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Desk Study Report

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

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Acronyms And Abbreviations

ADESO	-	African Development Solutions
ADS	-	Anglican Development Services
ASAL	-	Arid and Semi-Arid Lands
ASDSP	-	Agricultural Sector Development Support Programme
CFA	-	Cash for Assets
CIDP	-	County Integrated Development Plan
CRS	-	Catholic Relief Services
DFSA	-	Development Food Security Activity
FAO	-	Food and Agriculture Organization
FEWSNT	-	Famine Early Warning Systems Network
FFA	-	Food Assistance for Assets
FFP	-	Food for Peace
GAIN	-	Global Alliance for Improved Nutrition
GDP	-	Gross Domestic Product
GoK	-	Government of Kenya
HDDS	-	Household Dietary Diversity Score
HDI	-	National Human Development (HDI)
IF	-	Implementation Framework
IFAS	-	Iron and Folic Acid Supplementation
JKUAT	-	Jomo Kenyatta University of Agriculture and Technology
KALRO	-	Kenya Agricultural and Livestock Research Organization
KNBS	-	Kenya National Bureau of Statistics
KRC	-	Kenya Red Cross
KSh	-	Kenya Shillings
LAPSST	-	Lamu Port - South Sudan - Ethiopia Transport Corridor
MoALF	-	Ministry of Agriculture, Livestock and Fisheries
MoH	-	Ministry of Health
MUAC	-	Mid-Upper Arm Circumference
NFNSP		National Food and Nutrition Security Policy
NAWIRI	-	Nutrition in ASALs within Integrated Resilience Institutions
NDMA	-	National Drought Management Authority
NGOs	-	Non-Governmental Organizations
NNL	-	Nutritious Nomads Limited
NMK	-	National Museums of Kenya
NSVC	-	Nutrition Sensitive Value Chain
PPP	-	Public-Private Partnership
RAPID	-	Resilient Arid Land Partnership for Integrated Development
REGAL-AG	-	Resilience and Economic Growth in Arid Lands - Accelerated Growth
REGAL-IR	-	Resilience and Economic Growth in Arid Lands - Improving Resilience
RPLRP	-	Regional Pastoral Livelihoods Resilience Project

SACCO	-	Savings and Credit Co-Operative
SNV	-	Netherlands Development Organization
UoN	-	University of Nairobi
USAID	-	United States Agency for International Development
VC	-	Value Chain
VSF-Suisse	-	Vétérinaires Sans Frontières Suisse
VSLAs	-	Village Savings and Loans Associations
WEF	-	Women Enterprise Fund
WFP	-	World Food Programme

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Executive Summary

Background

The Arid and Semi-Arid Lands (ASALs) of Kenya experience the highest rates of food insecurity. This is due to highly unpredictable rainfall and frequent droughts that undermine livestock and crop productivity, as well as a general lack of basic amenities and services that underlie the historic marginalization of these areas. Undernourishment is prevalent in the ASALs, with micronutrient deficiencies being exhibited in vitamin A deficiency and iron-deficiency anemia, especially among vulnerable children and women of childbearing age. Nutritional trends show that 13.9% and 21.1% of children under the age of 5 in Isiolo and Marsabit counties, respectively, are stunted because of chronic undernourishment (Gok, 2019c, 2019d).

The 2019 SMART Surveys show that wasting stands at 9.2% and 18% in Isiolo and Marsabit, respectively, and the incidence of underweight (low weight for age) is 13.6% in Isiolo and 23.1% in Marsabit (GoK, 2019c, 2019d). These figures reflect conditions of chronic and acute undernutrition in the two counties. The Nawiri program aims to reduce levels of acute malnutrition among vulnerable populations in the Isiolo and Marsabit counties of Kenya. To inform this work, the Global Alliance for Improved Nutrition (GAIN), the partner on the consortium leading the market and food systems working alongside other partners on the CRS-led Nawiri consortium, commissioned this desk review to understand the functionality of local market systems and the implications for acute malnutrition patterns in Isiolo and Marsabit, and ways to leverage the private sector to improve the availability, accessibility, affordability and acceptability of nutritious foods in these areas.

Study Objectives and Methodological Approach

The desk review sought to answer two main research questions:

i. What are the major food commodities sold and purchased in Isiolo and Marsabit counties that have the potential to help address acute malnutrition?

ii. What is the capacity of the acutely malnourished populations in Isiolo and Marsabit to reach and benefit from the food value chains?

The study was undertaken through a literature review complemented with a few key informant interviews through telephone calls and emailed question guides. A market-based systems approach was used as an analytical framework to identify and address the underlying constraints in market transactions, their supporting functions and the institutional environment in which markets operate—and which prevent markets from delivering desired nutritional outcomes.

Food Commodity Markets Supplying Marsabit and Isiolo Counties

Marsabit and Isiolo counties are served by the north-central market corridor, which presents food commodity flow from Nairobi food markets to Isiolo through Meru and from Nakuru to Isiolo, Samburu to Marsabit and Moyale, and the flow of mainly processed food from the Ethiopian side of the Moyale border back to Marsabit town. Four source markets identified include: i) Nairobi (Wakulima, Nyamakima markets and Eastleigh); ii) hub markets located in food producing areas in the central region (Meru, Narumoru, Nanyuki, Nyahururu, Nakuru; iii) main markets in Isiolo and Marsabit towns that redistribute food from main markets; and iv) remote markets that are supplied from main markets. In Isiolo, there are 13 tertiary markets besides the main markets in Isiolo town, while in Marsabit there are two main tertiary markets in addition to the main markets in Marsabit and Moyale towns.

Food Commodities and Price Fluctuations

Four key food commodities identified along the north-central corridor were: i) dry grains, cereals and pulses; ii) fruits and vegetables; iii) processed food (rice, sugar, maize meal, wheat flour, pasta, etc.); and iv) livestock and livestock products (meat and milk, eggs, chicken). The main food products in household food baskets in Marsabit and Isiolo counties include maize, rice, wheat, beans, cooking oil, sugar, and pasta, with some occasional meat. The supply of milk and vegetables is highly seasonal, making them less available and more expensive during the dry seasons. Milk, which forms a major part of pastoralists' diets, is abundant during the short rains in October, November, and December (OND) and the long rains in March, April and May (MAM). The volatility of food prices is also influenced by the season, and prices increase with the distance of tertiary markets from hub markets in food producing areas. Transportation costs and transaction costs are passed on to consumers, making food less affordable in remote markets.

Capacity of Vulnerable Populations to Access Nutritious Foods

The ability of households to access food depends on the four following factors:

Availability: Food availability in the local markets in Isiolo and Marsabit is highly seasonal and heavily dependent on transport conditions. Earth surface roads become impassable during the rains, making food supply a challenge.

Accessibility: Most households in the ASALs must travel between 30km and 80km to reach critical food markets. The tertiary markets in Isiolo and Marsabit counties are far apart and not well-integrated with the main county markets.

Affordability: The majority of the households in Isiolo and Marsabit counties are poor. Vulnerable food consumers, even if they recognize the benefits of nutritious foods, are frequently unable to afford them. However, there is a data gap, making it difficult to quantify the cost of a nutritious diet for a typical household and therefore to estimate the level of income needed to close the affordability gap and enable households to purchase nutritious foods.

Acceptability and Appropriateness: Available reports show that households in Isiolo and Marsabit mostly prefer cereals (e.g., white maize and rice), partly because they may be unaware of the health and nutritional benefits of other foods, or how they are prepared, or because their preferences are dictated by cultural norms. Isiolo and Marsabit counties are inhabited by pastoralist communities that still practice various aspects of their culture, religion, and beliefs with a possible influence on food habits and negative impacts on the nutrition of pregnant women and children under age 5. For instance, the study found that among the Borana Community that inhabits both Isiolo and Marsabit counties, it is a taboo for women who have just given birth to consume liver, fish and milk, and the best part of meat is traditionally preserved for the men.

Challenges in Addressing Malnutrition in Isiolo and Marsabit Counties

- Climate variability: Unreliable rainfall and frequent droughts make supplies of foodstuffs scarce, seasonal, and expensive.
- Poverty/low income: Most of the food consumed in Isiolo and Marsabit is purchased from the market. Because the majority of these households are poor, access to nutritious foods is a challenge.
- Poor market access: Poor rural road infrastructure limits food commodity trade and access by vulnerable households.

- Distance from the herd: During the dry season, when food supplies are at their ebb, mothers and children are often separated from their husbands and the herd by a considerable distance. This means that families have no access to milk, and often no access to finance, because the men are away with the animals.
- Post-harvest losses: Losses as high as 55% have been reported in key animal and crop commodities value chains in Marsabit County due to the lack of post-harvest handling and storage. In Isiolo County, lack of adequate storage or value addition facilities (e.g., abattoirs) has led to post-harvest losses due to perishable products, especially meat and milk.
- Lack of capacity by producers and poor extension services: Entrepreneurship and skills in value addition and marketing are low; therefore, the economic value of food commodities is never fully exploited.
- Poor hygiene and food safety risks: Consumers are exposed to health threats because of the unhygienic handling of meat and milk drug residues that find their way into the meat and milk served to humans.
- Lack of market information: Limits traders' decisions, therefore affecting the supply of essential food commodities—resulting in brokers' dominance and high transaction costs and consumer prices.
- Limited value addition/processing: Foods such as milk and meat are rarely processed for longer storage, implying that producers and traders don't understand the full economic value of food products.
- Social security networks (SSN): Less effective traditional social/kinship alliances make poor or deprived households vulnerable to food insecurity and malnutrition.
- Lack of collective action: Unregistered groups cannot access financial services, and benefit from reduced transactional costs, due to economies of scale, leading to high consumer prices.
- Awareness and education: Poor households may lack the knowledge to make informed food choices and will naturally opt for familiar foods unless they are made aware of nutritious alternatives.
- Lack of credit services: Most financial institutions avoid the ASALs due to high operational costs, while Muslim pastoralists are often reluctant to seek financial services from non-sharia[1] compliant financial institutions.
- Conflicts and insecurity: Conflicts and insecurity restrict herd movements and access to critical pasture and water resources, and important food markets.
- Gender and social disparities in accessing nutritious foods: Gender bias in accessing productive resources and income control among pastoralist communities make female- and child-headed households more vulnerable to food and nutrition insecurity than their male-headed household counterparts. The presence of a husband sometimes decreases household access to milk and the ability to sell it. While a woman has the right to sell milk (and keep the proceeds) it is the husband who decides which animals stay near the town/market where she can sell the milk. He may keep the livestock away from the town/market or household to maximize herd productivity and to allow calves, rather than household members, use the milk. Several interventions are suggested to address these challenges,

[1] *Sharia* is the Islamic law; therefore "non-Sharia compliant financial institutions" are those that do not follow the fundamental religious concept of Islam.

including strengthening local organizations; investing in infrastructure; partnerships with existing initiatives; increasing the productivity of food systems; sustaining nutrition and resilience in households; and effective knowledge creation and communication for improved nutrition across priority value chains.

Suggested Interventions by Value Chain

From this desk review, the key interventions recommended for programming include the following:

i) Camel Milk Value Chain

As highlighted in the current Isiolo and Marsabit county integrated development plans (CIDPs), camel milk is one of the most strategic value chains. Camel milk is a major source of food security and income for their populations and holds a significant cultural value. The product contributes up to 50% of the total household nutrient intake and 30% of the annual caloric intake. The key interventions recommended for programming include the following:

Interventions to strengthen local organizations.

- Avenues should be considered to support the creation of an umbrella organization targeting existing income-generating women's groups to benefit from economies of scale and sharia-compliant financial credit.
- Strengthen the existing groups/cooperatives through further training on financial management and good hygiene practices including milking and post-harvest handling.
- Link the groups with various niche markets and stimulate local markets by supporting the establishment of camel milk bars. Package milk in smaller and affordable quantities for vulnerable households.

Interventions to increase infrastructural investment.

- Provision funds for the expansion of operations by equipping the bulking and cooling hubs through co-investing in refrigerated transport and cooling facilities in Isiolo town to reduce trader's post-harvest losses.
- Train milk producers and milk traders on how to start a value-added dairy by producing yogurt and cheese.
- Processing/preserving milk in powder form to address the deficit during the dry season and droughts.

Interventions to reinforce messages on improved nutrition and effective knowledge creation and communication.

- Behavior Change Communication (BCC) through awareness creation and education on the health and nutrition benefits of camel milk to ensure a critical mass of vulnerable populations embrace its consumption.

ii) Goat Meat Value Chain

The pastoral meat sector, especially goat, makes a significant economic contribution to Isiolo and Marsabit counties. Goats have short-generation intervals and are able to adapt to harsh conditions. They play a seminal role in the food security and income of pastoral households. About 75% of the county's households keep goats. The key interventions recommended for programming include the following:

Interventions to strengthen local organizations.

- Strengthen existing women's groups through further training on entrepreneurship and good hygiene practice and leverage the existing capacity on upgrading of the preservation techniques initiated by the University of Nairobi (UoN), the National Museums of Kenya (NMK) and the Jomo Kenyatta University of Agriculture and Technology (JKUAT).
- Support the groups to scale up their operations by making full use of the capacity of the solar tunnel driers installed by UoN in Isiolo.

Interventions to increase the productivity of food systems.

- Support women's groups through training and startup funds to process and brand quality products that can reach wider markets.

Interventions to reduce storage and post-harvest losses through improved techniques and practices.

- Establish *nyir* retail/outlet shops in Isiolo and Marsabit counties to stimulate the local market as a way to market the product and link the groups with various niche markets outside Isiolo and Marsabit.
- Package meat in smaller and affordable quantities for vulnerable households.

Interventions to increase cash income for the targeted groups.

- Support existing income-generating women's groups involved in purchasing, raising (fattening) and selling goats with funds to expand their businesses.
- Link goat marketing groups to emerging small stock markets beyond their locality for better income, such as Neema Slaughterhouse in Nairobi.

iii) Kale and Tomato Value Chains

Largely practiced by agropastoral populations, especially women, where rainfall can support crop growth and under smallholder irrigation along various rivers. The key interventions recommended for programming include the following:

Interventions to increase infrastructural investment.

- Leverage past initiatives, including rehabilitating irrigation infrastructure such as water inlets and canals, and strengthening water management committees for their sustainable management in micro-irrigation schemes in Burat Ward, Gafarsa, Malkadaka and Kinna in Isiolo.
- Support traders by providing makeshift stalls, especially in livestock markets, as a way to reach local markets.
- Strengthen extension services and link producers to lucrative markets in urban centers.

Interventions to strengthen local organizations.

- Formalize producer groups through registration to enable them to enjoy economies of scale and access financial services to expand their operations.

Interventions to support improved efficiency in the processing and preservation of food products.

- Promote the value addition of crops like tomatoes by, for example, drying them using the existing solar tunnel driers in Isiolo, making tomato paste, and branding tomato products and marketing them beyond the two counties.

iv) Fish Value Chain

The key interventions recommended for programming include the following:

Interventions to create partnerships with existing initiatives.

- Implement private-public partnerships (PPP) with county government, the private sector, beach management units (BMUs) and cooperatives, etc., to expand existing fish-handling structures and cold storage facilities at fish landing sites.
- Link fisherfolk with financial intermediaries for access to finance affordable credit facilities to facilitate investment in fishing gear.

Interventions to strengthen local organizations.

- Strengthen the existing groups/cooperatives through capacity building on fish processing, quality standards and the hygienic handling of fish and fish products.

Interventions to reinforce messages and effective knowledge creation and communication on improved nutrition.

- Nutrition communication campaigns on nutritional benefits and preparation of fish meal to promote its consumption among pastoralist communities.

