



Participatory Analysis and Co-Design of The Adapted Milk Matters Interventions





This publication was produced under the Nawiri program funded by the United States Agency for International Development (USAID) Bureau for Humanitarian Assistance (BHA). The program’s goal is to sustainably reduce persistent levels of acute malnutrition among vulnerable populations in Kenya’s arid and semi-arid lands (ASALs). The program is being implemented in Isiolo and Marsabit Counties by a consortium led by Catholic Relief Services.

Citation 2021: Catholic Relief Service (CRS), USAID Nawiri Participatory Analysis and Co-Design of The Adapted Milk Matters Interventions. Final Report. Catholic Relief Services, Nairobi, Kenya.

Photo Credits: Anthony Nyandiek, CRS USAID Nawiri.

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Catholic Relief Services, recipient of cooperative agreement no. [72DFFPI9CA00002] and do not necessarily reflect the views of USAID or the United States Government.



Acknowledgements

Catholic Relief Services (CRS), USAID Nawiri Program acknowledges the role of Dr. Mohamed Yusuf in conducting this study, including development of study protocol, data collection tools, carrying out data collection, data analyses and writing the study report and brief.

Special appreciation for the efforts of Gabriel Mbokothe, Livelihood and Private Sector Engagement Advisor, Nawiri, for providing overall strategic leadership, guidance and coordination for all the study processes; reviewing and providing technical inputs to all study tools and materials; and for the final review and finalization of this study report.

We would like to express our heartfelt gratitude to Ramadhan Nura Livelihood officer and Eric Munene MEAL officer Caritas Isiolo, as well as Rob Halake Livelihood officer Caritas Marsabit. Thomas Musyoki, Nawiri, Isiolo (CRS), and Ali Dida, Nawiri, Marsabit (CRS), for their assistance in coordinating with MoALF teams, ward level leaders, and study teams, mobilizing participants, and providing logistical support.

USAID Nawiri would like to express our heartfelt gratitude to everyone who participated in the research and contributed their time and insights to these findings. Andrew Catley, USAID Nawiri (Tufts University) Research Technical Advisor; John Burns, Nawiri (Tufts University) Research and Design Lead; and Dr. Joan Othieno, Nawiri Research and Design Manager (CRS). Dr. Mourad Aidi, Nawiri (CRS) chief of party; Margaret Kahiga, Nawiri (CRS) deputy chief of party; and Dr. Ailish Byrne, Nawiri strategic learning lead (CRS). We gratefully acknowledge Anthony Nyandiek, communications manager, Nawiri (CRS), for his assistance with copyediting and the final design of this report.

USAID Nawiri would like to thank the Marsabit and Isiolo county teams from the Ministries of Agriculture, Livestock, and Fisheries for their assistance in identifying study villages, mobilizing, and identifying study participants. We also thank the study participants, key informants at the county and subcounty levels, and mothers, fathers, and elder women who participated in the study and provided the necessary information. CRS would also like to thank the United States Agency for International Development's Bureau of Humanitarian Assistance for funding this activity.

Table of Contents

Acknowledgements	iii
Table of Figures	v
List of Tables	v
Acronyms and Abbreviations	vi
Executive Summary	vii
1.0. Introduction	9
1.1 Context of the Study	9
1.2 The Milk Matters approach	10
1.3 Study Purpose/ Justification	10
1.3.1 Specific Research Questions /Objectives	10
1.3.2 Research questions	11
2.0. Overview of the Study Design and Methods	12
2.1 Study design and locations	12
2.2 Primary data collection and tools	12
2.3 Study limitations and challenges	13
3.0 Study Findings	14
3.1 The importance of livestock and the role of milk in the diets	14
3.1.1 Importance of different livestock species as sources of milk	14
3.1.2 Role of milk in diets and perceptions about malnutrition	15
3.2 Seasonality in milk production, access and consumption, and other risks of malnutrition	18
3.2.1 Seasonality in milk production and availability.....	18
3.2.2 Seasonality in milk consumption and access	20
3.2.3 Seasonality in child morbidities and caseloads of malnutrition	22
3.3 Factors affecting milk availability and access in the dry seasons	23
3.3.1. Migration and access to pastures and water.....	23
3.3.2 Livestock diseases	25
3.3.3 Access to incomes and markets.....	27
3.3.4 Commercialization and consumption of milk	28
3.4 Interventions to increase milk availability and access in the dry seasons	29
3.4.1 Direct (Livestock) Interventions	30
3.4.2 Indirect (non-livestock) interventions.....	32
3.5 Implications of the interventions on mother’s/caregiver’s workload and childcare practices	33
4.0 Conclusion and Recommendations	35
4.1. Recommendations	35
Annexes	37
Literature cited	37

Table of Figures

Figure 1: Isiolo and Marsabit Counties	12
Figure 2: Ranking relative importance of the livestock species kept as milk source in different seasons.....	15
Figure 3 : Milk Gourds for Fathers and Children – Illeret	21
Figure 4: Seasonal morbidity and malnutrition caseload (Gus and Illeret).....	23
Figure 5: Livestock distances to water points in Isiolo and Marsabit (September 2021)	24

