption of meat in the area	Interviewed
KINISA Cultural Group— Garbra Tulla	Retail Production/supply of sukumawiki (Kale), maize, Ndengu (mung bean), sweet potatoes, watermelon, beans, tomatoes	Hallo Huka Salad	*About/Capacity:* for sale and personal consumption; they cannot quantify because they usually start consuming even before harvesting; the group grows tomatoes, onions and green grams using drip irrigation *Challenges:* lack of quality seed, which is resistant to the area, lack of training of farming methods (agricultural specialists in the area)	Interviewed
MADOS Investment— North Horr	Wholesale and retail Processed maize flour, wheat flour, rice, milk, beans, maize and other foodstuffs	Guyo Galgalo Ali	*About/Capacity* has 3 shops and one main store; supplies to more than 20 retailers and the community within North Horr sub-sounty; has satellite and mobile supply chains within the foras (grazing zones); owns a truck for sourcing of food stuffs from Meru and Isiolo; employs over 20 staff; distributes 70 bundles of maize flour, 70 bags of rice, 50 bags of maize and 30 bags of beans a week *Challenges:* has good logistical arrangements but has challenges doing bookkeeping over a period longer than a year; has limited capital to supply further; lacks adequate refrigeration equipment for milk; poor/technical arrangement of products in the store	Interviewed
ARANO DC Ltd— North Horr	Wholesale and retail Processed maize flour, wheat flour, rice, milk, beans, maize and other foodstuffs	Abduba Arano	*About/Capacity* has one wholesale shop and one mini supermarket and supplies over 100 retailers; sources food products from Nairobi, Isiolo, Moyale and Meru; using a business-owned lorry *Challenges:* fluctuating prices, cost of transporting food to the deeper parts of the county, inadequate storage capacity. Has the potential to process and supply camel milk through ATMs but lack the technical and financial capacity	Interviewed
Robe Butcheries— North Horr	Wholesale and retail Goat, cow and camel meat	Robe Galgalo	*About/Capacity* owns a butchery that supplies at least a goat a day, which is generally finished before noon; owns the only 20-liter freezer among meat suppliers in the area, allowing others to store their meat there *Challenges:* has the potential to supply more but lacks manpower and capital and the distance for sourcing livestock is very long, especially during the dry season	Interviewed

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
Duba Diba— North Horr	Retail Goat, cow and camel meat	Duba Diba	*About/Capacity:* goat meat supplier who purchases goat at about KES 3,500; slaughters and sells for about KES 5,500 daily *Challenges:* bookkeeping, as records for previous week are unavailable, unable to track profits and costs, lack refrigerators, thus limiting him to 1 goat per day	Interviewed
Loiyangalani Fisher Folk's Cooperative— Loiyangalani	Production/processing, wholesale/retail Fish and fish products	Kara Naftali, Chairman	*About/Capacity:* comprised of all fisher folks in Loiyangalani; produces fish and processes it into fillets and dries to transport to other areas; sometimes sell aggregated fish and other times independently *Challenges:* lack of cold rooms, poor sensitization of fish products in the community, unstable market, transportation costs, no cold chain trucks. Lacks refrigeration equipment, no electricity—only solar power (a factory is being set up by the county government but not yet operational). Selling is done in pieces as opposed to Kgs; thus, sensitization is required	Interviewed
Doris, vendor— Laisamis	Retail Processed maize flour, wheat flour, rice, milk, cereals, vegetables and fruits	Doris Kiende	*About/Capacity* supplies the community, especially consumers from the Manyattas; has been involved in community change of attitude towards certain foods *Challenges:* financial capacity to supply food within Manyattas and foras. Inadequate transport for sourcing and supply of food products. Has the potential to change perception of the community in terms of foods consumed.	Interviewed
Kara, vendor— Loiyangalani	Processing of fish to fillet and then drying Wholesale and retail of fish	Kara Naftali	*About/Capacity* engages in the production, processing, and supply of fish in Loiyangalani and Marsabit Counties; has the capacity to produce and supply over 1,000 pieces a day *Challenges:* inadequate boats for production. Only two solar powered 200-liter freezers available for storage of fresh fish and fillet, meaning most of the fish must sell in dried form (fresh sells for more). Lack of cold rooms, lack of cold chain transport trucks, poor market links and poor consumption levels, especially among the pastoralist community	Interviewed
Digital Wholesalers— Loiyangalani	Wholesale and retail Processed maize flour, wheat flour, rice, milk, beans, maize, spaghetti, macaroni and others	Mohamed Hussein Ali	*About/Capacity:* biggest supplier in Loiyangalani; supplies within Loiyangalani and surrounding villages such as El Molo; sources produce from Marsabit Town, Isiolo and Meru; owns a bus and uses it to transport food products *Challenges:* transport cost is high, storage is difficult as the area relies on solar power, lack of refrigerators for milk, capital to supply even further into the manyattas	Interviewed