Potential Private Investors and Other Possible Partners

Value Chain	Potential Partners
Camel Milk Value Chain	• Kenya Camel Association (KCA) has been involved in the development of the camel subsector through enhanced service delivery across the camel value chain, including value addition, knowledge management and sharing, and lobby and advocacy. KCA is currently partnering with the University of Nairobi, as well as Egerton University, on separate projects in camel milk value chains in Isiolo and Marsabit, respectively. • Anolei, Defee and Tawakal women's groups, which are involved in camel milk processing in Isiolo town. • Korkora Milk Processing Ltd., which processes camel milk in Saku and Marsabit county, and Afro Naturals camel milk processing company in Isiolo (currently closed due to noncompliance with NEMA requirements).
Goat Meat Value Chain	• The University of Nairobi, National Museums of Kenya and Jomo Kenyatta University of Agriculture and Technology previously worked with women's groups on meat product development, differentiation and branding. This provides opportunities for further research on product development, quality and market performance, as well as a nutritional

	analysis of the meat products under different drying conditions to inform the modification of the solar tunnel drier.
Kale & Tomato Value Chain	• AMIRAN Kenya limited has several drip irrigation packages tailored to farmers' needs and scale of operations and offers extension services for clients. • Syngenta Kenya supplies vegetable seeds, agrochemicals and follow up to provide extension services to clients. • NDMA and ActionAid, through the Ministry of Agriculture, Livestock and Fisheries of Isiolo County, are possible partners, particularly with respect to their previous joint micro-irrigation interventions.
Fish Value Chain	• The beach management units at Lake Turkana. • Fish marketing cooperatives in Marsabit. • The county governments of Isiolo and Marsabit. • The Kenya Marine and Fisheries Research Institute (KMFRI), Lake Turkana Research station. KMFRI has been conducting research and building capacity of the fisherfolk in Lake Turkana on post-harvest losses reduction.

Key findings

- Major food commodities with the potential to help address acute malnutrition, purchased, and consumed by the majority of households in Marsabit and Isiolo counties, are comprised of cereals and pulses. These include maize, rice, wheat, beans, cooking oil and sugar and pasta, with some occasional meat. Most of the food commodities consumed by households originate from other counties and Ethiopia, where production costs are lower.
- Seasonal fluctuations in food supply and price spikes are barriers to gaining access and availability to food, with dry seasons the lean months.
- Poor roads and long distances between producing areas and consumer markets in Isiolo and Marsabit counties are a barrier to gaining physical access to food. Food prices in the two counties are relatively higher than those in neighboring counties.
- A nutrient-poor diet, and consequent poor nutritional status, is likely to be heavily driven by multiple factors such as poverty due to a considerable affordability gap; poor market access due to bad roads; post-harvest losses; and the limited value addition of food commodities such as drying foods like vegetables and meat, which help increase the availability of food during the dry season, during which prices are highest.

Recommendations

- Interventions to increase cash income to empower household access to nutritious diets. Current income and available food commodities are not sufficient for a household to access a nutritious diet. Avenues should be explored to allow households to increase their means of accessing nutritious foods offered for sale in the markets by enhancing household incomes to increase purchasing power.
- Livelihood interventions, such as engaging in IGAs such as poultry production by supplying households with chickens for increased egg consumption, could increase household incomes and egg supplies and, therefore, improve affordability. Target women to ensure the income from such activities is directed towards meeting the family's food and nutritional needs, but also target youth, people with disabilities and men to ensure equity, social order, and harmony.

- Promote the increased consumption of legumes and kale across the counties, targeting all age groups. These foods play a significant role in meeting nutrient requirements.
- Encourage households to stock up on pulses (dried legumes) ahead of the lean seasons. These products are easier to transport than fresh food products, have a long shelf life and are widely consumed and accepted. They are also affordable and increase access to nutrients.
- Drying foods, such as vegetables and meat, can be used to increase the availability of food during the dry season, when prices are highest. Drying foods can be a means for households to preserve foods during seasons of relative abundance and to prepare for the lean (dry) seasons using methods such as solar drying. Nonetheless, potential storing solutions should be investigated further. The transportation of dried goods can potentially be more economical and efficient and may increase the availability of key nutrients at a low cost across the zone.
- Use local FM radio stations and schools to promote social behavior change and promote the consumption of nutritious foods. Consider using nutrition champions/ambassadors in each ward.
- Nawiri should seek synergy with the Agricultural Sector Development Support Programme (ASDSP II) in Isiolo and Marsabit counties that is working to increase the productivity of priority value chains; strengthen entrepreneurial skills of priority value chain actors; improve access to markets by value chain actors; and strengthen structures and capacities for collaboration.

Further Research

- Mapping malnutrition hotspots to guide targeting for interventions.
- In-depth analysis of private actors in the food market system to understand their roles, influence and challenges faced.
- Analysis of gender and social disparities in accessibility, affordability, and acceptability of nutritious foods in Isiolo and Marsabit.
- Determination of consumer food preferences (consumption of selected nutritious foods) and factors that determine food choices among vulnerable populations. Identify cultural barriers to the consumption of nutritious foods by different communities, and to what extent these can be addressed using BCC.
- Analysis of household food basket; quantities and costs of nutritious foods available in markets by season and locality; awareness of households on nutritious foods; and their willingness to pay for them if offered in markets.
- Determination of impacts of the completed Isiolo-Moyale road on availability, accessibility, and affordability of nutritious foods in Isiolo and Marsabit.
- A study of the market penetration of various food products such as *nyir*, camel milk, fish, etc., in Isiolo and Marsabit.
- Analysis of the fish value chain in Marsabit and Isiolo to understand actors, roles and their influence, entry points for partnership, and barriers and opportunities.
- A study to assess the cost of local main diets for a typical household size targeting various wealth groups (very poor, poor, middle and better-off) is recommended to estimate the additional income that would be required to cover the cost of a food habits nutritious diet and non-food expenditure.

1.0: Introduction

1.1 Arid and Semi-Arid Lands Context

The arid and semi-arid lands (ASALs) of Kenya make up 89% of the country; the arid counties alone cover 70% (FAO, 2017) and are home to 36% of the country's population (GoK, 2017a). ASALs are characterized by low and unpredictable rainfall, and therefore water scarcity, making them more suitable for pastoralism, which is characterized by mobile livestock production as opposed to arable farming. With 24 million hectares of land suitable for livestock production, ASALs are home to 60% of Kenya's livestock, a resource valued at approximately USD 2 billion (WFP, 2013). Despite their enormous contributions to local, national, and regional economies, poverty and livelihood insecurity in the ASALs of Kenya are among the highest in the country (GoK, 2017a). This is mainly due to their vulnerability to natural shocks such as frequent droughts, low adaptive capacity and historical marginalization that denies populations living in ASALs access to basic public goods and services. Isiolo and Marsabit counties are among the 23 counties[2] classified as Arid and Semi-Arid Lands (ASALs), the majority of which are in northern parts of Kenya.

Kenya's ASALs contribute to 70% of the total livestock herd (GoK 2017a), 16% of total milk production, 60% to 70% of the red meat consumed in the country (Davies, 2007) and over 20% to the gross domestic product. Despite their local, national, and regional economic contributions, ASALs experience the highest rates of food insecurity due to unpredictable rainfall and frequent droughts that devastate the system and can lead to the widespread loss of livestock and livelihoods. The situation is exacerbated by conflicts and insecurity, lack of viable alternative economic activities, unsupportive policies and a low investment in public goods that underlies their historical marginalization.

ASALs are characterized by historic underinvestment in both infrastructure and services, leading to weak foundations to support sustainable livelihoods. This is evident in the low budgetary allocation, which undermines the overall production of food in these areas (GoK 2017b). Further, fragile livelihoods with limited support from government and poor access to services have left many households more vulnerable. Poor health services and chronic undernutrition result in unmanageable costs for treatment and related economic losses for households.

1.2: Malnutrition in the Arid and Semi-Arid Lands

Undernourishment and hunger co-exist among many rural populations in the ASALs. Micronutrient deficiencies are common, including vitamin A deficiency and iron-deficiency anemia, which are more common in vulnerable children and women of child-bearing age. High malnutrition and undernutrition rates are generally due to inadequate food intake in the dry seasons, predisposing diseases, ignorance, cultural taboos, and poverty, among others. Nutritional trends reported that SMART surveys (2019) show that 13.9% and 21.1% of children less than five years old, in Isiolo and Marsabit counties respectively, are stunted, indicating chronic undernourishment, which remains a serious county development concern in northern Kenya. Stunting is the result of long-term nutritional deprivation and often results in delayed mental development. The 2019 SMART surveys show that wasting stands at 9.2% and 18% in Isiolo and

[2]They include: Mandera, Garissa, Tana River, Wajir, Isiolo, Turkana, Samburu, Marsabit, Baringo, Laikipia, West Pokot, Kajiado, Narok, Kitui, Makueni, Nyeri (Kieni), Meru (Meru North), Embu (Mbeere), Tharaka Nithi (Tharaka), Kwale, Taita Taveta, Kilifi and Lamu.

Marsabit respectively, and the incidence of underweight (low weight for age) is 13.6% in Isiolo and 23.1% in Marsabit County (GoK, 2019c, 2019d). The proportion of underweight children reflects both conditions of chronic and acute undernutrition and demonstrates the extent of nutritional problems in the two counties. The high rates of malnutrition are linked to (but not solely arising due to) inappropriate feeding practices in the two counties. There are significant regional disparities in nutrition, with those in arid and semi-arid areas showing consistently higher levels of acute malnutrition than other regions.

A review of the Mid-Under Arm Circumference (MUAC) measurements among women show that 5.3% and 10.7% are undernourished in Isiolo and Marsabit, respectively (GoK, 2019c, 2019d). In addition, the data shows that 13.1% and 37.5% of households in Isiolo and Marsabit do not consume iron-rich foods (Table 1).

Table 1: Key Nutrition Indicators in Isiolo and Marsabit

Indicators (2019)	Isiolo	Marsabit
Under age 5 Nutrition Indicators		
● Under age 5 Malnutrition (wasting)	9.20%	18.0%
● Under age 5 underweight	13.60%	23.1%
● Under age 5 stunting	13.90%	21.1%
Maternal Nutrition Indicators		
Maternal Nutrition MUAC - malnourished women (<21cm)	5.3%	10%
Household Dietary Diversity		
Household dietary diversity score (consumed 5 food groups)	59.30%	77.0%
Did **NOT** consume iron rich foods	13.10%	37.5%
Did **NOT** consume vitamin rich foods	15.20%	79.8%
Consumed staples	99%	99%

Source: GoK. 2019c. Integrated Smart Survey Isiolo County. Ministry of Health Kenya and the Isiolo County Government, Republic of Kenya. GoK. 2019d. Integrated Smart Survey Marsabit County. Ministry of Health Kenya and the Marsabit County Government, Republic of Kenya.

Given the multifaceted causes of malnutrition, solutions to this challenge require responses from a variety of sectors. First, there are specific sets of interventions aimed at addressing malnutrition by tackling its immediate causes. Approaches that aim to increase the intake of nutritious food can be effective in the short-term but do not address the underlying causes of malnutrition. Long-term interventions to prevent malnutrition involve effective interventions across sectors including health, gender, social policies, education, water, and sanitation. The food and agriculture sector is particularly vital to providing nutritious food for all, reducing poverty and protecting the environment in the targeted counties.

The National Food and Nutrition Security Policy (NFNSP) Sessional Paper Number 1 of 2012 recognizes food security as a basic human right. The NFNSP has emphasized the promotion of the good nutritional status of Kenyans through multi-sectoral and coordinated interventions that focused on food security, improved nutrition and increased incomes (GoK 2017c). A major impetus for its Implementation Framework (IF) is the need to achieve higher levels of success in improving food and nutrition security. The IF recognizes the significant efforts and range of programs relevant to food and nutrition security that are ongoing or are being planned for implementation within multiple sectors. The aim is to support these initiatives and develop new ones based on identified cross-sectoral gaps. Among the factors underpinning the Implementation Framework is the National Food and Nutrition Security Policy that calls for a multidisciplinary approach at the national and county levels. The envisaged goals are only achievable by having an integrated approach in place with strong coordination mechanisms involving public-private partnerships, inter-ministerial linkages and county and national government synergies.

1.3: USAID Nawiri Program

The USAID Nawiri program is a 5-year initiative which aims to sustainably reduce persistent levels of acute malnutrition among vulnerable populations in Isiolo and Marsabit counties of the arid and semi-arid lands (ASAL) regions of Kenya. The program is funded by the USAID Bureau of Humanitarian Assistance (BHA) under the Resilience Food Security Activity (RFSA) in Kenya. The interventions include those that work with local systems and institutions, including private-sector actors (producers and processors) who support the value chains for milk and meat, as well as supporting the role of the private sector in the local food system more broadly. Its implementation is being done in two phases described as follows:

i. Phase I (1.5–2 years) - Research, test approaches and collaboratively design a context-sensitive, multi-sectoral activity that sustainably reduces persistent acute malnutrition; and
ii. Phase II (3–5 years) - multi-sectoral activity implementation including collaborative learning and adaptation, and local system and institutional strengthening.

In order to inform this work, GAIN, the partner in the consortium leading the market and food systems component, working alongside other partners on the CRS-led Nawiri consortium, commissioned a desk review. The desk review sought to understand the functionality of local market systems; describe local private sector actors; identify the implications of the private sector using market-based solutions to address persistent acute malnutrition rates in the ASALs; and identify practical ways the private sector can be leveraged to improve the availability, accessibility, affordability, and desirability of nutritious foods in these areas.

1.4 Study Objectives and Research Questions

The desk review sought to collate existing information, both published and grey literature, to distill credible applicable and appropriate recommendations for the Nawiri program, including any further research or learning required to inform its programmatic action. The desk review focused on answering two main research questions, as stated below.

i. What are major food commodities sold and purchased in Isiolo and Marsabit counties with the potential to help address acute malnutrition?
ii. What is the capacity of the acutely malnourished populations in Isiolo and Marsabit to benefit from the food value chains?

2.0: Study Approach and Methodology

2.1: Methodological Approach

2.1.1: Review of the Desk Study Report by TIFA Consultants

The desk study originally conducted by the TIFA consultants formed the basis of this review. The study was conducted in 2020 and was undertaken through a literature review of reports by the county governments, national government, NGOs and development agencies, and scientific publications. Four criteria were used to determine the appropriateness of the literature to be reviewed, namely (i) the aim

of the original study; (ii) credibility of the source; (iii) age of publication (majority reviewed, not older than 10 years); and (iv) the appropriateness of the methodology used in the study. Keywords used to search for desk research materials from online sources included nutrition-sensitive value chain, value chain actors, nutrition indicators, child nutrition, private sector, Marsabit, Isiolo, camel, goat, chicken, eggs, fish, kale, green grams, farming, livestock, women, traders, markets and safety nets, farming, and livestock. A critical review of the desk study report was conducted to identify the information gaps using the original scope of work (SOW) as the basis. In addition, the report was synthesized to answer the key research questions and objectives of the assignment as spelled out in the original SOW.

2.1.2: Additional Literature Review

The information gaps formed the basis for an additional literature review undertaken through a web search for relevant literature, including government and non-governmental reports; scientific and technical publications; and other sources of literature. The keywords used to search for online literature included food commodity market; food market systems; food value chain in northern Kenya; food commodity markets in Isiolo and Marsabit; acute malnutrition in northern Kenya; poverty and food security in ASALs; private sector involvement in food commodity market and value chains; farming in northern Kenya; livestock production in Isiolo and Marsabit; and women, traders, markets, and safety nets, among others.

2.1.3: Key Informant Interviews

To complement and validate the information gathered from secondary sources, key informant interviews were conducted using phone calls and emailed question guides. A total of five key informant interviews were conducted: one each from the Ministry of Agriculture, Livestock and Fisheries Development in Isiolo and Marsabit; one from the National Drought Management Authority (NDMA) in Isiolo; one from non-governmental development agency (Mercy Corps) in northern Kenya; and one from a *Deedha*[3] official. The information sought included food commodities sold in local markets, quantities, price dynamics, their sources, market actors, and opportunities and barriers facing the food market system in the two counties. In addition, various private investors and their roles in the food commodity value chains were identified.

2.1.4: Content Analysis

Analysis of the contents of selected literature was done to tease out information relevant to the objectives and research questions of the study. The analysis was based on the predetermined themes corresponding to the main research questions (i.e., market system —food types, quantities, prices, sources, markets and actors, and challenges; opportunities and barriers; capacity of vulnerable groups to benefit from the local food commodity markets; and private sector involvement in the local food markets). Using the synthesis through the collected information, we suggested possible interventions and entry for supporting the private sector to improve the availability, accessibility, affordability, and desirability of nutritious foods in the ASALs. The themes were later paraphrased and reorganized to form the various sections of the report.

[3] *Deedha* is a traditional institution among the Borana pastoralist community. It is made up of a council of elders elected by the community and entrusted with making crucial decisions such as pasture and water management and conflict resolution and is guided by a set of bylaws in enforcement of the set regulations.