List of Tables

Table 1: Children 6 To 59 Months and PLW Requiring Treatment for Malnutrition.....	9
Table 2: Study Respondents	13
Table 3: Meal Composition Calendar	16
Table 4: Seasons and their local names	18
Table 5: Seasonal Calendar, Isiolo County.....	19
Table 6: Average daily milk intake by children during the different seasons	20
Table 7: Prices of milk in the different seasons (KES per liter).....	22
Table 8: Seasonal Calendar, Livestock Diseases North Horr Subcounty	26
Table 9: Livestock prices in the different seasons (KES).....	27
Table 10: Prices of Essential Commodities In The Study Areas.....	28

Acronyms and Abbreviations

ASALs	Arid and Semi-Arid Lands
CRS	Catholic Relief Services
EBF	Exclusive Breastfeeding
FAO	Food and Agriculture Organization of the United Nations
FGDs	Focus Group Discussions
GAM/MAM/SAM	Global/Moderate/Severe Acute Malnutrition
IPC – AMN	Integrated Phase Classification for Acute Malnutrition
KES	Kenya Shilling
KIIs	Key Informant Interviews
LEGS	Livestock Emergency Guidelines and Standards
MM	Milk Matters
NDMA	National Drought Management Authority
NAWIRI	Nutrition in ASALs Within Integrated Resilient Institutions
PE	Participatory Epidemiology
PLW	Pregnant and Lactating Women
SMART	Standardized Monitoring and Assessment of Relief and Transition
USAID/BHA	United States Agency for International Development/Bureau for Humanitarian Assistance
USD	United States Dollar
WASH	Water, sanitation and hygiene
WHO	World Health Organization

Executive Summary

The goal of the Nawiri project, implemented in Isiolo and Marsabit Counties by Catholic Relief Services (CRS), is to sustainably reduce levels of persistent acute malnutrition in Kenya's arid and semi-arid lands (ASALs). Milk forms an important component of household diets for livestock keeping populations in Isiolo and Marsabit Counties. CRS is using the adapted Milk Matters (MM) approach as part of the research phase (2019-2021) to identify community-determined interventions for increased dry-season milk availability and access. Recognizing the seasonality of food access in pastoralist settings, as well as the high nutritional content of animal milk, was central to the strategy. This study therefore aimed to identify appropriate, context-specific community-defined interventions that will increase milk production, directly or indirectly over one calendar year, particularly during dry seasons.

The research was conducted among the Borana and Samburu communities in Isiolo and the Gabra and Dassenech groups in Marsabit County. While the study was carried out in Sericho Ward in Garbatulla Subcounty, Cherab and Chari wards in Merti Subcounty, and Oldonyiro Ward in Isiolo Central Subcounty, in Marsabit the study focused on the larger North Horr Subcounty which includes the Illeret, Dukana, Maikona, and North Horr wards. It used a participatory analysis to conduct an in-depth field study in Isiolo and Marsabit Counties to better understand why animal milk availability and accessibility decline during the dry season. Community leaders, livestock producers, mothers/caregivers of children under age 5 and pregnant and lactating women (PLW), government representatives (Department of Veterinary Services and Ministry of Health) were selected to take part in a series of county and comprehensive community discussions in 16 villages, two in each ward and eight in each of the counties, and 32 FGDs and KIIs were completed during the study.

The research reveals that livestock contributes significantly to household income and food security, with livestock-owning households benefiting from improved nutrition because of increased purchasing power from livestock-related income or direct consumption of what they produce. Camels, cattle, sheep and goats all provide food (milk and meat), though to varying degrees depending on the species, herd size and composition, and geographic region. As income sources sheep and goats, as well as camel and goat's milk, were said to provide a regular flow of cash for the purchase of grains, meeting emergency needs such as health care, and for paying school fees. While sheep production was prioritized for markets as a source of income and slaughter for the family, occasions and for gifting to close social relations, cattle were highly valued because of the importance of cattle in meeting social and cultural obligations, as noted by the Samburu elders.

In terms of milk, camels, goats and sheep predominate the production system in Dukana and Maikona in North Horr, and as a result, camels alongside goats were ranked as dominant sources of milk for the households. In Sericho, Chari and Cherab wards in Isiolo County, although few camels were kept, cattle and goats were predominant species kept. Camels and goats were ranked as most important in Sericho, whereas goats and cattle were considered most important in Chari and Cherab wards. Households in Sericho, Oldonyiro and Illeret are predominantly cattle, sheep and goat keeping, and they ranked goats, cattle and camels in descending order as most valuable as a source of milk. Sheep and goats were raised by practically every household in Illeret and were considered the most significant animals for milk production.