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
Al Habib Center—Laisamis	Wholesale and retail Food products such as maize flour, wheat flour, rice, milk, beans, maize		*About/Capacity:* one of the two main wholesalers in Laisamis; sources food from Nairobi, Meru and distributes to both consumers and retailers *Challenges:* transport costs, price fluctuations, spoiled goods due to high temperatures, capital for purchasing supplies, reliable hired transport	Interviewed
Al Bashir Supplies—Laisamis	Wholesale and retail Food products such as maize flour, wheat flour, rice, milk, beans, maize		*About/Capacity:* the other big food supplier in Laisamis; mainly sources supply from Isiolo and Nairobi; has adequate storage facility but insufficient refrigeration equipment; has manpower readily available and the potential to distribute larger volumes of food products Challenge: capital	Interviewed
Producer/Supplier—Marsabit Town	Producer/wholesale and retail Maize, beans, green grams (each 1–2 acres), avocado, mangoes, pawpaw, passion fruits	Philip Kapana	*About/Capacity:* Pumps water for irrigation and therefore able to produce when there are no rains; supplies Moyale, Marsabit and Ethiopian markets; does grafts of the seedlings and sells *Challenges:* an overage of mangoes and papaws produced during the rainy season go to waste because that is when the demand is low; lack of knowledge on preservation or value addition	Interviewed
Shudaa Market Butcheries—Moyale	Retail Cow, goat and camel meat	Shuga Chude	*About/Capacity:* meat suppliers are located in one place (privately owned); they buy the animals to slaughter (cows, goat and camel) from Karare, Laisamis and Chalbi then market and slaughter them at the slaughterhouse located in Marsabit Town, which is privately owned; currently one cow/goat is sold for a day or two; they have the potential to supply more if the market expands *Challenges:* expensive slaughterhouses, which are privately owned (to house: 400 per cow/camel, 200 per goat; to service: 400 per cow/camel, 200 per goat); no storage facility, so they rely on hanging the remaining meat and selling the following day	Interviewed
Milk seller—Marsabit Town	Retail Milk	Jennifer Lesukat	*About/Capacity:* she sells milk to her neighbours, other villagers and packs them in small bottles after boiling to be transported to Marsabit town for sell and to other customers who make daily order of milk for hotel use *Challenges:* lack of storage facilities; no shop	Interviewed
Songa Women Group (now known as MT	Processors/retail Ghee, mala, honey	Mary Lenene	*About/Capacity:* during the rainy season they buy 60–80 litres of milk but when milk is scarce, they buy 20 litres; from every 20 litres of milk, they get 5.5 litre ghee, which they sell at 350 per a half a litre; they also make mala from	Interviewed

Company/ Location	Product Processed/ Distributed	Owner/ Manager	About/Capacity/Challenges	Status
Marsabit Cooperative Ltd— Marsabit Town			the milk, which they sell at 60 shillings per litre; they have a machine to do the processing and a refrigerator for storage; the group is also involved in beekeeping, harvesting around 20 litres of honey, which they sell at 500 per litre; they plant and sell seedlings (fruits, flowers, trees, etc.) in their 3 greenhouses; the group has potential to grow and have tried making yogurt but have difficultly acquiring the necessary culture chemical used to make it *Challenges:* lack knowledge on recordkeeping and hygiene; poor infrastructure	
Moyale Camel Factory—Moyale			*About/Capacity:* under construction	Were mentioned during a KII with production manager-livestock department in Moyale
Sororo Milk Processing Plant—Marsabit			*About/Capacity:* has been operational since 2015 but is currently closed due to leadership issues	
Moyale Camel Milk Cooperative Ltd— Moyale Town			*About/Capacity:* they process and market camel milk with the capacity to process 700 litres of camel milk per day	
Karare Women's Group—Marsabit	Processors/retail Milk, ghee, yoghurt		*About/Capacity:* they process milk small-scale to get ghee and yoghurt; they also sell fresh milk	

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