2.2 Analytical Framework

2.2.1: Market Systems Framework

A market-based systems approach was used as an analytical framework and as an alternative way of thinking about solutions to the constraints that inhibit markets from supplying nutritious foods to those at the base of the pyramid, as elaborated in Thorpe and Reed (2016). GAIN defines a "nutritious" food as a food that provides beneficial nutrients (e.g., vitamins, major and trace minerals, essential amino acids, essential fatty acids, dietary fiber) and minimizes potentially harmful elements (e.g., antinutrients, quantities of saturated fats and sugars) (GAIN, 2017). A market-based approach widens the boundaries of action beyond a value chain and the business models of chain actors, to consider a much broader range of factors including the institutional environment and the presence or absence of supporting services and infrastructure that also affect outcomes. In this way, the underlying systemic constraints that prevent favorable outcomes can be identified and innovative solutions to redesign the system can be found, which affects how value chains operate but which value chain approaches may fail to reflect. In addition, the market-based approach broadens our understanding of the actors that may have (or acquire) the awareness, incentives, and capabilities to change the way the market system operates. They include small, medium, and micro-businesses, business associations, government, professional and civil society organizations, among others.

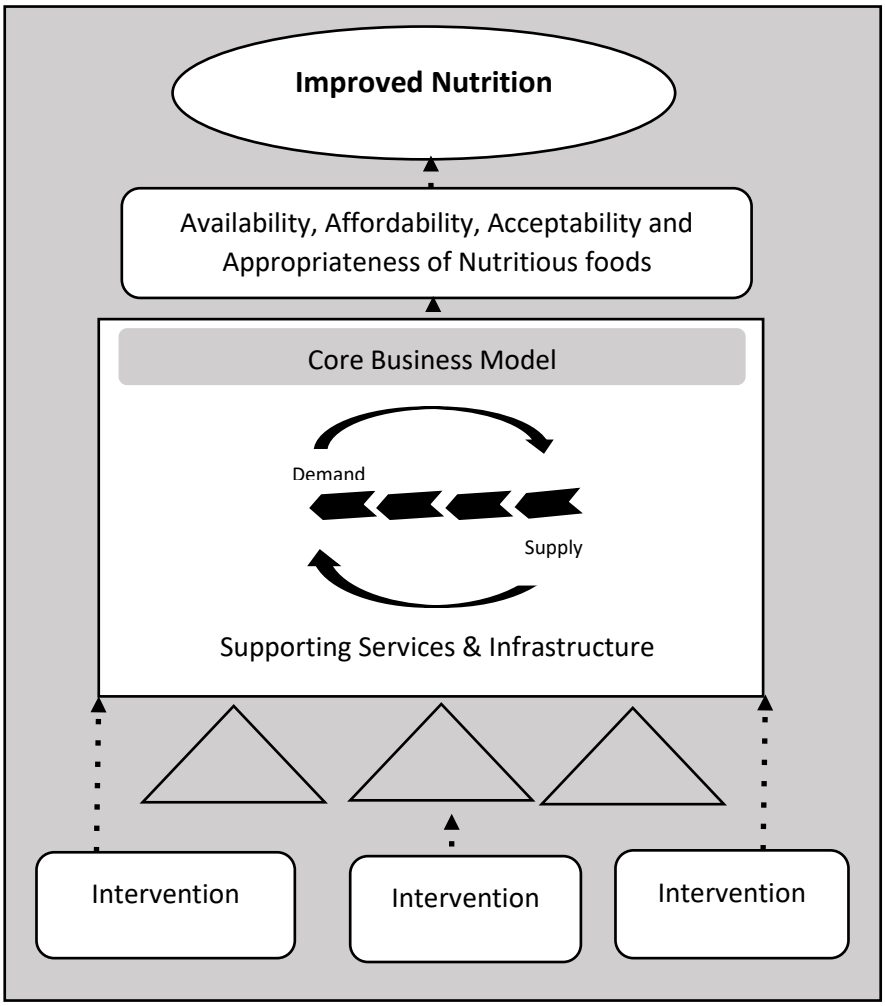

Figure 1: Market Systems Approach (Adopted from Thorpe and Steel, 2016, as based on DFID, 2008)

Unlike a typical value chain approach, the market system we used emphasized affordability, acceptability, availability, and acceptance as key product characteristics to address undernutrition at the base of the pyramid. It helps demystify the dominant logic or assumptions about how markets and households at the base of the pyramid function and allows for identifying and addressing underlying constraints in market transactions, their supporting functions and the institutional environment in which markets operate, and which are preventing markets from delivering desired nutritional outcomes.

Market approaches to nutrition use a theory of change that starts from the desired impact —improved nutrition for the vulnerable household suffering recurrent acute malnutrition, in the case of this study— and works backwards to the underlying market system and the challenges faced in the local food market system. To achieve the desired impact, such as improved nutrition, interventions work through existing markets to improve the way they function in relation to the desired outcome (Figure 1). Application of the market-based system is targeted at the capabilities of system actors to deliver desired nutrition outcomes.

In this study, we found the market-based approach more appropriate since most communities in Isiolo and Marsabit counties access a substantial portion of their food basket from the market and are linked to both the formal and informal sector.

We applied the approach to the challenge of making nutritious foods more accessible for acutely malnourished populations in the ASALs by seeking to understand the food value chains and key product characteristics that determine whether poor households can access nutritious foods in the wider market context. Further, the approach was used to identify opportunities for improving availability, accessibility, affordability, and acceptability of nutritious foods to the vulnerable populations, in partnership with the private sector and other local actors in food systems in Isiolo and Marsabit counties.

2.3: Study Limitations

The main limitations of the study are typical of a desk study, and mainly related to the scarcity, incompleteness, and variance of secondary data, especially for the ASALs. Details concerning some aspects of the study may be incomplete due to general data gaps, partly owing to the variance in the objectives and methodology of previous studies and reports. Specifically, there was limited consumer information; scarce information on crop production as compared to livestock production in Isiolo and Marsabit counties; and lastly, commodity prices for livestock and crops are based on published information and could have changed as some publications are old. Where possible, such gaps were filled by requesting reports from relevant institutions, government, and non-governmental agencies, as well as conducting key informant interviews with personnel from such agencies.

2.4: Study Areas

2.4.1: Marsabit County

Marsabit County falls within the arid and semi-arid lands of Kenya that area largely classified as a dryland. The county, with a total area of 70,961.2 sq. km, is in the extreme end of northern Kenya and lies between latitude 02° 45 ° North and 04 ° 27 ° North and longitude 37 ° 57 ° East and 39 ° 21 ° East. It shares an international boundary with Ethiopia to the north, borders Lake Turkana to the west, Samburu County to the south and Wajir and Isiolo counties to the east (Figure 2) (GoK, 2018).

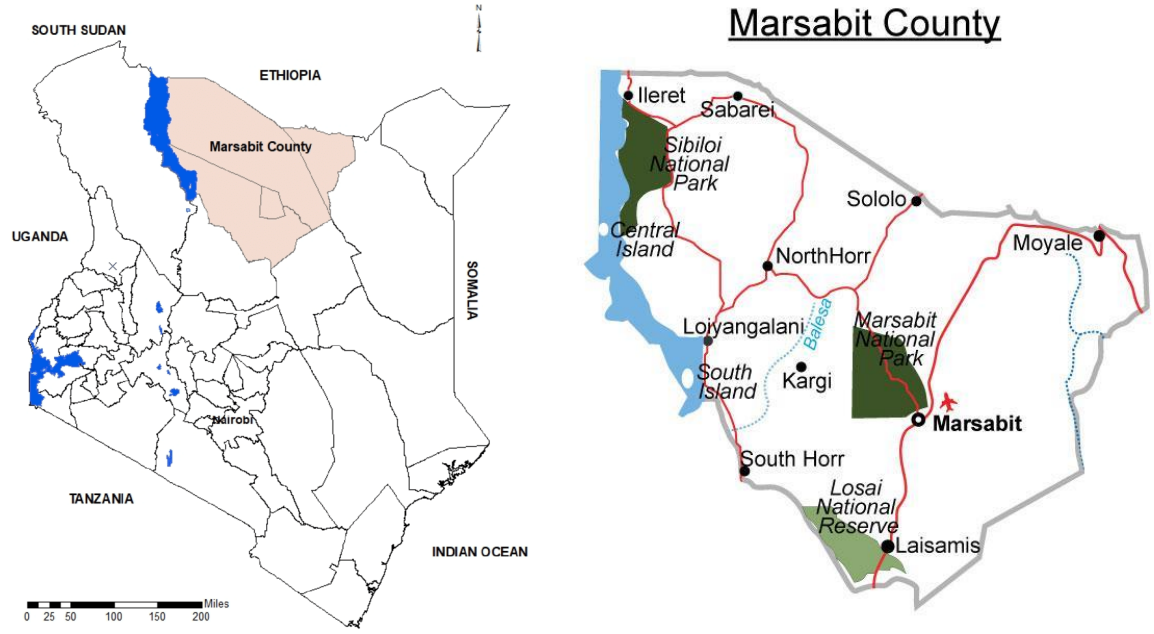

Figure 2: Location of Marsabit County

The county has a bimodal rainfall pattern, with the long rains season falling between April and May and the short rains falling between November and December. Rainfall ranges between 200mm and 1,000mm per annum and its duration, amount and reliability increases with the rise in altitude. North Horr (550m) has a mean annual rainfall of 150mm; Mt. Marsabit and Mt. Kulal experience 800mm, while Moyale receives a mean annual rainfall of 700mm.

The main economic activity in the county is pastoralism, which is characterized by extensive livestock production that largely relies on mobility to track pasture and water. Crop agriculture is only practiced in areas with permanent water sources, such as around Mt. Marsabit and Mt. Kulal. The county has no permanent river but has four drainage systems, covering an area of 948 sq. km. Chalbi Desert is the largest of these systems, and it receives runoff from the surrounding lava and basement surfaces of Mt. Marsabit, Hurri Hills, Mt. Kulal and the Ethiopian plateau, supporting some agropastoral activities. Both the National Human Development (HDI) and Gender Inequality adjusted Human Development Index (IHDI) for the county are low in comparison to the national averages. The Kenya National Human Development (HDI) Report of 2013 showed HDI for Marsabit County was 0.348 against a national HDI of 0.520. On the other hand, the Gender Inequality adjusted Human Development Index (IHDI) was 0.692 in comparison to the national GGI score of 0.62.

The current road network in the county comprises 312 km tarmacked, 580 km gravel surface and 4,108 km earth surface. However, most of the roads are impassable during the rainy seasons. The completion of the north-south highway linking Isiolo-Marsabit and Ethiopia under the Lamu Port-South Sudan-Ethiopia Transport Corridor (LAPSSET) project is expected to open the area for investments and greatly improve connectivity and lower costs for transporting goods and services to the county, as well as boost cross-border trade between Kenya and Ethiopia. The main markets that double as livestock and food commodity markets in Marsabit County include Marsabit, Moyale, Illaut and Merille.

2.4.2: Isiolo County

Isiolo County is in the upper eastern region of Kenya (Figure 3), bordering Marsabit County to the North, Samburu and Laikipia Counties to the West, Garissa County to the Southeast, Wajir County to the Northeast, Tana River and Kitui Counties to the south and Meru and Tharaka Nithi Counties to the southwest. The county covers an area of approximately 25,700 km2. The county is largely arid and semi-arid land, with about 95% of it being arid, including Oldonyiro, Ngare Mara, some parts of Burat, Chari and Cherab Wards in Isiolo North Constituency and Garbatulla, Sericho Ward and the northern part of Kinna Ward. The rainfall amount received in these areas ranges between 150 mm and 350 mm annually. Only 5% of the county is semi-arid, which covers part of Wabera Ward, Bulla Pesa Wards, some parts of Burat Ward in Isiolo and some of the Southern part of Kinna Ward that receives rainfall ranging between 400–650 mm annually. These areas receive relatively high rainfall due to the influence of Mount Kenya and Nyambene Hills in the neighboring Meru County. There are six perennial rivers in the county: Ewaso Ngiro North, Isiolo, Bisan-gurach, Bisanadi, Likiundu and Liliaba rivers.

The county experiences two rainy seasons. The short rains occur between October and December, with the peak in November, while the long rains occur between March and May, with the peak in April. The higher-ground areas near Mount Kenya and Nyambene Hills (Bulla Pesa, Burat and Kinna wards) receive between 500–670mm of rainfall per year, while the drier Eastern and Northern part of the county receive less than 300mm. Vast areas (80%) of Isiolo can only support mobile livestock production, making nomadic pastoralism the dominant land use in the county. However, rain-fed agriculture is practiced in Bulla Pesa, Wabera and Kinna wards, where the rains are higher.

The county has a road network of 975.5 km, with only 34 km tarmacked. Gravel and earth-surfaced roads account for 22% and 75% of the total road surface, respectively. All the earth surface roads are impassable during the wet season. Isiolo airport is envisaged to become an international airport under Vision 2030 and is already partly in operation. There are more than 10 major livestock markets in the county including Isiolo, Garbatulla, Belgesh, Eskot, Duse, Kinna, Modogashe, Merti, Kipsing and Oldonyiro. The main livestock traded include cattle, goats, sheep, and camels.

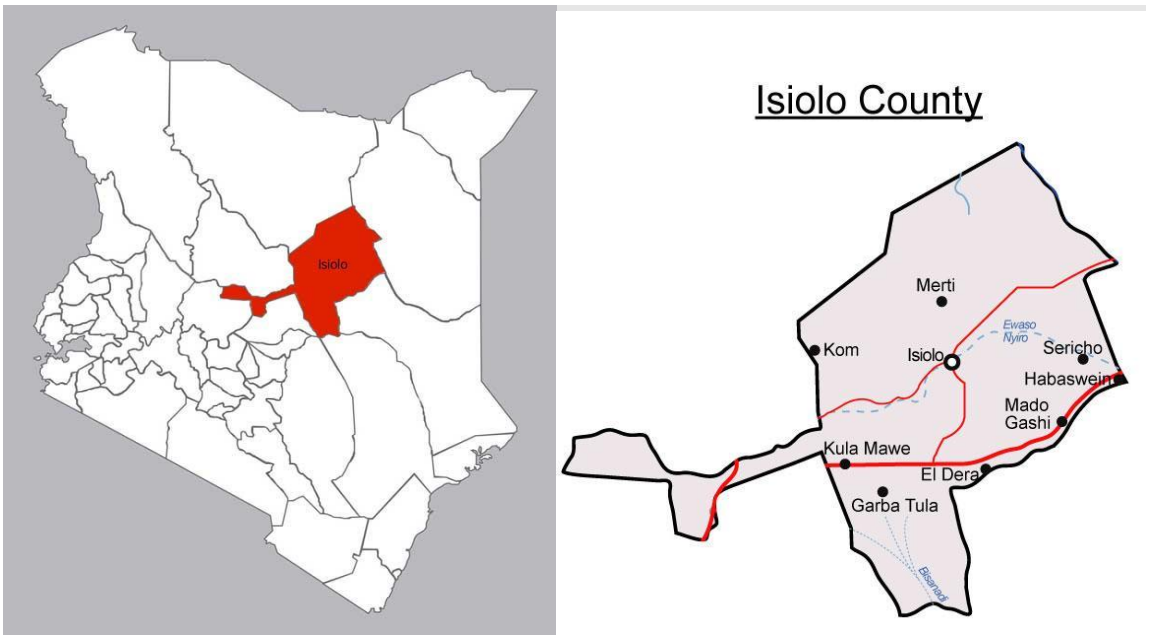

Figure 3: Location of Isiolo County

3.0: Key Findings

Isiolo and Marsabit counties are chronically food deficient, and households living there are highly dependent on food imports to meet their consumption needs. Per-capita food availability has reportedly declined by more than 10% over the past three decades in the ASALs (GoK, 2017). In such conditions, market integration is critical to ensuring the continuous and consistent availability of food in sufficient amounts and at reasonable prices to meet nutrition requirements. This is the reason why it is important to understand food markets, how they operate and the integration among local markets and main supply markets. Food markets link food production and consumption sectors, and when they are functioning well, they can create jobs and stimulate economic growth by spurring the diversification of food systems based on comparative advantage. This can lead to a more equal distribution of income and purchasing power, and thus increase nutritional well-being and enhanced food security (WFP, 2013).