Women in the study areas mentioned several types of food given to children of different age groups and pregnant and lactating women. The most commonly mentioned ones are animal milk (camel, cattle and goat milk), sweetened tea with milk, porridge, mashed potatoes, and rice/ugali with milk. Milk, particularly camel milk, is viewed as healthy diet, expressed locally in terms of taste and influence on child health and growth in all communities. As a result, milk is a key part of children's diets in all of the locations and is commonly given to them as fresh milk to drink and added to complementary foods like tea and porridge. When milk was accessible, it was consumed fresh or mixed into complementary foods, contributing to the dietary diversity of children in all study locations. Its importance for children was also evident from its introduction (together with water) only a few days after birth. Rainfall patterns, on the other hand, impacted the pattern of milk production, indicating fluctuations in levels of availability and access for children, pregnant and lactating women.

Migration, access to and distances from pastures and water, animal diseases, degree of commercialization and access to kinship support, plus access to income, are all factors that affect milk availability and access according to the study. There was a significant difference in milk intake of children and PLW in the wet and dry seasons, as evidenced in the seasonal consumption calendar. Discussions highlighted that children under age 5 were prioritized when milk was available. As a result, younger children consumed larger quantities of milk in all seasons. While the children in the study areas were accessing more than the recommended daily milk intake of at least 500 ml for children aged 24-59 months (Dror & Allen, 2014; World Health Organization, 2005) in both the short and long rainy seasons, the daily intake reduced significantly in the two dry seasons. In the rainy season when pastures and water were available, and lactating animals close to the homesteads, milk was more available to children and PLW. In the case of PLW milk distribution was unequal, as was the case with other foods, with mothers receiving the smallest amount of food/milk. When food was limited women gave priority to their children and husbands, eating lesser portions or lower-quality items. As a result, milk consumption among PLW was low in general, especially during the dry season and among poorer households.

Milk availability and pricing changed seasonally depending on several factors, including livestock type and the size and accessibility of the village's milk market. During the dry season milk prices were significantly higher than during the rainy season, when milk is more easily accessible on the market, prices are lower, and more households have access to milk. During dry seasons diets are less diversified, with households consuming more grains as income and reduced food supply raise market costs. Alongside seasonal milk access and availability, seasonal co-morbidity was also a major contributor to malnutrition, with health workers reporting a high prevalence of childhood diseases like the common cold/pneumonia, malaria, fever and diarrhea, as well as diseases affecting PLW like anemia, malaria, and pneumonia, and higher malnutrition caseloads during the dry season.

Participants in the study offered a range of actions at various levels, including production, marketing and consumption, all of which would increase milk access and availability. These interventions were categorized into two groups: direct (livestock) and indirect (non-livestock). Animal health, feed/fodder distribution to protect herds and maintain milk production during the dry season, water, feed, pasture, and natural resource management, livestock and milk marketing and restocking are all potential direct intervention areas, while cash transfers and strengthening existing nutritional programs for more effective malnutrition management among child and PLW, were indirect interventions suggested. In earlier Milk Matters studies, these strategies were shown to be a cost-effective dry season/drought strategy for preserving milk production and avoiding the need for costly treatment measures to address severe acute malnutrition. However, to maximize their impact and ensure the interventions' long-term sustainability, it will be necessary to adopt a multi-sector approach, as malnutrition cannot be solved through single sectors but rather through comprehensive and coordinated approaches; considering the role of markets in the design and implementation of interventions; strengthening nutrition social behavior change communication to promote positive choices by increasing nutrition knowledge and education for positive impact, and including markets in the design and implementation of interventions.

1.0. Introduction

1.1 Context of the Study

Malnutrition among children under age 5 and pregnant and lactating women (PLW) continues to be a serious public health concern in Isiolo and Marsabit Counties, with rates frequently exceeding the World Health Organization (WHO) cut-off point of 10%. Nationally, these counties are classified in the critical phase (phase 4), as witnessed by the numbers of children who are acutely malnourished and in need of treatment (Government of Kenya, 2021)(Table 1). The February 2020 SMART Survey conducted in Isiolo County unveiled Global Acute Malnutrition (GAM) and Severe Acute Malnutrition prevalence of 16.7% and 1.5%, respectively (Department of Health, 2020). In Marsabit, the prevalence of acute malnutrition has been above the critical 15% in most years, particularly in the dry spell. While the integrated SMART survey reports for Marsabit County for the last four years reported chronic malnutrition (stunting) figures ranging from 24.7% to 28.8% (FAO et al., 2020), the GAM rate in North Horr Subcounty, in which this study was conducted, was 21.8% in 2018, while the prevalence rate for SAM was 5.2% (National Drought Management Authority, 2018).

Table 1: Children 6 To 59 Months and PLW Requiring Treatment for Malnutrition

County	Global Acute Malnutrition		Severe Acute Malnutrition		Moderate Acute Malnutrition		Pregnant And Lactating Women	
	Caseloads	Targets	Caseloads	Targets	Caseloads	Targets	Caseloads	Targets
Isiolo	10,312	5,387	926	695	9,386	4,693	1,948	1,848
Marsabit	20,241	11,502	3,727	2,795	16,514	8,257	7,171	71,71
Total ASALS	352,842	198,733	89,247	66,935	263,595	131,797	96,971	96,971
National	541,662	306,063	140,933	105,698	400,729	200,363	98,759	98,759

In the ASALS counties, the main driver of acute malnutrition was poor dietary intake with reduced milk production and consumption, with milk forming the main diet of children across the arid areas (Government of Kenya, 2021). Also, in these areas, seasonality plays an important role in malnutrition vulnerability because livelihood choices are based on seasonal patterns of water and plant availability, as well as geographic mobility. Seasonal variations in nutritional status occur but vary per pastoralist ethnic group (Fujita et al., 2004; Sadler et al., 2009). According to a season-by-season review of nutritional data from Northern Kenya, levels of wasting fluctuated by roughly 5 percentage points in normal years, with much larger shifts in drought years (Sophie Chotard et al., 2006).