Markets are important determinants of food availability and food access. Particularly in structural food deficit countries like Kenya, markets must be able to efficiently distribute food from surplus to deficit areas, including through importation. The extent to which markets make food available and keep prices stable depends on whether markets are integrated. If markets are integrated, food will flow from surplus to deficit areas, and imports will flow from port and border areas into the hinterland. High prices in deficit areas provide the incentive to traders to bring food from surplus to deficit areas, making food available. As a result of these flows, prices should decline in deficit areas, making food more accessible to households. This section presents findings on the type of food markets, their linkages (flow of food commodities) and actors involved in the food market system in Isiolo and Marsabit counties.

3.1: Food Commodity Markets Serving Marsabit and Isiolo Counties

Available reports and key informant interviews reveal that ASALs rely on three main market corridors presented in Figure 4 as identified by WFP (2013), namely:

i. Northwestern corridor: Nairobi-Kitale-Lodwar-Kakuma-Lokichogio, linking with South Sudan.
ii. North-central corridor: Nairobi-Meru/Nakuru-**Isiolo**/Samburu-**Marsabit-**Moyale, linking with Ethiopia; and
iii. Northeastern corridor: Nairobi-Thika-Garissa-Wajir-Mandera, linking with Somalia.

Marsabit and Isiolo counties are specifically served by the north-central corridor, which presents the food commodity flow from as far as Nairobi food markets to Isiolo through Meru, from Nakuru to Isiolo, Samburu to Marsabit and Moyale, and the flow of mainly processed food from the Ethiopian side of the Moyale border back to Marsabit town (Figure 4).

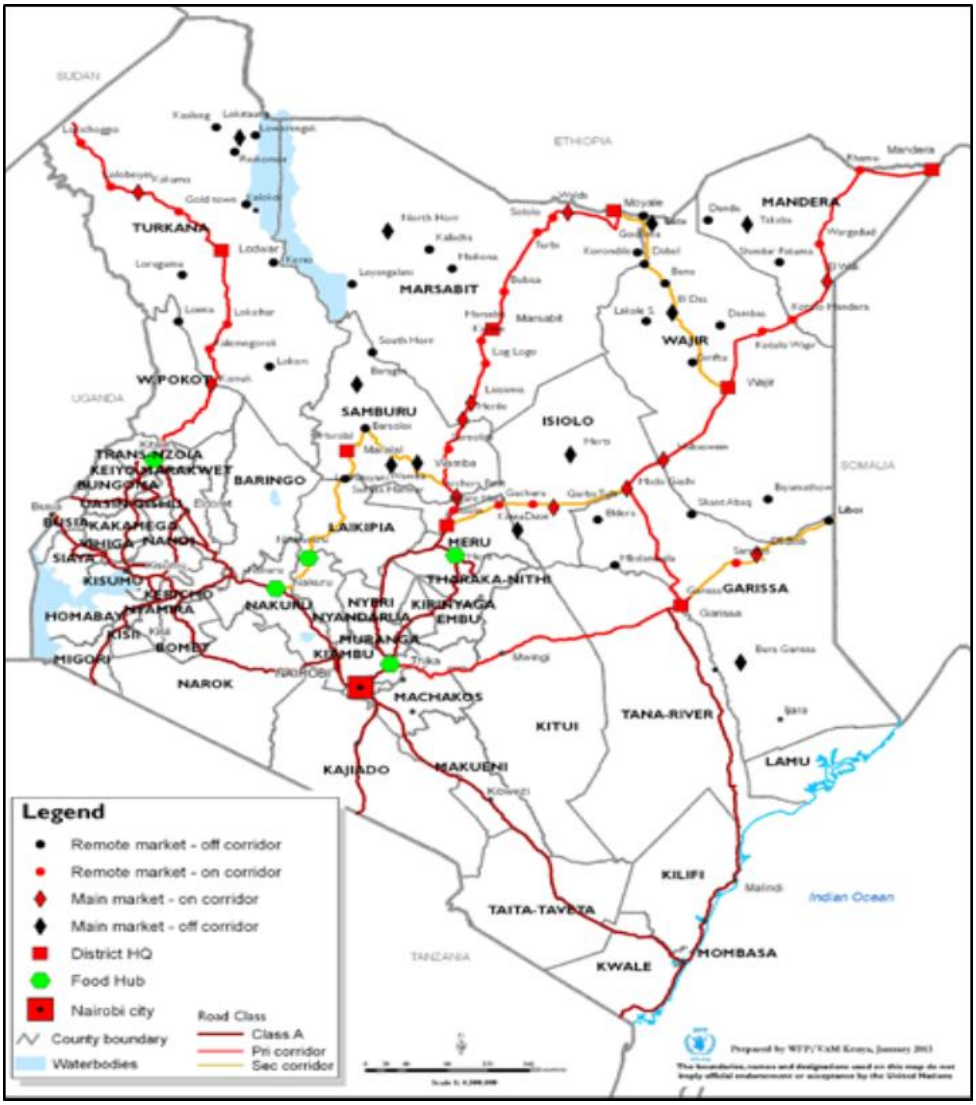

Figure 4: Main Trade Corridors in Kenya's Arid Lands

Source: WFP, 2013: Market Dynamics and Financial Services in Kenya's Arid Lands

Four source markets are relevant to Isiolo and Marsabit counties: 1) Nairobi markets (Wakulima, Nyamakima markets and Eastleigh); 2) hub markets in the central region (Meru, Narumoru, Nanyuki, Nyahururu, Nakuru); 3) main markets in the ASALs (Isiolo, Marsabit and Moyale); and 4) remote markets in the ASALs (Figure 5). The hubs are in producing areas and are the main suppliers of food to the ASAL regions. Main markets include the county/subcounty headquarters and other large markets along the transport corridors. They are formal (local authority controlled) and act as redistributors for the remote markets. For each main market, several remote markets exist, which do not act as suppliers for any other location. Whereas all the main markets situated along the north-central corridor seem to be well integrated, the tertiary markets are less integrated with the main markets, mainly due to poor road infrastructure and market information flow.

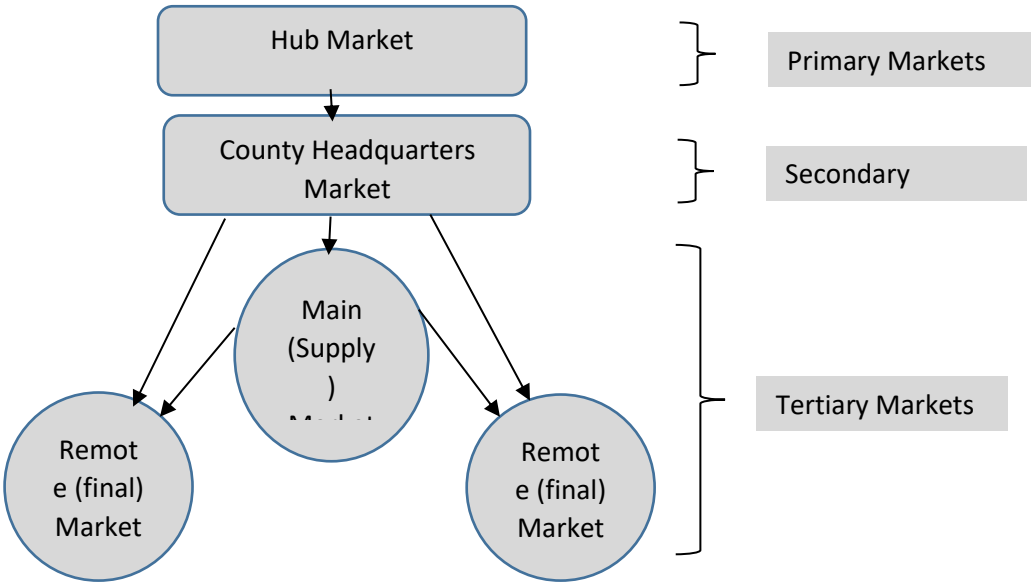

Figure 5: Links Between Markets (Source: Adopted from WFP, 2013)

3.1.1: Food Commodities Sold in Marsabit and Isiolo Counties

Four key food commodity categories identified along the north-central corridor were: 1) cereals and beans; 2) fruits and vegetables; 3) processed food (rice, sugar, maize meal, wheat flour, pasta, etc.); and 4) livestock, meat, milk, eggs, and chicken which all follow the supply chains described above. Market purchases are dominated by staple foods (primarily maize), both in terms of money spent and quantity. Maize is by far the most important staple food commodity, not only in Marsabit and Isiolo counties, but also in other ASAL counties. Maize, rice, and beans are the main cereals and pulses, purchased and consumed in Marsabit and Isiolo. White maize is consumed regularly in the form of grain and meal (*unga*), with local maize being preferred over imported yellow maize. Beans are the most widely consumed product among pulses, and their marketing takes place jointly with maize and other cereals. Maize grain is the cheapest source of calories and the primary one for poorer households. Rice, wheat flour and sorghum are also purchased for household consumption. Additional basic foods purchased by households are beans, sugar and vegetable oil, which are typically purchased year-round. Certain items like milk and vegetables are highly seasonal in supply and become unavailable or unaffordable during dry seasons and therefore less consumed during such times (FEWS NET, 2018). A report by FEWS NET (2018) shows that most of the cereals, maize, bean, wheat, cowpeas, cooking oil and wheat flour in Marsabit come from Ethiopia because they are sold for cheaper prices across the border. Traders make more profit even if they sell their goods at relatively lower prices than those prevailing on the Kenyan side. The traders prefer the flour from Ethiopia because it is packaged in large sacks, and they can make more profit by retailing it in small quantities. Maize prices are notably higher in Marsabit and Isiolo than in source markets in Meru North (FEWS NET 2018).

Most food commodities were sourced from neighboring counties. The rest, mostly processed foods such as maize and wheat flour, rice, vegetable oil, sugar, salt or tea leaves, are sourced from Nairobi. In bad years, when yields in the nearest producing regions are low, the supply lines of more basic products, especially cereals, are extended to Nairobi, since wholesalers in these markets can source food commodities from outside the country. Because of this, Nairobi is a major source of supply, with Wakulima market supplying fresh fruits and vegetables, Eastleigh market supplying processed food and Nyamakima market being a source of staple foods.

3.1.2: Food Commodity Markets in Marsabit County

Four main markets were identified in Marsabit County (Table 2). Most of them are livestock markets, specializing in either small or large stock, but they also serve as food commodity trade centers. Vegetables, fruits and pulses sold in Moyale and Marsabit towns came from Ethiopia through the Moyale border—Illaut and Merille markets are mainly supplied from Meru, Isiolo, Nanyuki and Narumoru. Other minor markets include Karare, Arge, Oltorot and Dambalafachan, with similar food commodity diversity as Illaut and Merille.

Table 2: Commodity Market in Marsabit

Market	Food commodity	Sources of foodstuffs
Moyale (Gumersa Market)	Sheep and goats	Ethiopia, Korondille (Wajir county), Dabel (Moyale), Nana (Moyale), Amballo (Moyale), Godoma (Moyale), Turbi (North Horr)
	Cattle and Camel	Ethiopia, Bori, Dabel, Amballo, Sololo, Amballa, Fachana, Qate, Misa, Bathan Rero
	Meat (chevon, beef, camel); eggs, rice; milk (cow, camel); vegetables (cabbage, kales, amaranth); pulses (beans, green grams, ground nuts, lentils, cow peas, green peas); fruits (oranges, mangoes, banana, pawpaw, pineapples, watermelon, passion fruit); fish; chicken; processed food (sugar, maize meal, wheat flour, pasta); groundnuts_	Ethiopia, Meru, Narumoru, Nanyuki, Moyale
Marsabit	Sheep and goats	North Horr, Kalacha, Turbi, Bubisa, Kargi, Hulahula, Karare, Maikona, Orodere, Korr
	Camel and Cattle	Kalacha, Bubisa, Karare, Dakabaricha, Hula
	Meat (chevon, beef, camel); eggs, rice; milk (cow, camel); vegetables (cabbage, kales, amaranth), pulses (beans, green grams, lentils, ground nuts, cow peas, green peas), fruits (oranges, mangoes, banana, pawpaw, pineapples, watermelon, passion fruit); fish; chicken; processed food (sugar, maize meal, wheat flour, pasta), groundnuts	Ethiopia, Meru, Nanyuki, Mau, Isiolo, Narumoru, Marsabit
Illaut	Sheep and goats	Samburu, Farakoren, Korr, Ngurunit, South Horr
	Camel and Cattle	Korr, Ngurunit, Illaut, Farakoren
	Meat (chevon, beef); rice; milk (cow); vegetables (cabbage, kales, amaranth), pulses (beans, cow peas, green peas), fruits (oranges, mangoes, banana); chicken; processed food (sugar, maize meal, wheat flour)	Meru, Isiolo, Nanyuki, Narumoru

Merille	Camel and Cattle	Loglogo, Laisamis, Merille, Ngurunit, Korr, Samburu (sereolipi)
	Meat (chevon, beef); eggs, rice; milk (cow); vegetables (cabbage, kales, amaranth), pulses (beans, cow peas, green peas), fruits (oranges, mangoes, banana); chicken; processed food (sugar, maize meal, wheat flour, pasta)	Isiolo, Meru, Nanyuki, Merille

3.1.3: Food Commodity Markets in Isiolo County

There are more than 10 major livestock markets in Isiolo county namely, Garbatulla, Belgesh (currently not operating), Eskot (currently not operating due to insecurity), Duse, Kinna (currently not operating), Modogashe, Merti, Barambate (currently not operating), Kipsing and Oldonyiro (Table 3). Like in Marsabit, they are mainly livestock (cattle, goats, sheep and camels) markets. Livestock buyers come from Nairobi and Meru, and as far as the coastal region of Kenya. Some markets were reported to be currently nonoperational, some due to insecurity, for example Eskot (personal communication with *Deedha*[4] Member from Kinna, Isiolo). Whereas some markets with modern infrastructure such as Modogash and Barambate are yet to be operational, others such as Kinna have been closed as middle traders/brokers delink the producers from potential buyers from other areas to maximize their margins and commissions.

Table 3: Nutritious Food Markets in Isiolo County

Market	Food commodity	Source of foodstuff
Isiolo	Livestock, meat (chevon, beef, camel); eggs, milk (cow, camel); vegetables (cabbage, kales, amaranth); pulses (beans, green grams, ground nuts, lentils, rice, cow peas, green peas); fruits (oranges, mangoes, banana, pawpaw, pineapples, watermelon, passion fruit); fish; chicken; processed food (sugar, maize meal, wheat flour, pasta); groundnuts	Meru, Naro-Moru, Nanyuki, Nairobi
Oldonyiro	Livestock; meat (chevon, beef); rice, milk (cow, camel); eggs; vegetables (cabbages, kale); pulses (beans, green grams, ground nuts); fruits (banana, oranges, mangoes, pawpaw); chicken; processed food (sugar, maize meal, wheat flour, pasta); groundnuts	Nanyuki and Meru town
Eskot	Livestock; meat (beef); vegetables (cabbages); pulses (beans); fruits (banana, oranges, mangoes); processed food (sugar, maize meal, wheat flour)	Garissa town
Merti	Livestock; meat (chevon, beef)	Merti town
Duse	Livestock; meat (chevon, beef); eggs; rice, vegetables (cabbages, kale); pulses (beans); fruits (banana, oranges, mangoes); processed food (sugar, maize meal, wheat flour)	Kinna town
Kipsing	Livestock; meat (chevon, beef); rice, eggs; milk (cow); vegetables (cabbages, kale); pulses (beans, green grams,	Nanyuki town

[4] *Deedha* is a traditional institution among the Borana pastoralist community. It is made up of a council of elders elected by the community and entrusted with making crucial decisions such as pasture and water management and conflict resolution and is guided by a set of by-laws in the enforcement of the set regulations.

	ground nuts); fruits (banana, oranges, mangoes, pawpaw); chicken; processed food (sugar, maize meal, wheat flour)	
Bisan Biliqo	Livestock; meat (beef); milk (cow); eggs; vegetables (cabbages); rice, pulses (beans); fruits (banana, oranges, mangoes); processed food (sugar, maize meal, wheat flour)	Merti
Ngaremara	Livestock; meat (chevon, beef); rice, milk (cow); eggs; vegetables (cabbages, kale); pulses (beans, green grams, ground nuts); fruits (banana, oranges, mangoes, pawpaw); chicken; processed food (sugar, maize meal, wheat flour), groundnuts	Isiolo town

3.2: Food Commodity Prices in Isiolo and Marsabit Markets

3.2.1: Seasonal Influence on Food Commodity Availability and Prices

Although there is no complete current data on commodity prices for Isiolo and Marsabit, an earlier report by WFP (2013) shows how seasons affect the availability of food commodities and, therefore, their prices. Seasonal volatility of food prices follows similar patterns across most food items, except for meat, which tends to be cheaper in the dry season than the wet season (Figure 6). This is because livestock keepers spare their herds for breeding during the good/wet seasons (March, April and May and October, November, and December), but sell cheaply under duress during the dry seasons (January, February, June, July, August and September) and drought periods, therefore making the prices of meat cheaper during lean months.

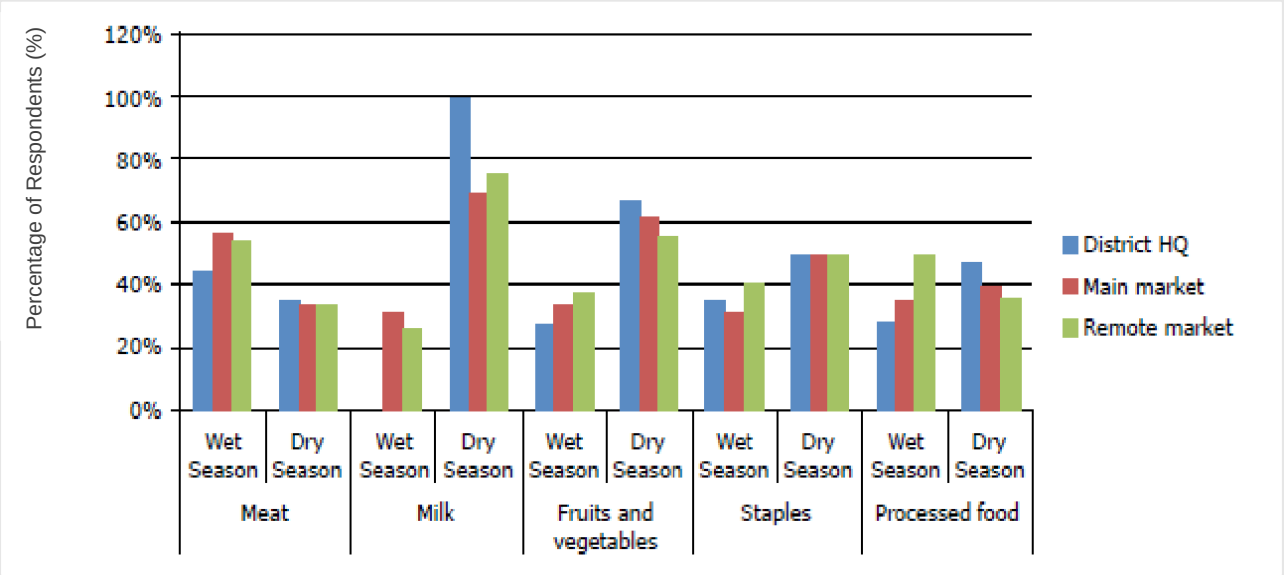

Figure 6: Seasonal Fluctuation in Prices of Food in the ASALs (Source: WFP, 2013)

Milk supply is subject to seasonal fluctuations but follows the exact opposite availability trend of meat, being higher during the calving and kidding period that coincides with the rainy seasons—and, therefore, abundant pasture—and declines during the dry season due to lack of pasture. However, extraordinarily

long seasonal migrations due to droughts can alter the availability patterns and cause supply shortages of meat and milk. These strong seasonal factors also influence the number of traders dealing with these two commodities over the year.

Production of food crops, especially vegetables, is highly seasonal as most of them are grown during the rainy season[5]. The volumes available in the market are determined by seasonal production cycles, rain performance in the producing areas and road conditions during the rainy season. Although horticultural crops (including fruits and vegetables) may be available all season in small-scale irrigated fields, although in small quantities, when sourced from other counties, high transaction and transportation costs make them expensive.

A report by NDMA (2020) shows that maize prices mirror the seasonality in food producing areas. In Marsabit, maize prices tend to increase between April and July, while in Isiolo, higher prices are observed in April, September, and December (Figures 7 and 8).

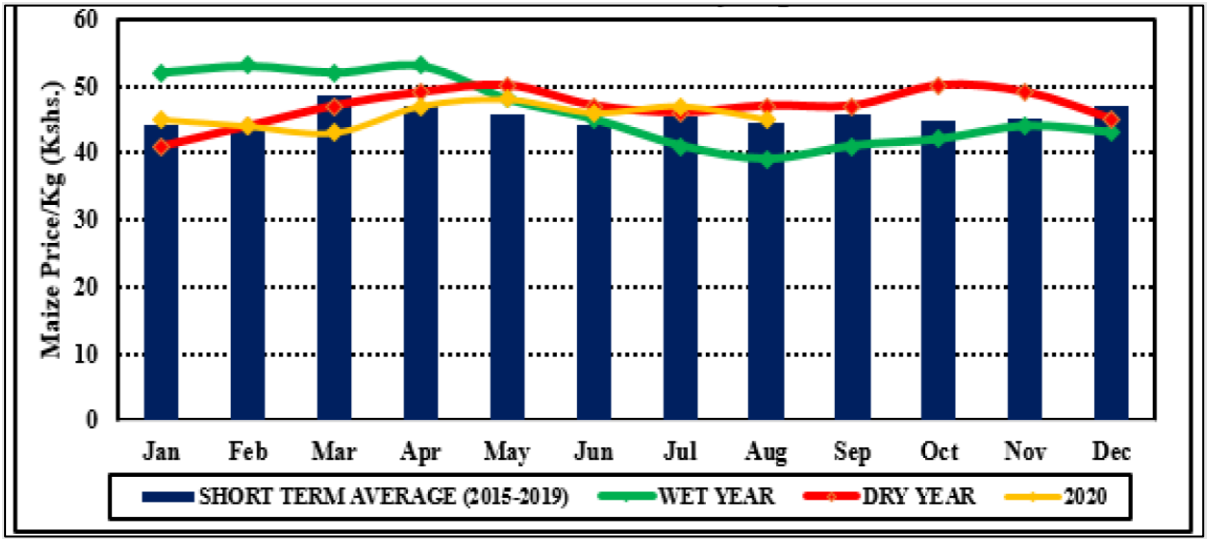

Figure 7: Maize Prices as of December 2020 in Comparison to Short Term Average (2015–2019) Prices in Marsabit (Source: GoK 2020b. Marsabit County Drought Early Warning Bulletin for August 2020. National Drought Management Authority (NDMA), Republic of Kenya)

[5] Isiolo and Marsabit counties experience two wet seasons: short rains occur in October, November and December, and the long rains in March, April, and May, while January and February and June, July, August, and September are considered dry seasons (NDMA, 2020).

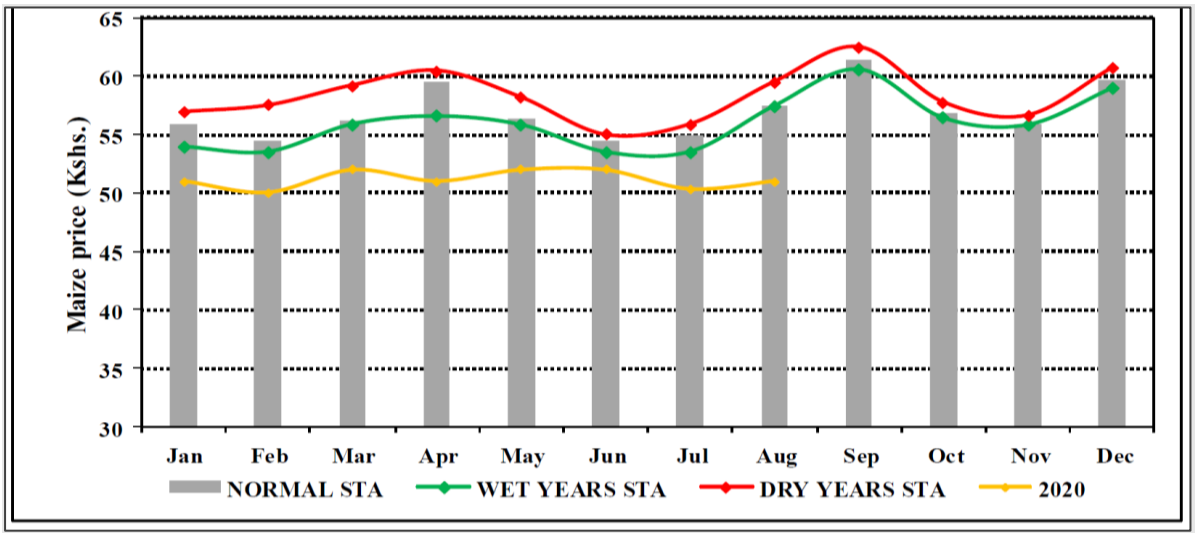

Figure 8: Maize Prices as of December 2020 in Comparison to Seasonal Average (2015–2019) Prices in Isiolo (Source: GoK 2020a. Isiolo County Drought Early Warning Bulletin for August 2020. National Drought Management Authority (NDMA), Republic of Kenya)

The ASDSP II baseline survey reports for Isiolo and Marsabit counties (GoK, 2019a, 2019b) that focused on preferred value chains show that camel milk supply fluctuates following rainfall patterns and therefore peaks during the short rains season in October, November and December and the long rains season in March, April and May. This is expected, as production in the drylands is significantly influenced by rainfall amounts and distributions that determine pasture and water availability. Figures 9–14 present seasonal fluctuations in the availability of camel milk, goat, beef, kale and tomatoes in the two counties.

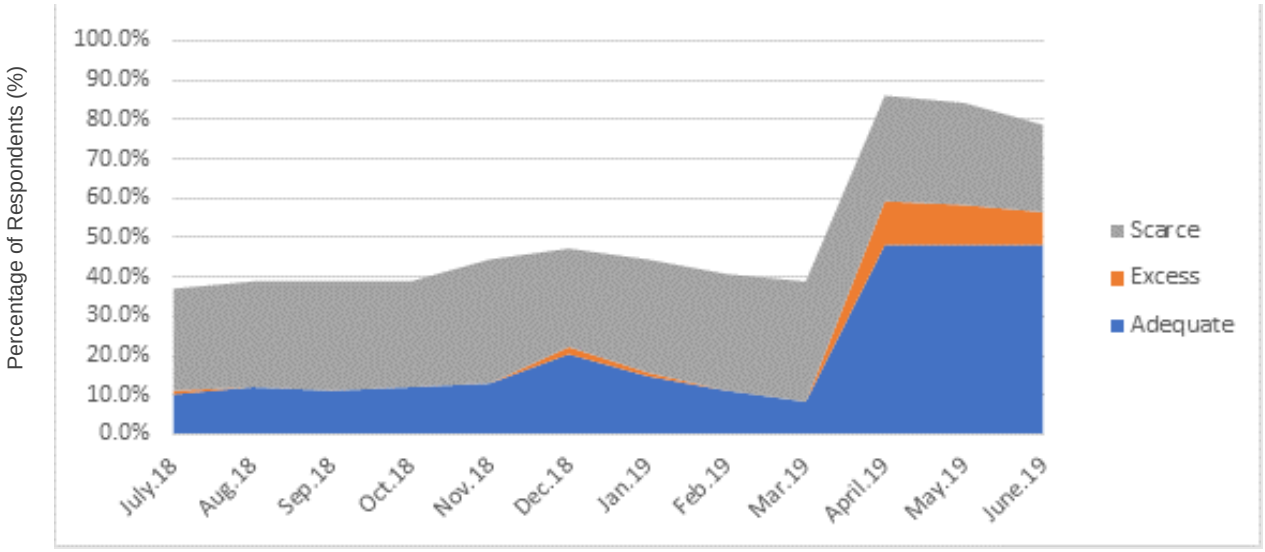

Figure 9: Seasonal Availability of Camel Milk in Marsabit County (Source: GoK, 2019b)

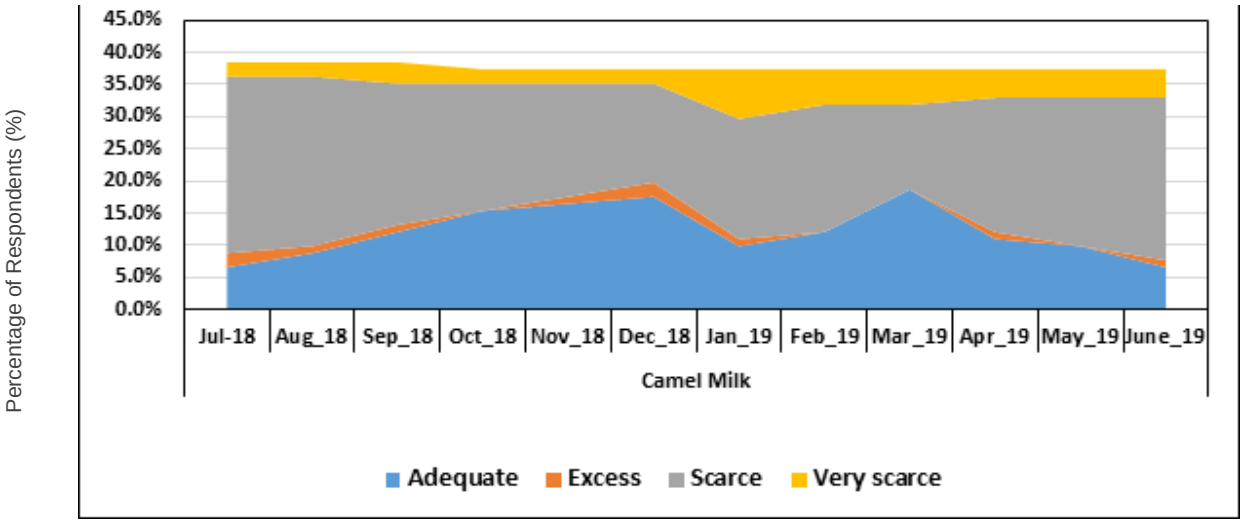

Figure 10: Seasonal Availability of Camel Milk in Isiolo County (Source: GoK, 2019a)

According to the ASDSP II baseline survey reports for Marsabit county (GoK, 2019b), supplies of goat and beef are generally expected to rise following good rains; therefore, availability for sale peaks early in the dry season, as herd owners tend to spare animals for breeding during the rainy seasons.