While milk is among the highly valued foods thought to be integral to solving the problem of child undernutrition in general (Muehlhoff E. et al., 2013), its vital role in pastoralist nutrition and livelihoods has long been recognized (Sadler et al., 2010). In Isiolo, an analysis of the economic and nutritional contribution of camel milk found that in the two largest milk-producing clusters (Central and Kulamawe), the milk had an economic value of KES 222,667,200 (about USD 2.6 million) per year and benefitted 10,532 people (Yazan A. M Elhadi & Oliver V. Wasonga, 2015). As livestock keeping populations, milk forms an important component of household diets in Isiolo, and Marsabit Counties and the nutritional situation of children follows a similar seasonal pattern as rainfall and milk supply. Even in normal years these trends are attributable to the substantial seasonal variation in rainfall in these locations, with rain contributing to periods of good grazing for livestock and high milk production, followed by drops in pasture and milk during the dry season. Resulting in a significant reduction of milk, the late dry season is considered the main risk period for childhood malnutrition in pastoralist areas (Sadler et al., 2012).

Studies such as *Milk Matters: The Role and Value of Milk in the Diets of Somali Pastoralist Children* in Liben and Shinile, Ethiopia (Sadler et al., 2012) have shown that when available, milk is prioritized for consumption by young children and seasonal lack of access to animals and animal products, exacerbated during drought periods, is widely perceived by pastoralists as a primary cause of child malnutrition. Studies have also shown that by targeting support to milking animals that stay close to women and children during the dry season and/ or drought periods, milk production and consumption among children improves as does their nutritional status.

1.2 The Milk Matters approach

In implementing Nawiri through a phased approach, the consortium led by Catholic Relief Services (CRS) is using the adapted Milk Matters (MM) approach as part of the research phase (2019-2021), to identify community-defined interventions for increased dry-season milk availability and access in Marsabit and Isiolo Counties. The approach was originally developed by the Feinstein International Centre at Tufts University and Save the Children. It aims to boost milk production in animals that stay close to women and children during dry seasons, when males migrate in search of pasture with larger herds. Recognizing the seasonality of food access in pastoralist settings, as well as the high nutritional content of animal milk, remains central to the strategy. Due to decreased access to milk over the long dry season, it has long been known that this is a critical period in terms of the risk of acute child malnutrition (USAID East Africa Resilience Learning Project, 2015).

A critical stage of the approach is the participatory analysis of acute malnutrition and local identification of one or more interventions that target peaks in acute malnutrition during the main dry season. Part of this analysis includes consideration of costs of the intervention(s), to select and test interventions that in the long-term can be locally managed and which are affordable. The participatory methodology proposed in the Milk Matters approach emphasizes community voice and participation in analysis of the causes of acute malnutrition, especially due to declining milk during the dry period, and the identification of context fitting interventions or activities to address these causes; thus, aligning with locally owned, county-led, and co-designed approaches promoted by USAID Nawiri.

1.3 Study Purpose/ Justification

The aim of this study is, therefore, to identify appropriate, context-specific community-defined interventions that will increase milk production, directly or indirectly, over one calendar year and particularly during dry seasons. Given long-term changes in livestock ownership, the study will focus on both livestock and non-livestock interventions according to local preferences and local analysis of their relevance, feasibility and sustainability. Identified and prioritized interventions will form a basis for co-designing interventions that will be integrated into CRS Nawiri's phase 2 activities, to improve availability and access of livestock milk and the health of children and PLW in Marsabit and Isiolo Counties.

1.3.1 Specific Research Questions /Objectives

The purpose of this Adapted Milk Matters study is to identify community-defined interventions to increase dry season milk availability and accessibility to target communities, to inform the selection and co-design of Phase II interventions that in the long-term can be locally managed, which are affordable and scalable.

The specific objectives of the study include to:

- Identify appropriate local interventions for increasing milk production, directly or indirectly over one calendar year, particularly during dry seasons.
- Based on analysis on the availability and access of milk, and proposed type(s) of livestock and non-livestock support, co-design appropriate intervention frameworks with local communities, particularly women, for Nawiri Phase II.

1.3.2 Research questions

To aid in achieving the above objectives, the study will seek to answer the following key questions:

1. What is the effect of seasonality on livestock milk production?
2. What are local community participant suggestions on livestock and non-livestock interventions that directly or indirectly increase availability and access to livestock milk, particularly during the dry season?
3. How will the interventions help foster reduced workload among mothers and associated improved childcare practices?
4. What types of interventions do local communities feel Nawiri could support that will increase milk production and access in the context of Isiolo County and the North Subcounty in Marsabit?
5. How will the local communities sustain select interventions for increased milk production and greater access, considering factors of affordability, scalability and sustainability?