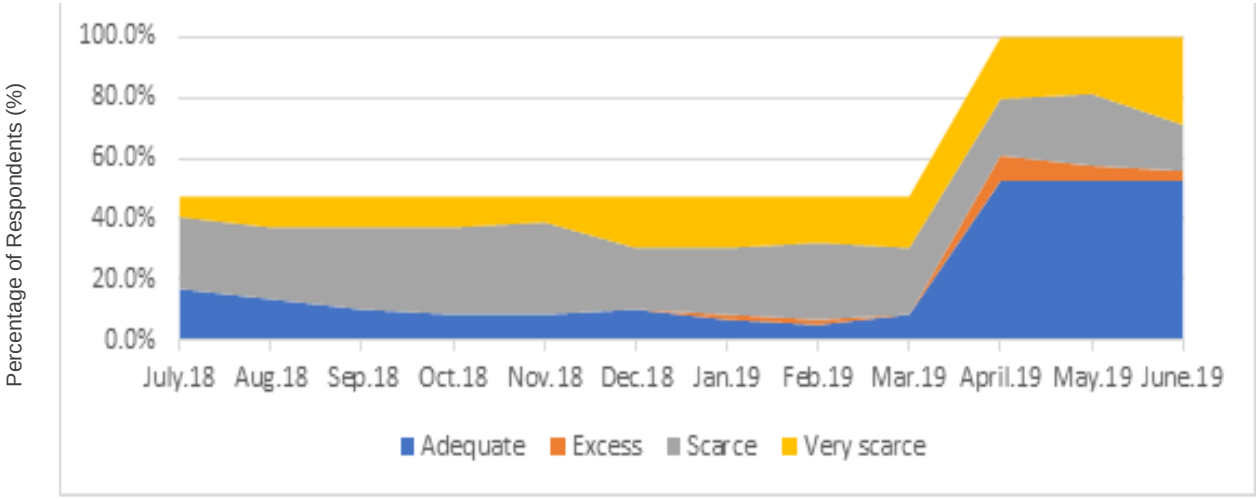

Figure 11: Seasonal Availability of Goat in Marsabit County (Source: GoK, 2019b)

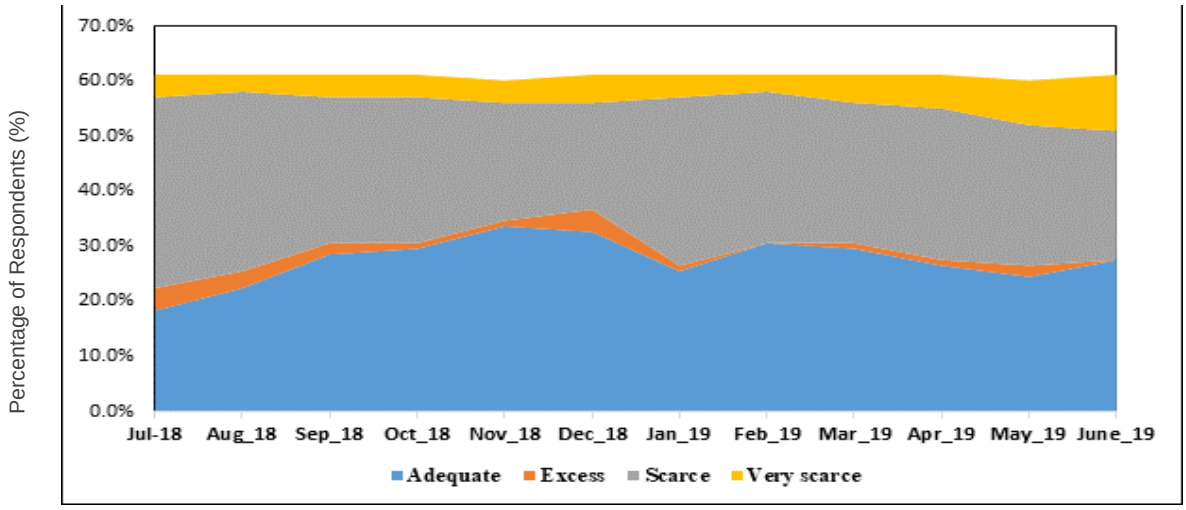

Figure 12: Seasonal Availability of Beef in Isiolo County (Source: GoK, 2019a)

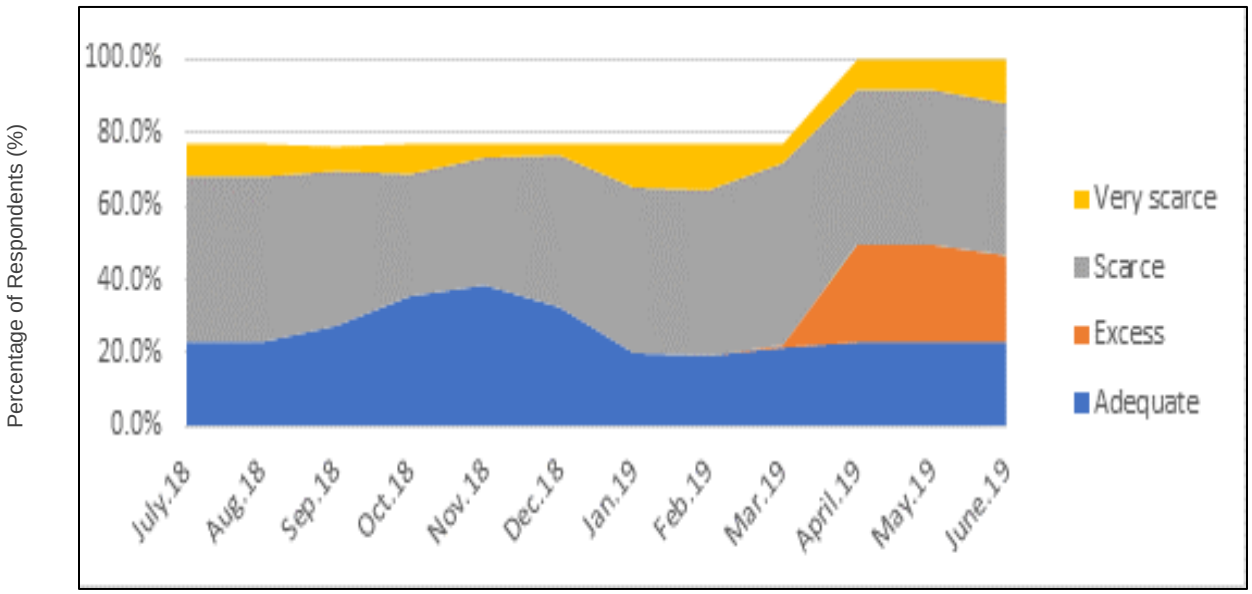

Figure 13: Seasonal Availability of Kale in Marsabit County (Source: GoK, 2019b)

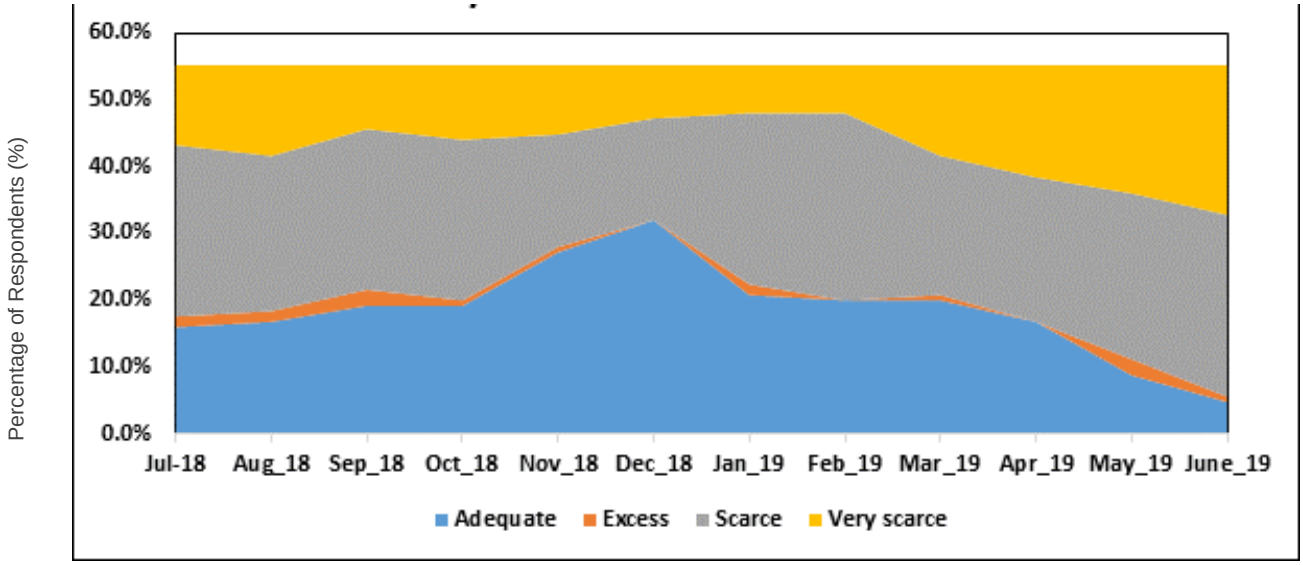

Figure 14: Seasonal Availability of Tomatoes in Isiolo County (Source: GoK, 2019a)

Seasonality in quantities produced, road conditions and transport availability tend to increase the instability and price volatility of remote markets and markets off the main trade corridors. Whereas supply is high during the rainy seasons, making food cheaper, earth surface roads may be impassable—escalating transport costs and food commodity prices.

3.2.2: Influence of Distance on Food Commodity Availability and Prices

Besides seasonality, distance between the producing areas and tertiary markets is another critical determinant of food commodity availability and affordability, especially in ASALs, which get their food supply from external sources. The report by WFP (2013) reveals that prices increase by about 1.3% on average per additional transport hour from the hub market to county headquarters. Similarly, prices increase by about 1.8 % for transportation between county headquarters and remote markets off the corridor. The factors found to influence the resupply time are price and the availability of commodities at origin (hub or county headquarters), distance, time and transaction costs from the source to the destination markets. Traders' resupply times and schedules increase with the remoteness of markets off the main transport corridors. Competition levels decrease with the remoteness of the market, which weakens the supply network and traders' response capacity, while increasing their vulnerability and those of households in remote areas to supply shocks. Traders in the arid lands are by and large price takers as they are not influential enough, nor do they have the negotiating power to influence the price of the foods traded. They are consequently vulnerable to price volatility, and likely to pass on food price increases and transaction costs to consumers. Food is therefore more expensive in remote markets than in main ones, and more expensive in the latter than in the county headquarters. Vulnerable consumers and deficit producers respond to increases in basic food prices by reducing consumption, and often switch to less preferred, but less expensive, foods.

3.3: Capacity of the Vulnerable Populations to Access Nutritious Foods

In this section, we apply the market-based approach in interrogating the characteristics of food commodities that determine whether households at the base of the pyramid in Isiolo and Marsabit counties can meet their food and nutritional needs.

1. Availability (whether appropriate and acceptable food commodities are geographically available to the consumer or user)

Food availability in local markets in Isiolo and Marsabit counties is highly seasonal and heavily dependent on transport conditions. Markets in the arid lands off the main transport routes are less integrated with their respective supply sources than markets along the main highways. As a result, the quantities of food commodities available from the local markets during seasons, including the choice of a food basket that meet households' macronutrients and diet diversity requirements at an affordable cost, is a challenge. The earth surface roads connecting the main county markets to the tertiary markets are impassable during rainy seasons and therefore reduce traders' capacity to scale up supply, especially in remote markets.

2. Accessibility (whether the cost and associated price of a food commodity matches consumers' or users' ability and willingness to pay)

Most households in the ASALs must travel between 30km (WFP, 2013) and 80km (Adongo et al., 2010) to reach critical food markets. The tertiary markets in Isiolo and Marsabit are far apart and not well integrated with the main county markets. Where there is a large geographical gap between producer and consumer, significant effort is needed for distribution—a challenge often referred to as last mile distribution (Thorpe and Reed, 2016). Distribution is one of the largest causes of failure for businesses and therefore of unreliable food supply at the base of the pyramid. Besides long distances to food markets, when it rains most of the roads are impassable, making it difficult for most households to meet their desired food and nutritional needs.

3. Affordability (whether the cost and associated price of a food commodity matches consumers' or users' ability and willingness to pay)

Affordability is determined by the alignment between the cost (and associated price) of nutritious foods and the willingness and ability of households to pay for them (Thorpe and Reed, 2016). It is a challenge in rural areas, and so even though people recognize the benefits of high nutrient-dense products, they are frequently unable to afford them.

Most of the households in Isiolo (63%) and Marsabit (79%) are poor as shown by the resilience analysis report conducted by FAO in Isiolo, Marsabit and Meru counties (FAO, 2017). The ASDSP II baseline survey report, based on data gathered from a sample of 302 households in Marsabit, shows that most of the households earn below Ksh. 3,252 (USD 32) a month in the rural and peri-urban areas and their average monthly budget for food is below KSh.1,954 (USD 20), therefore deemed food poor. Whereas most households in the counties are poor, food prices in the remote areas are higher relative to the rest of the country owing to factors such as the transport costs associated with long distances between the producing areas and tertiary markets in the ASALs, as well as poor roads. This study found a general data gap in terms of quantifying the cost of a nutritious diet for a typical household to determine cash income amount needed to close the affordability gap and enable households to purchase a nutritious diet.

Research indicates that a moderate increase in prices triggers traders' willingness to participate in the market, and therefore plays an important role in increasing food supply. But for vulnerable food consumers and deficit farmers, the increase in basic food prices implies they must reduce consumption of food and other goods, triggering a switch to less preferred but less expensive foods. For pastoral groups, an increase in food prices also impacts household income. The deterioration of the livestock-grain terms of trade renders such groups even more vulnerable to food price rises.

4. Acceptability and Appropriateness (whether the food commodity that is available meets the needs of consumers or users; whether there is awareness of the product; whether it is perceived to add value; and whether it is socially and culturally acceptable to consumers or users)

Isiolo and Marsabit counties are inhabited by communities that still practice all aspects of their culture, religion, and beliefs with possible influence on food habits. The ASDSP II survey reports for Isiolo and Marsabit show that households prefer staple foods (GoK, 2091a, 2019b) because they are the cheapest option and a primary source of calories for the poorer households. In addition, some households may be unaware of the health and nutritional benefits of other nutritious foods, or how they are prepared, and still, they may not just want to breach the cultural norms. In Isiolo county, a study found that there were food taboos stipulated on certain foods during pregnancy like not eating chicken eggs and fish from the lake. A majority of the mothers (71.5%) practiced the taboos, and this was attributed to a lack of nutritional knowledge in pregnancy (Sora et., al. 2020). Some of the beliefs that surround the diet of pregnant women can harm pregnant women and their children. Appropriateness is determined by the alignment between the type of product needed by the household and the type of product offered. Nutritional outcomes are also affected by decisions made in the household—whether the product is consumed in the correct quantity and frequency and prepared in the right way.

3.4: Private Sector Actors in Food Chains

In this section, we present possible key entry points in building partnerships with various private sector actors in Isiolo and Marsabit counties (Table 4). The list was generated through key informant interviews (n=5) with officials from government and non-governmental agencies in Isiolo and Marsabit Counties. Although several indicated that they were struggling or operating below capacity, their very existence offers potential entry points for partnerships with them to help address acute malnutrition in Isiolo and Marsabit counties.

Table 4: Priority Entry Points for Building Partnerships with Private-Sector Actors in Various Value Chains in Marsabit and Isiolo

Company/individual	Location	Possible entry points for partnership
Korkora Milk Processing Ltd	Saku township and Karare	Milk processing
White Gold	Nanyuki	Camel milk processing
Classic (Closed—first-ever milk processing plant in Isiolo.)	Isiolo	Camel milk processing
Afro Naturals (closed-due to noncompliance with NEMA regulations)	Isiolo	Camel milk processing
Bulle Dogo Dambicha (BDD)	Isiolo	Dairy farming and feedlot (cattle fattening)

Halimarido	Saku township	Meat
Sagante Feedlot	Saku (Sagante)	Fodder production (Hay)
Guleid Farm	Sololo	Fodder production (Hay)
Ichinni Milk and Honey Sales	Saku and Sagante	Honey business
Emaus Farm	Saku (Milima tatu)	Fodder production (Hay)
Sidai Africa Ltd.	Saku and other small franchises in rural towns in Marsabit and Isiolo counties	Agrovet business
Green Mill	Kula Mawe	Feed formulation factory
Kulamawe Poultry Industries Limited (low capacity)	Kula Mawe	Poultry slaughterhouse
Various Financial institutions (Crescent Takaful Savings and Credit Cooperative SACCO (CTS), Village Savings and Loans Associations (VSLAs)	Marsabit and Isiolo towns	Access to Sharia-compliant financial services

3.5: Challenges in Addressing Malnutrition in Isiolo and Marsabit

This section presents some of the challenges facing the food market system that limits the availability, accessibility, acceptability, and appropriateness of food commodities to vulnerable populations in Isiolo and Marsabit counties.

- Seasonality is a critical factor influencing the availability of food commodities in the ASALs across the year. There are seasonal fluctuations in the production and supply of nutritious foods, and therefore consumption, due to a fluctuation in commodity prices. The cost of nutritious foods is normally lowest during the long rains season, with the highest peak during the dry season,
- Climate variability is by far the most limiting factor to the availability of food commodities in the ASALs. Isiolo and Marsabit, like other ASALs, experience scarce, unreliable rainfall and frequent droughts that make the supply of most foodstuffs scarce and seasonal. The highly variable climate makes crop agriculture only possible in a few areas receiving relatively higher rainfall and those with permanent water sources to allow irrigation. Livestock production, and in particular milk production, is episodic and follows rainfall trends. Crop losses and massive losses of livestock, especially during extended dry seasons and droughts, is common.
- Post-harvest losses in key animal and crop commodities value chains have been reported to be as high as 55% in places like Marsabit County (GoK, 2019b). This is attributed to a lack of requisite technologies such as refrigerated transport for meat and camel milk, for example, and a lack of post-harvest handling and storage facilities. Such losses limit what is available for consumption and markets, creating scarcity that pushes up consumer prices of otherwise affordable food commodities.
- Lack of capacity by producers and poor extension services especially on agronomic practices, entrepreneurship, value addition and marketing are a constraint among the pastoral and agropastoral communities in relation to farming communities. This implies that the real economic value of most value chains is never fully exploited.