2.0. Overview of the Study Design and Methods

The Milk Matters approach employs a participatory methodology adopted from participatory epidemiology (PE), as described by Catley A, 2005, Burns et al., 2021a and Catley et al., 2012. Methods used include semi-structured interviews, seasonal calendars, consumption calendars, proportional pilling and matrix scoring, to better understand why animal milk availability and accessibility decline during the dry season, from community perspectives in Isiolo and Marsabit Counties. A series of county and comprehensive community discussions were held in various locations throughout the two counties, organized around interactive approaches to create datasets from ranks, scores and proportions that can be statistically analyzed.

2.1 Study design and locations

Milk Matters is an action research project first trialed in pastoralist areas of Ethiopia, that showed how targeted livestock support during the dry season and droughts can protect children from acute malnutrition. The first stage of the approach involves participatory analysis with pastoralist women while also ensuring the adequate involvement of men, to better understand why the availability and accessibility of animal milk decline during the dry season by livestock species, local contexts and local community livestock management practices. Based on this analysis, women then identify, propose and prioritize types of livestock support that they view as appropriate and that they could manage, considering potential additional workload, including milking animals and feeding children (second stage). Additionally, part of the analysis includes consideration of the costs of the intervention, with the aim of selecting and testing interventions that in the long-term can be locally managed and remain affordable.

The study was carried out according to a standard methodology that included desk review, a series of county and comprehensive community consultations in selected sites within the two counties, validation of the draft report by key stakeholders and final report production. The study was conducted in Isiolo and Marsabit Counties among the Borana and Samburu communities in Isiolo, and Gabra and Dassenech communities in Marsabit. In Isiolo County the study was conducted in Sericho Ward in Garbatulla Subcounty, Cherab and Chari wards in Merti Subcounty and Oldonyiro Ward in Isiolo Central Subcounty, whereas in Marsabit County it focused on the larger North Horr Subcounty, including Illeret, Dukana, Maikona and North Horr wards. These sub-counties are long time acute malnutrition hotspots and among the areas in which the nutrition situation remains critical, according to the GOK integrated phase classification for acute malnutrition (IPC-AMN) conducted in February 2021 (Government of Kenya, 2021).



2.2 Primary data collection and tools

The study was facilitated by a lead researcher and 6 research assistants trained in participatory methods including interviewing skills. In preparation for the fieldwork, several studies conducted by Nawiri including the nutrition ethnographic study in study areas (Hussein A. Mahmoud, 2020), an assessment of women's knowledge on the

seasonality and causes of child malnutrition (Burns et al., 2021b) and, investigation of the causes and seasonality of acute malnutrition (Burns et al., 2021a) were reviewed. Subsequently, the team consulted stakeholders through KIIs and FGDs at county level, using some of the following participatory methods:

- 1) Proportional pilling to compare seasonal milk off-take, to establish the proportional influence of certain factors on the reduction in milk off-take (e.g., animal disease, nutrition, and/or birthing patterns), to better understand milk use and distribution within households.
- 2) Map scoring for seasonal movement of livestock, to capture the typical movement of children under age 5 and identify livestock species kept at closest proximity to children per season.
- 3) Seasonal calendars to determine variation in rainfall and dietary intake of milk by species, and other foods given to young children, by season and by normal versus dry seasons.
- 4) A consumption calendar, to link relative changes in intake of animal milk by young children with absolute measures.
- 5) Simple scoring to determine how communities perceived the importance of certain factors as causes of malnutrition.

A total of 16 villages, two in each ward and eight in each county, were purposely selected in consultation with the Nawiri team and research partner, the Department of Livestock Production. At the village level community leaders, livestock producers, mothers/caregivers of children under age 5 and PLW, plus government representatives (Department of Veterinary Services and Ministry of Health), were selected to participate in discussions through a total of 32 FGDs and 23 KIIs (Table 2).

County	Subcounty	FGDs	KIIs	Total
Isiolo	Sericho	4 FGDs	5 KIIs	16 FGDs and 13 KIIs
	Cherab	4 FGDs	2 KIIs	
	Chari	4 FGDs	2 KIIs	
	Oldonyiro	4 FGDs	4 KIIs	
Marsabit	Illeret	4 FGDs	2 KIIs	16 FGDs and 10 KIIs
	Dukana,	4 FGDs	4 KIIs	
	Maikona	4 FGDs	2 KIIs	
	North Horr	4 FGDs	2 KIIs	
Total		32 FGDs		32 FGDs and 23 KIIs

2.3 Study limitations and challenges

Primary data collection occurred during one time period in September and October 2021, when populations were still facing the impact of the long dry spell, with the National Drought Management Authority (NDMA) Drought Bulletin classified “Alarm” situation in both counties. At the time several organizations, as well as the county and national governments, were providing interventions to respond to the situation. CRS support through Nawiri was providing unconditional cash transfers as well as other emergency interventions, including fodder distribution and water trucking. The situation and existing interventions may have resulted in the populations over-emphasizing the importance of emergency interventions such as fodder distribution, animal health and vaccination and cash transfers, without due consideration of the sustainability of such interventions. It therefore may also be important to conduct and compare the findings with those from other seasons. The research team attempted to triangulate information from different sources to ensure that interventions were appropriately designed.

3.0 Study Findings

3.1 The importance of livestock and the role of milk in the diets

Across all the wards in the two counties, cattle, camels, sheep and goats are the main livestock species, and study participants identified themselves as pastoralists/livestock producers, even when they were permanently settled in villages. FGDs underlined the importance of livestock for a variety of purposes, including food (meat and milk), income, social and cultural obligations, and drought power:

- Camels, cattle, sheep, and goats all provide food (milk and meat), though to varying degrees depending on the species, herd size and composition, and geographic region (see the relative importance of the different livestock species as a source of milk in 3.1.1).
- As income sources, sheep and goats, as well as camel and goat milk, were said to provide a regular flow of cash for the purchase of grains, meeting emergency needs such as health, for paying school fees.
- Sheep production was prioritized for markets as a source of income and slaughter for family, occasions and for gifting to main social relations.
- Among the Samburu of Oldonyiro, the FGDs ranked cattle highly due to their importance in meeting social and cultural obligations as noted by the Samburu elders who said, “although we have started to keep camels, cattle continue to remain the most important species when one is getting married, we pay our bride prices in cattle and the milk is most preferred for young children.”
- Respondents emphasized camels' resilience to climate shocks and the shifting species composition of pastoral herds (keeping more goats and camels) as livestock owners strive to diversify and manage risks, even in areas where cattle played a larger role.
- Camels and donkeys were valued as significant modes of transportation for migration, collecting water for households and livestock, transporting children and young stock, and delivering milk to markets and collecting essential goods (donkey).

3.1.1 Importance of different livestock species as sources of milk

Participants in FGDs were asked to rank and compare the livestock they kept based on the number of animals, relative importance and purpose of production, particularly milk production. While the most common livestock species kept were camels, cattle, sheep, goats, and donkeys, participants noted a link between livestock ownership, particularly camels and goats, and improved access to milk and children's nutritional status. Informants emphasized the importance of the different species driving the households' own consumption of milk, which differed between communities. In ranking (Figure 2) of the different species in terms of milk, the following was observed:

- The four pastoralist groups (Borana, Samburu, Gabra, and Dassenech) differed in their livestock management, the role of milk in diets, access to other foods, and how they feed their children.
- Households in Sericho, Oldonyiro and Illeret predominantly keep cattle, sheep and goats. They ranked goats, cattle and camels in descending order as the most valuable sources of milk. Sheep and goats were raised by practically every household in Illeret and were considered the most significant animal for milk production.
- Camels, goats and sheep predominate the production system in Dukana, Maikona, North Horr, Chari and Cherab, and as a result, camels alongside goats were ranked as dominant sources of milk for the households.

Although cattle were said to have higher milk outputs compared to goats and to fetch high prices in the market, they were more vulnerable in the dry seasons, needing more water and frequent watering.

- In Sericho, Chari and Cherab, although a few camels were kept, cattle and goats were the predominant species. Camels and goats were ranked as most important in Sericho, whereas goats and cattle were considered most important in Chari and Cherab.
- The value of lactating goats and a few cattle as sources of milk for households in the settlements, and for pastoral households left behind after splitting herds during the prolonged dry season or drought seasons, was emphasized in all regions. They were said to be easier to keep, feed and water, and the cost of herding them at the villages was low.
- In all locations, camels and goats were said to be most accessible across all seasons, as cattle moved very far from the settlements and sheep were rarely used for milking. In severe drought, however, the larger stock in also travelled much further for pasture, and consumption of milk by young children was severely reduced.

Ownership of multiple species of livestock was said to lead to better opportunities to access milk and improve the nutritional status of children and PLW. The significance of wealth (measured by camel ownership) and resource sharing on household access to milk was stressed by respondents in Oldonyiro: “Camel owners do not need to migrate as frequently and they have more milk (because of high milk yields, longer lactation and frequent milking) and for a longer period than cattle keepers,” noted an FDG participant. Comparatively, camel-owning households were said to experience improved nutrition through greater power to consume more milk for longer (due to higher milk output and lactation period), and diversified diets from the sale of camel milk:

“Cattle herding is becoming increasingly difficult. As Samburu, cattle are rooted in our culture being important for milk, incomes and culturally for marriage, as we pay bride price in cattle. However, as the drier periods become frequent and prolonged, we have to migrate exposing the community to conflicts with neighbors.” Samburu Elder, Labarshereik village, Oldonyiro Ward

Figure 2: Ranking relative importance of the livestock species kept as milk source in different seasons



3.1.2 Role of milk in diets and perceptions about malnutrition

Women in the study areas mentioned several types of food given to children of different age groups and PLW. The most common ones are animal milk (camel, cattle and goat milk), sweetened tea with milk, porridge, mashed potatoes and rice/ ugali with milk. As shown by the meal calendar (Table 3 below) and observed by the study team, there were very low levels of fruit and vegetable availability and intake across all the study locations, which

puts both the children and PLW at risk of vitamin deficiency, particularly Vitamin A and C, especially in locations where camel milk (rich in Vitamin C) is not consumed in adequate quantities. Also, most women's FGDs, particularly in Illeret, reported insufficient food at household level. Meal frequencies were also said to vary with incomes and mother's workload, with the lowest frequency of two meals per day reported in Illeret (for other locations, the frequency was between four and eight times for children).