- Poor Hygiene and food safety risks, especially during milking and post-harvest handling when milk is exposed to microbial contamination (Odongo, 2016). In addition, some producers administer drugs to the livestock without consulting veterinary officers, which increases the risks of over/under dosage and antibiotic resistance. These practices present serious health threats to consumers when the drug residues find their way into their meat and milk (ILRI, 2018).
- Poverty/low income determine household purchasing power and, to a large extent, access to nutritious food. Most of the food consumed in Isiolo and Marsabit is purchased from the market. Only a few households, living in areas where water availability allows, engage in crop production. Livestock is the main source of livelihoods for pastoralist households.
- Poor market access due to poor rural road infrastructure limits food commodity trade and access by vulnerable households. The tertiary markets in Isiolo and Marsabit are poorly distributed, confined to major urban centers and only operate on certain days of the week—making it difficult and expensive for most households to access food for their nutritional needs.
- Weak market linkages lead to poor integration among tertiary markets and consumer price disparities. They also limit traders' decisions to participate in markets, which affects the supply of essential food commodities. Markets in Isiolo and Marsabit counties are poorly integrated and show huge variations in prices, which limits vulnerable households' access to nutritious foods. In addition, when producers are not informed about market prices, brokers take over–resulting in high transaction costs for producers.
- Limited value addition/processing means producers and traders never realize the full economic value of food products. Lack of food processing and preservation, especially for perishable foodstuffs, also leads to post-harvest losses and limited availability, especially during times of scarcity.
- Social security networks (SSN) are very crucial for food and nutrition security among pastoralist communities. Traditionally, poor, or deprived households rely on social/kinship alliances for food at times of scarcity and on livestock to restock their herds following drought losses. However, such social capital mechanisms have become less effective and, partly in concert with other stressors including climate change, the reason for increased impoverishment and food and nutrition insecurity among pastoral households.
- Lack of collective action means that producers and traders cannot exploit economies of scale to reduce transaction costs, which are normally passed to the consumers in the form of high food prices. Lack of organized/registered groups also implies that food chain actors cannot have access to financial services.
- Awareness and education on nutritional foods can be a barrier to addressing malnutrition because poor households will naturally opt for cheaper foods, or those they are familiar with, unless they are made aware of nutritious alternatives. This may be required to break cultural barriers associated with the consumption of otherwise nutritious foods**,** for example fish.
- Lack of credit services in the ASALs limits investment in various food chains, adversely affecting food production and supply through trade. Whereas most of the financial institutions shy away from the ASALs given high operational costs, pastoralists in Isiolo and Marsabit, who are predominantly Muslims, are often reluctant to seek financial services from non-sharia compliant financial institutions. They rely mostly on informal credit services, which are limited in their capacity to support big investments.

- Conflicts and insecurity are common in Isiolo and Marsabit as in other ASALs. Whereas most of the conflicts in Marsabit and Isiolo arise from competition over scarce resources or contested territorial claims (Gakuria, 2013), recurrent violent conflicts are normally politically instigated leading to ethnic contests and sometimes election violence. In Isiolo County, most of the conflicts are ethnic or clan based (CHRIPS, 2020). The conflicts and insecurity in these areas restrict herd movements and access to critical pasture and water resources, and access to important food markets, rendering most households vulnerable to food insecurity and malnutrition.

3.6: Gender and Social Disparities in Accessing Nutritious Foods

Gender and social inclusivity are crucial to achieving sustainable food systems. Isiolo County, for example, undertook a study to determine factors affecting women and youth, and constraints to their involvement in sustainable priority value chains in the County, and developed a Gender and Social Inclusion Action Plan (GSIAP) to guide interventions (GoK, 2020).

Because pastoral communities are highly patriarchal, women, youth and people with disabilities have limited access to productive assets and are less involved in household decision making. In contrast, they are entrusted with some of the most difficult chores under harsh environments in the ASALs that include feeding their families, taking care of the sick and looking after livestock left behind when herds migrate, especially during droughts. For most pastoral women, access to livestock (cattle, sheep, goats and poultry) is by virtue of their relationships to men (husbands, fathers and sons), who control them. In general, this desk review found that husbands and wives usually still discuss the sale of livestock prior to animals being marketed, though men may make the final decision. Women can also have a fair amount of control, particularly over small livestock, and in some pastoralist groups where women have traditionally played a key trading role, they can be central to livestock sales and marketing. The highly skewed access to productive resources and control of income mean that men have much greater access to nutritious foods than women, children, and people with disabilities.

Cultural norms also can lead to a disparity in the consumption of nutritious foods. Among the Borana community, women who have just given birth are not allowed to consume liver, fish and milk, as they are traditionally preserved for men (Dissemination workshop participant, Marsabit County). Further, this study reveals that in most pastoral societies, milk, particularly once it has been taken from the cow, is totally under the jurisdiction of women and they have absolute rights over its distribution. Even if the men milk the livestock, as amongst the Gabra, they will pass the containers to their wives. When milk enters the hut, its management becomes the responsibility of the wife. “This means she is able to make decisions about how much milk will be consumed fresh, how much will be conserved as ghee (dehydrated butter) or fermented milk, and how much will be shared with other households (McPeak 2006). This study found this to be the case in Marsabit, where women also made decisions on how much milk is sold. However, the presence of a husband sometimes decreases milk sales. While a woman has the right to sell milk (and keep the proceeds), it is the husband who decides which animals stay near to the town where she can sell the milk. He may keep the livestock away from the town or household to maximize herd productivity and to let calves, rather than people, use the milk.

In their midterm review of the Enhancing Opportunities for Women’s Enterprises (EOWE) program, which included Isiolo and Marsabit counties, SNV (2018) observed that a series of structural barriers, among them gender norms that govern ownership of assets, also limit women's capacity for entrepreneurship.

Other barriers include low access to agriculture production techniques, low levels of financial literacy, and limited skills and confidence. These factors explain why women's businesses often remain informal, tend to underperform, and have high risks of failure. This has a profound impact not only on gender disparity in employment and economic opportunities, but also undermines households' food and nutrition security, which is a sole responsibility of most women in the ASALs.

Despite cultural barriers, there are examples of women working in groups who have been able to establish enterprises that generate incomes over which they have control. Examples include Anolei Camel Milk Marketing Cooperative Society; Defee Self-Help Women's Group and Tawakal Self-Help Women's Group (Dokata, 2014; Mwaura et al., 2015; Elhadi, 2015); and livestock marketing groups in Marsabit (Arasio, et al., 2020; Arasio, et al., 2018). This provides an entry point for not only improving equity, but also nutrition among pastoral households through the empowerment of women.

3.7: Existing Food Value Chains in Marsabit and Isiolo Counties

The ASALs are dominated by pastoralist and agropastoral communities that rely on livestock for their livelihoods (IGAD, 2019). Livestock products, mainly milk and meat, are therefore the first choice of diet among households in Isiolo and Marsabit counties (GoK, 2019a). The main livestock-related value chains that would be of interest to many households, and vulnerable groups such as children and women, are meat and milk.

3.7.1: Meat Value Chain

Whereas the main livestock species preferred in Marsabit are goats and camel, Isiolo County is predominately a beef-rearing area (GoK, 2019b; GoK, 2019a). There is a high demand for goat meat and beef within and outside the two counties. As the adoption of camel rearing increases among nontraditional keepers, the demand for its meat has also risen, especially among urban and peri-urban residents, and therefore has reasonable potential for commercialization, through which women's groups can benefit through value addition (for example, traditionally dried and smoked strips of meat locally known as *nyiri nyiri*). However, as compared to beef and goat meat, camel meat is expensive for most poor households and therefore partly the reason for its market concentration in urban and peri-urban areas. Despite challenges, including exorbitant transportation costs and poor linkages between producers and terminal markets, there exists relatively well-developed beef and goat meat value chains in Isiolo County (Chira et al, 2015; Iruata et al., 2015), with most of the live animals from Marsabit and Isiolo destined for markets in larger towns and Nairobi city (Roba et al, 2019). Whereas the beef value chain is mainly dominated by men, women are increasingly getting involved in the goat meat value chain, either as traders of live animals (Arasio et al., 2020; Arasio et al., 2018) or value-added meat products, particularly *nyiri nyir*.

3.7.2: Milk Value Chain

Milk is central in the livelihoods of pastoral households (Elhadi, 2015), and its nutritional, social and economic roles have been widely studied (Nori, 2019). The main sources of milk for pastoralist communities living in the ASALs are cow, goat and camel. Whereas pastoral milk is traditionally for subsistence, pastoralist women are increasingly involved in the milk trade (Nori, 2019). While cow and goat milk remain largely for domestic consumption, there has been an increase in the commercialization of camel milk in response to rising urban and peri-urban demand. An elaborate

camel milk value chain dominated by women's groups has been reported in Isiolo County (Mwaura et al, 2015). Goat milk has been popularized for its nutritional value, while on the other hand, the camel milk value chain, besides the nutritional benefits, mainly provides income opportunities for organized women's groups who either engage in trade of unprocessed or value-added products.

3. 7.3: Crop Value Chains

Given rainfall scarcity, high climate variability and frequent droughts that limit and cause fluctuations in forage production and livestock productivity in the ASALs, pastoralist households normally rely on additional food sources, especially vegetables, fruits, cereals, nuts and processed foods from non-ASAL counties. Therefore, besides the mainstream value chains (milk and meat), this study identified priority vegetable value chains (tomato and kale) as contained in the ASDSP II baseline reports for Marsabit and Isiolo counties (GoK, 2019b; GoK, 2019a).

3.7.4: Proposed Value Chains for Intervention

The proposed value chains for intervention in section 3.8, below, are those prioritized in the ASDSP II baseline reports for both counties. Whereas the focus on vegetable value chains is to promote household production where it is viable, the livestock-based value chains are those expected to provide opportunities, especially for women to earn income to enable them to purchase nutritious foods offered in the local markets.

3.8: Intervention Opportunities for Improved Food security and Income

The ASDSP II survey reports for Isiolo and Marsabit (GoK, 2019a; 2019b) show that beef, camel milk and tomato value chains were the preferred value chains for development in Isiolo, while goat, camel milk and kales were the preferred value chains in Marsabit. These value chains were preferred based on their suitability for the agroclimatic zones in the two counties, level of adoption by pastoralist communities (GoK, 2019a; 2019b) and potential for addressing nutrition gaps. It is worth noting that the proposed interventions are mainly those involving women. This is because availing opportunities for income-generation among women has been shown to positively influence a household's food basket and nutritional status, especially in pastoral systems where, in most cases, women are responsible for feeding their families. The proposed interventions are not only those that are expected to strengthen the local food market system, but also generate income that would enable those dependent on the market to access nutritious foods. This is important since income smoothes fluctuations in access and consumption of nutritious foods occasioned by seasonality, by making households more flexible in their food choices and desired diversity. Households with reliable sources of income are therefore able to maintain access to nutritious food even during lean months.

3.8.1: Camel Milk Value chain

Camel milk has a lower lactose and fat content, but higher levels of minerals and vitamins, than cow milk. It contains three times more vitamin C and 10 times more iron compared to cow's milk. Literature points to the health benefits of camel milk, including the ability to boost immunity and treat juvenile diabetes and lactose intolerance (Nikkah, 2011). Camels are well adapted to drylands and can tolerate drought and provide milk during times of feed scarcity. Camel rearing is increasingly being adopted among even nontraditional camel keepers such as the Borana community in Isiolo and Marsabit. There is a ready local

market for camel milk—the daily demand is estimated at close to 20,000 liters a day against a supply of 5,000 liters per day[6]. The majority (60.9%) of pastoral households are already consuming camel milk (Elhadi, 2015). The urban and peri-urban camel milk marketing system in Isiolo is dominated by women traders who obtain camel milk through their cooperatives from village bulkers and transport it to cooling and bulking centers in Isiolo before transporting it to Nairobi, mainly to the Eastleigh area. The camel milk marketing groups include Anolei Camel Milk Marketing Cooperative Society, Defee Self-Help Women's Group and Tawakal Self-Help Women's Group, all based in Isiolo town. NGOs such as SNV have supported the women's groups through various interventions, which can be upscaled. There is one camel milk processor (White Gold) based in Nanyuki town, which pasteurizes 500litres/day.

Challenges

Affordability: The average price of a liter of camel milk is KES 250, which is rather high for several poor pastoralist households, implying that even if available, such households are likely to opt for cheaper alternatives, often with less nutrition benefits.

Poor hygiene and post-harvest losses: Poor hygiene and sanitary standards, from milking to handling, storage and transportation, have been reported to cause microbial contamination in camel milk, making milk spoilage the highest source of post-harvest losses in the camel milk value chain (Odongo, 2016). Capacity building on hygiene and safety standards can help reduce both losses and health risks arising from post-harvest handling of the milk.

Suggested Interventions

- Strengthening the existing groups/cooperatives through further training on financial management, good hygiene practices during milking, handling at home and during transportation, which has been reported as one of the major challenges in the camel milk value chain (Odongo, 2016; Noor et al., 2014).
- Explore the possibility of creating an umbrella organization for the uncoordinated income-generating women's groups to enable them to benefit from collective bargains, and access sharia-compliant financial products, which should be tailored for the Muslim communities in Isiolo and Marsabit.
- Expansion of operations of cooperatives by equipping bulking and cooling hubs by co-investing in refrigerated transport (e.g., motorcycles *(boda boda)* that can reach the remote sources), and cooling facilities in Isiolo town to reduce post-harvest losses among traders. In addition, members of the groups can be supported through th provision of funds to either start up or scale up their businesses.
- Supporting value addition through training on product development and differentiation (e.g., yogurt) to target various market segments. Processing and preserving milk in powder form would also help address deficits during dry season and droughts.
- Linking the groups with various niche markets other than the traditional markets in Eastleigh Nairobi, as well as stimulating local markets by supporting establishments of camel milk bars. Packaging milk in smaller and affordable quantities for vulnerable households.
- Behavior Change Campaigns (BCC) through awareness creation and education on the health and nutrition benefits of camel milk to ensure a critical mass of vulnerable populations embrace its

[6] https://nation.africa/kenya/business/seeds-of-gold/camel-milk-is-a-healthy-investment-4764

consumption. In addition, packaging the milk in smaller quantities (breaking bulk) would make it affordable to most households.

3.8.2: Goat Meat Value Chain

Goat meat has high nutritional value and is rich in protein and zinc; a serving of goat meat (85g) has about 122 calories, 0.79 grams of saturated fat and 3.2 milligrams of iron (Correa, 2011). Goats are preferred among the pastoralist communities in Isiolo and Marsabit since they are drought tolerant and well suited to the variable climatic conditions in the two counties. In addition, goats have higher fecundity than larger stock, and are easily disposed of for petty cash to meet household and social obligations. There is currently a large export market for goat meat in the Middle East through Ethiopia/Djibouti and Somaliland.

In addition, there is the potential for value addition through the existing traditional methods of preservation to produce *nyiri* (dried and smoked strips of meat, which is dried and deep fried in oil, with a shelf life of up to one year). The demand of the product is increasing among urban and peri-urban areas. The University of Nairobi, National Museums of Kenya and Jomo Kenyatta University of Agriculture and Technology through a past project "Reducing Post-Harvests Losses and Value Addition in East African Value Chains" (RELOAD) have trained women's groups in value addition that conform to sanitary standards. Through the project, UoN in partnership with Ewaso Ngiro North Development Authority installed solar tunnel driers in Isiolo to ensure efficient and climate smart drying of the meat products.

Challenges

Affordability: The average price of a kilogram of goat meat is KES 390, which is too high for most poor households compared to other food items like maize at KES 90 per kilogram, which is sufficient for one meal for a family. The diets of most families are therefore likely to be dominated by cereals, which are less nutritious.

Poor hygiene and safety standards: Poor hygiene and sanitary standards in traditional processing of nyir pose health risks to consumers (Kisembe et al., 2015) and limit market penetration of such products because they must be informally sold in local markets. The microbial load contamination has been shown to be highest at slaughter (75%), followed by processing (56%) and marketing 67%, in that order (Kiembe et al., 2015).