Table 3: Meal Composition Calendar

Community	Breakfast	Lunch	Supper
Children less than 6 months	<p>Borana/Gabra: Mostly breastfeeding and sometimes water and camel maybe be diluted goat milk).</p> <p>Samburu: Breastfeeding, porridge, mashed potatoes, cow or goat milk</p> <p>Dassenech: Breastfeeding, diluted or fresh goat milk</p>	<p>Mostly breastfeeding and sometimes water and camel milk (maybe diluted goat milk)</p> <p>Breastfeeding, rice with soap, mashed potatoes, cow or goat milk</p> <p>Breastfeeding, diluted or fresh goat's milk</p>	<p>Mostly breastfeeding and sometimes water and camel milk (maybe diluted goat's milk)</p> <p>Breastfeeding porridge, cow or goat's milk</p> <p>Breastfeeding, diluted or fresh goat's milk</p>
Children more than 6 months	<p>Borana/Gabra: Tea with anjera (pancake) in the settlements, and milk when available, tea only or with ugali and milk for pastoral</p> <p>Samburu: Breastfeeding, porridge, cow or goat's milk</p> <p>Dassenech: tea with milk and milk in the rainy season</p>	<p>Ugali with milk/rice and beans in the settlements, and milk or tea in the pastoral areas</p> <p>Rice with beans, ugali with milk and some maize and beans and milk in the rainy season</p> <p>Cooked maize/wheat with cooking oil</p>	<p>Beans with rice, rice with soup and some milk in the evening</p> <p>Rice with beans, ugali with milk and milk in the rainy season</p> <p>No dinner, lunch leftover or cooked maize/wheat</p>
PLW	<p>Borana/Gabra: Tea with anjera in settlements, and tea and ugali with milk, some milk in the rainy season</p> <p>Samburu: tea with milk and porridge</p> <p>Dassenech: Tea with milk</p>	<p>Rice/ugali with soap in the settlement, pastoral women may skip lunch or have tea with milk</p> <p>Maize and beans, rice with milk, some milk in the rainy season</p> <p>Maize and beans, ugali with milk, sometimes fish</p>	<p>Beans with rice, rice with soup in the settlements, ugali with milk in pastoral and some milk in the rainy season.</p> <p>Maize and beans, porridge and diluted milk</p> <p>No dinners, lunch leftover or ugali/cooked maize</p>

When asked about food sources considered the healthiest and most nutritious for the family, the common response was "foods of animal origin such as meat and milk." Milk, particularly camel milk, is viewed as healthy

diet, expressed locally in terms of taste and influence on child health and growth in all communities. As a result, milk is a key part of children's diets in all the locations and is commonly given to them as fresh milk to drink and added to complementary foods like tea and porridge. Its importance for children was also clear from its early introduction (alongside water), typically within a few days of birth. Among the camel keeping Gabra and Borana, camel milk is given un-boiled¹ to new-born babies as a complementary food. Across all locations it was animal milk was given early to infants, the reasons cited being that animal milk is very nutritious, breastfeeding mothers did not have adequate breastmilk to meet the child's needs, "animal milk was good for the child as it was protective against diseases," and perceptions that breastmilk was "hot and would make the child thirsty."

The importance of milk for children's nutrition was also highlighted by health workers in the facilities visited. They observed that in the rainy season, when milk was available, the malnutrition cases significantly reduced. Similar evidence from nutritional assessments showed that in most areas where the nutrition situation was classified as IPC Critical, milk production and consumption were below long-term averages (Government of Kenya, 2021). While emphasizing the importance of animal milk, the health workers expressed fear that the widespread early introduction of animal milk (i.e., before 6 months) may reduce the practice and frequency of exclusive breastfeeding, besides exposing the children to the risk of contaminated milk or zoonotic diseases, particularly when milk is not boiled. This has also been reported as a risk factor for malnutrition in other studies that have shown low EBF rates in Marsabit and Isiolo Counties (Burns et al., 2021b; FAO et al., 2020; Government of Kenya, 2021). Most mothers, particularly in Illeret, claimed that family food was insufficient and that those breastfeeding mothers lacked good quality milk to meet their children's needs. The low spacing between children may also contribute to the early introduction of milk, considering that children are weaned once mothers realize they are pregnant again.

"Pastoral producers whose children and PLW are more dependent on milk diets are at risk of malnutrition in the dry seasons. Also, in this time, they migrate more and are more likely to not access health services and to default on nutrition programs. The situation in the dry season is made worse by the lack of markets. For those in settlements, at least they are in the better situation considering other alternatives such as UHT and powder milk are available", health facility in-charge Biliqi, Sericho Ward.