Suggested Interventions

- Strengthening existing women's groups through further training on entrepreneurship, good hygiene practices and leveraging the existing capacity on upgrading of the preservation techniques initiated by UoN, NMK and JKUAT.
- Support the groups to scale-up their operations by making full use of the capacity of the solar tunnel driers installed by UON in Isiolo.
- Supporting women's groups through training and start-up funds to process and brand quality products that can reach wider markets.
- Establishing *Nyir* retail shops in Isiolo and Marsabit to stimulate the local market as a way of establishing a reliable outlet for the meat products, as well as linking the groups with various niche markets outside Isiolo and Marsabit. In addition, packaging the products in smaller quantities may make the meat affordable and therefore increase consumption among vulnerable households.
- Several income-generating women's groups involved in purchasing, raising (fattening) and selling goats have been identified from studies (Arasio et al., 2020; Arasio et al., 2018) conducted

in Marsabit County. Such groups can be supported with funds to expand their businesses and linked to emerging small stock markets beyond their locality for better income.

3.8.3: Kale and Tomato Value Chains

Kale, local known as "*Sukumawiki,*" is rich in vitamins K, A and C; mineral elements; and antioxidants. It is a versatile and green leafy vegetable that grows quickly and is a year- round crop considered affordable by local households in Isiolo and Marsabit counties. Growing kale for household consumption requires minimum resources, although it requires sufficient soil moisture throughout the growing period. It is therefore mostly grown in areas with perennial water sources (e.g., along rivers, under small-scale irrigation and commonly in home gardens, where the crop benefits from kitchen wastewater).

Tomato is rich in vitamin C, potassium, folate and vitamin K, and is one of the most widely accepted and consumed vegetable worldwide—ASALs are no exception. Just like kale, its production is fast growing, and it is one of the main vegetables produced under micro-irrigation along major rivers and permanent water sources in Isiolo and Marsabit counties. However, the two vegetables are perishable and must be transported to market soon after harvesting to ensure they reach consumers while fresh. There exist several ongoing and past interventions by various organizations including the World Bank-funded Food for Asset/Cash (FFA) project implemented by the National Drought Management Authority (NDMA) and Action Aid, in partnership with the Ministry of Agriculture, Livestock and Fisheries of Isiolo County. Through the FFA project, communities in Isiolo—among other selected ASAL counties—were supported to produce vegetables and pulses under micro-irrigation for both home and market to enhance their livelihood resilience. Although some of these initiatives have been relatively successful, they face several challenges, including dilapidated irrigation infrastructure, poor management, poor market linkages and a lack of reliable extension services.

Challenges

Post-harvest Losses: Tomato and kale are highly perishable and therefore require ready transport and market (GoK, 2019c; 2019d). This means that to achieve sustainable commercialization production, linkages to reliable markets need to be established as a prerequisite.

Suggested interventions.

- Leveraging on past initiatives, such as rehabilitating irrigation infrastructures such as water inlets and canals and establishing water management committees to oversee water scheduling and maintain the infrastructure in micro-irrigation schemes in Burat, Bulapesa, Gafarsa, Malkadaka and Kinna wards in Isiolo, for example. This will help sustain production of kale and other essential vegetables like tomatoes, green grams, cowpeas, and onions.
- Promoting water harvesting (both in situ and ex situ) to ensure availability for production and domestic use throughout the year. Water availability is not only necessary for enhancing production, but also for post-harvest handling and processing. Availability of water for domestic use will also mean that women have enough time to engage in other productive activities for increased food and nutrition security.
- Strengthening extension services and linking producers to lucrative markets in urban centers. This can be easier if the producer groups are formalized through registration to enable them enjoy economies of scale and access financial services to expand their operations.

- Value addition of tomato for drying using the existing solar tunnel driers in Isiolo; tomato paste production; and for the branding of products and marketing beyond the two counties. This would help reduce post-harvest losses that are normally high in the tomato value chain.
- Supporting traders by providing makeshift stalls, especially in livestock markets, as a way of reaching local markets.

3.8.4: Fish Value Chain

Fish is not only a source protein, but also contain long-chain omega-3 fatty acids, which are essential for healthy brain development in children. It is therefore particularly important to include fish in the diets of pregnant and breastfeeding women and children, particularly during the first two years of life (the 1,000-day window). Strong evidence shows how consumption of oily fish lowers the risk of coronary heart disease (FAO, 2018).

Fishing activities in Isiolo County are based on River Ewaso Nyiro, especially in Merti and Garbatula wards, and fishponds, with the latter being insignificant (UPEO, 2017). In aquaculture, the commonly cultured fish are Tilapia and African Catfish, while the main types of fish caught from the rivers include Clarias, Common Carp, Lungfish, Tilapia, Barbus and Labeo (GoK, 2015).

The annual fish production in Isiolo County is estimated at only 20 tons (GoK, 2018). However, the River Ewaso Nyiro has a production capacity of 500 tons, implying that its potential is underutilized.

In Marsabit County, the main source of fish is Lake Turkana, and the major fishing and landing areas are in Loiyangalani, El Molo Bay, Moite, Ileret and Telesgaye. The types of fish commercially harvested are Tilapia, Labeo and Nile perch. Annual fish production is estimated at 630 tons, with only 2% of the households in the county depending on fishing as a source of livelihood (GoK, 2017b).

In Marsabit County, there is an organized fish market system, with fisherfolk organized into beach management units. Fish marketing cooperatives buy the fish in bulk from the fishermen in aggregate to attain the volumes demanded by markets outside the county before dispatching.

Challenges

Acceptability: Statistics show that 80% of the fish from Marsabit County is transported and sold to markets outside the county identified as Kisumu, Busia, Nairobi, Uganda and Congo (DDO, 2020). This implies that most households in the county do not benefit from the nutritional value of the harvested fish. This is mainly attributed to cultural barriers since fish consumption is not common amongst pastoralists and is often viewed as taboo among some communities (Chege et al., 2015). Given that fish consumption is culturally not popular among pastoralist communities, there is a need for awareness creation and education on the benefits of fish and various ways to prepare a fish meal to overcome the cultural barrier.

Post-harvest Losses: Fresh fish has a short shelf life; therefore, good handling practices are required. A recent report (Malala et al., 2017; Keyombe et al., 2018) estimated post-harvest fish losses in Lake Turkana at over 35%. Use of high temperatures, especially in drying and frying, destroys vital nutrients in fish and the smoking and salting of fish is costly for most of the poor fisherfolk, therefore leading to further losses. These losses are attributed to lack of appropriate fish handling structures (Obiero et al., 2018), lack of cold storage facilities and fish preservation techniques (Mungai, 2019). These are required in addition to reliable refrigerated transport to reduce post-harvest losses and ensure hygiene and sanitary standards are observed by fisherfolk and traders.

Poor hygiene and safety standards: Poor hygiene in the post-harvest handling of fish is evident from sun-drying fish on bare ground to open transportation on motorcycles (*boda boda)* and open display at market centers. This exposes fish to microbial contamination, with consequent health implications on consumers.

Lack of infrastructure and Equipment: In both Isiolo and Marsabit, the fish value chain is at its nascent stage of development. The fisherfolk use handmade nets, rafts made from palm trees and discarded plastic bottles as fishing floats (GoK, 2018). There is a low level of investment in infrastructure and fishing gear (Mungai, 2019). This limits the quantity of fish harvested and available for local consumption and supply to various markets.

Suggested Interventions

- Private-public partnerships (PPP) bringing various actors (county government, private sector, BMUs and cooperatives) to invest in new, and expand existing, fish handling structures and cold storage facilities at fish landing sites. This could be in the form of grants to BMUs and cooperatives to purchase solar powered coolers and build shades and sanitation facilities.
- Strengthening the existing groups/cooperatives through capacity building on fish processing, quality standards and hygiene handling of fish and fish products.
- Mobilization of the fisherfolk into savings groups and build their capacity in management of Savings and Internal Lending Communities (SILC) and linking them to financial intermediaries for access to finance and affordable credit facilities to facilitate investment in fishing gear.
- Nutrition communication campaigns that promote benefits of fish consumption and addressing the cultural beliefs/taboos associated with its consumption, and how to prepare fish meals among the pastoralist communities. This would help create demand and therefore spur local market for fish in the two counties.
- Further research on cost benefit analysis of fishing activities and trade; prices and seasonality of fish catch; and mapping hotspots for vulnerability to the fishing villages.

3. 9: Potential Private Investors and Other Possible Partners

Table 5 presents some of the potential private sector actors and other possible partners in the preferred value chains.

Table 5: Potential Private Investors and Other Possible Partners

Value Chain	Potential Partners
Camel Milk Value Chain	• Kenya Camel Association (KCA) has been involved in the development of the camel subsector through enhanced service delivery across the camel value chain including value addition, knowledge management and sharing, lobby and advocacy. KCA is currently partnering with the University of Nairobi in training pastoralists on camel husbandry in Isiolo County under an IDRC- funded project and with Egerton University in development of solar power solutions for camel milk preservation in Marsabit County under the Kenya climate Smart Agriculture Project (KCSAP).

	• Anolei Camel Milk Marketing Cooperative Society, Defee Self-Help Women's Group and Tawakal Self-Help Women's Group, which are involved in camel milk processing in Isiolo town. • Korkora Milk Processing Ltd., which processes camel milk in Saku, Marsabit County. • Afro Naturals camel milk processing company in Isiolo (currently closed due to noncompliance issues with NEMA requirements and will require support to comply with environmental requirements).
Goat Meat Value Chain	• The University of Nairobi (UoN), National Museums of Kenya (NMK) and Jomo Kenyatta University of Agriculture and Technology (JKUAT) previously worked with women's groups on meat product (*nyiri nyiri*) development. This provides opportunity for further research and training on product differentiation and branding; analysis of meat product market performance; and nutritional quality under different drying conditions to inform the modification of the solar tunnel drier.
Kale & Tomato Value Chain	• AMIRAN Kenya Ltd. has several drip irrigation packages tailored to farmers' needs and scale of operations and offers extension services for clients. • Syngenta Kenya supply vegetable seeds, agrochemicals, and follow up to provide extension services to clients. • NDMA and Action Aid, through the Ministry of Agriculture, Livestock and Fisheries of Isiolo County, are possible partners, particularly with respect to their previous joint micro-irrigation interventions.
Fish Value Chain	• The Beach Management Units (BMUs) at Lake Turkana. • Fish marketing cooperatives in Marsabit. • The county governments of Isiolo and Marsabit. • The Kenya Marine and Fisheries Research Institute, Lake Turkana Research station. KMFRI has been conducting research and building the capacity of the fisherfolk in Lake Turkana on post-harvest losses reduction.

4.0: Conclusions

- Major food commodities with the potential to help address acute malnutrition purchased and consumed by majority of households in Marsabit and Isiolo counties comprise of cereals and pulses. These include maize, rice, wheat, beans, cooking oil, sugar, and pasta with some occasional meat. Most of the food commodities consumed by households originates from other counties and Ethiopia, where production costs are lower.
- Seasonal fluctuations in food supply and price spikes are a barrier to gaining access and availability to the foods. with dry seasons being the lean months.
- Poor roads and long distances between producing areas and the consumer markets in Isiolo and Marsabit Counties is a barrier to gaining physical access to the foods. Food prices in the two counties are relatively higher than those in the neighboring counties.
- Inadequate nutritious diet and consequent poor nutritional status likely to be heavily driven by multiple factors such as poverty due to a considerable affordability gap, poor market access due to bad roads, post-harvest losses and limited value addition of food commodities such as drying foods such as vegetables and meat, to be used as a method to increase availability of food during the dry season, during which prices are highest.

5.0: Recommendations

- To address food availability, accessibility, affordability and acceptability to the vulnerable populations, a four-pronged approach needs to be adopted aimed at:
    a. strengthening food market functionality and performance.
    b. improving household incomes.
    c. enhancing household own production; and
    d. changing the behavior of households with regards to intra-household decision-making and food habits towards the consumption of nutritious foods.
- These should entail improving the supply side of the market by supporting traders to enhance their volumes and efficiency by establishing and strengthening existing trader groups to reduce transaction costs through collective action, and to facilitate their access to credit facilities; capacitating households to access food by supporting income-generating activities (IGA); awareness creation and education on the health benefits of nutritious foods; and supporting households to enhance production to bridge food deficits.
- To increase access to finance by different value chains and groups within the project, NAWIRI should continue to strengthen community-based financial institutions (CBFIs) such as SACCOs and savings groups. These include identifying existing CBFIs and strengthening their management, operational and finance functions while opening new savings groups in the project area targeting vulnerable groups such as youth, women and people with disabilities.
- Interventions to increase cash income to empower household access to nutritious diets. Current income and available food commodities are not sufficient for a household to access a nutritious diet. Avenues should be explored to allow households to increase their means of accessing nutritious foods for sale in the markets by enhancing household incomes to increase their purchasing power.
- Livelihood interventions, such as engaging in IGAs such as poultry production through supplying households with chickens for increased egg consumption, could increase household income, egg supplies, and improve affordability. Target women to ensure the income from such activities is directed towards meeting food and nutritional needs of the family, as well of those of youth, people with disabilities and men to ensure equity, social order, and harmony.
- Legumes and kale play a significant role in meeting the nutrient requirements and increased consumption by the households should be promoted across the counties targeting all age groups.
- Stocking up on pulses (dried legumes) ahead of the lean seasons as these products are easier to transport than fresh food products, have a long shelf life and are widely consumed and accepted could improve affordability and increase access to nutrients.
- Drying foods, such as vegetables and meat, could be used as a method to increase availability of food during the dry season, during which prices are highest. Drying foods could be a means for households to preserve foods during seasons of (relative) abundance and prepare for the lean (dry) seasons, using methods such as solar drying. Nonetheless, potential storing solutions should be investigated further. Transportation of dried goods could potentially be more economical and efficient and may increase the availability of key nutrients at a low cost across the zone.
- Nawiri should make use of local FM radio stations and schools to promote social behavior change and the consumption of nutritious foods. Having nutrition champions/ambassadors in each ward would help reach a wider population and more vulnerable groups. This will also help create demand and stimulate the local market.

- Lastly, Nawiri should leverage Agricultural Sector Development Support Programme (ASDSP II) interventions in Isiolo and Marsabit counties. The program targets four key results areas: increased productivity of priority value chains; strengthened entrepreneurial skills of priority value chain actors; improved access to markets by value chain actors and strengthened structures and capacities for consultation, collaboration, cooperation; and coordination of the agricultural sector in the two counties. ASDSP II survey reports for Isiolo and Marsabit show that beef, camel milk and tomato value chains are the three prioritized value chains for development in Isiolo, while goat, camel milk and kales are the preferred value chains in Marsabit.

6.0: Further Research

- Mapping malnutrition hotspots and understanding the determinants in rural, urban and peri-urban areas of Isiolo and Marsabit to guide targeting for intervention.
- Gross margin analysis for key actors in the value chain to determine where costs can be reduced with efficiencies and better models to benefit the producers/traders.
- A study on consumer-specific information for nutritious foods in both Marsabit and Isiolo to understand consumption habits; cost of nutritious food in various areas; consumer food preferences; areas of possible innovations for new products; and concerns and barriers to food consumption.
- Understanding household consumption of selected nutritious foods and factors that determine their food choices (e.g., camel milk consumption among the vulnerable populations), as well as gender and social disparities in the consumption of nutritious foods.
- Explore cultural barriers to the consumption of nutritious foods with the different communities in the two counties and to what extent these can be addressed using BCC.
- Understanding the awareness of households about nutritious foods, and their willingness to pay for them if offered in markets.
- Mapping and in-depth analysis of private actors in food market system to understand their roles, influence and challenges faced.
- In-depth analysis of access and affordability and acceptance of nutritious foods by gender.
- An analysis of household food baskets and quantities of nutritious foods available in markets by season and locality.
- Analysis of fish value chain in Marsabit and Isiolo to understand actors, roles and their influence, entry points for working with them, as well as barriers and opportunities for improving fish consumption in Isiolo and Marsabit.
- A study to assess the cost of local main diets for a typical household size targeting various wealth groups (very poor, poor, middle and better-off) is recommended to estimate the additional income that would be required to cover the cost of a food habits nutritious diet and non-food expenditures.
- A study to assess the business feasibility/viability of the proposed value chains.
- An analysis of incomes generated from the camel milk business by women's groups, and how decisions on how such incomes are spent are made—whether these go towards the purchase of food and, if yes, what proportion is spent on nutritious foods.

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