The predominant term used among Borana and Gabra communities to refer to malnutrition was *Defe Dab*, the term used among the Samburu was *Ngerai Namena*, all of which translate to "inadequate nutrition," whereas the Dassenech used multiple terms, "Um fouli gaa badaya" and "Um afyia mana," which translate to "very thin/ weak child" or "child of poor health." When shown pictures of malnourished children (marasmus, kwashiorkor and stunting), the mothers were able to recognize them saying that though stunting was seen, marasmus was considered more problematic. Malnutrition affects young children throughout the long dry season (and to a lesser extent during the short dry season), according to all mothers, and is associated with a lack of milk for young children, among other factors. These children were often said to be thin, crying and have "poor growth" and often said not to have breastfed well. As for the most vulnerable, women's FGDs identified children under age 5, PLW and the elderly as most vulnerable. In Biliqi and Iresaboru in Sericho, people with HIV/ AIDs were also mentioned as vulnerable individuals. Those under 2 years old and no longer breastfeeding were believed to be the most vulnerable, since they had not yet acclimatized to eating adult foods and were reliant on milk. For mothers, anemia was identified as one of the most common diseases affecting PLW and was associated with poor diets. Such women were said to face difficulties at childbirth and to have underweight children at birth, some of whom did not breastfeed well and were at risk of malnutrition later in life.

Inadequate income was identified as an important risk factor, particularly for the settled populations who had limited earning opportunities. Communities frequently cited the absence of sufficient and nutritious food, as well

¹ In Gamura village (Maikona), mothers reported boiling camel milk to prevent diseases and diarrhea among children.

as water, sanitation and hygiene² and childhood diseases as primary mechanisms for malnutrition. Inadequate nutritional intake by household members has been identified as a risk factor for PLW, as well as children under age 5. Access to milk was linked to children's ability to endure other malnutrition-related factors such as childhood illnesses like respiratory infections, diarrhea and malaria, all of which were common in the study locations. As for PLW, participants highlighted their increasing dependence on cereals as the main source of staple diets and they related their malnutrition to poor diets, loss of appetite during hyperemesis and pregnancy and workload during the dry season.

3.2 Seasonality in milk production, access and consumption, and other risks of malnutrition

The study areas' major livelihood source is pastoral, with fishing being practiced in Illeret Ward, which depends on rainfall. Isiolo and Marsabit Counties have two distinct seasons with unpredictable rainfall and dry seasons. Additionally, respondents in Oldonyiro reported getting sparse showers, locally referred to as *Lorikine*, in September (4 days). The short rains typically begin in April and May and are preceded by a short dry season from January to March, whereas the long rains begin in October and last until December, following a long dry season from June to September. Table 4 provides the Borana, Samburu, Gabra and Dassenech names for these different seasons.

Season (month of the year)	Local name of the seasons			
	Borana	Samburu	Gabra	Dassenech
Short dry season (January to March)	Bona Hagayya	Somso	Bona Hagayya	Mar
The short rainy season (April and May)	Ganna	Lngeringerua	Ganna	Irguda
Long dry season (June to September)	Adoleesa	Ngakua	Adoleesa	Mar Gudha
Long rains (October to December)	Agayya	Ltumuren	Agayya	Nyerube

3.2.1 Seasonality in milk production and availability

Table 5 depicts the seasonal calendar capturing milk production by different species of livestock in different seasons, with patterns of milk production determined by rainfall patterns. The seasonality and unpredictability of rainfall impacts on milk access and availability, hence on consumption. It also affected access to incomes, the prevalence of disease both livestock and human and access to services, as most pastoral producers moved from settlements where services were available, to distant pastures. Maximum milk production for all livestock species was in the peaks of the long and short rainy seasons (April, and November and December), when animals were lactating. The seasonal calendar also shows that following rainfall declines malnutrition in both children and PLW rises, peaking in the dry seasons (months of February and March, July and August).

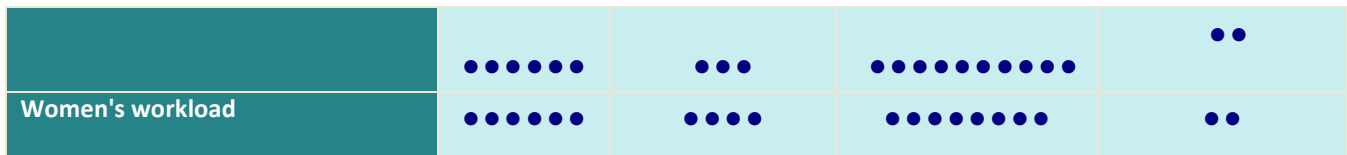
Key informants indicated these periods were when the hunger intensified as animal source foods declined, livestock prices reduced, access to water reduced and women's workloads increased. The key informants at health

² Access to water as a risk factor was particularly highlighted in areas with chronic water shortages such as Biliqi in Sericho where water was being rationed (five drums per household for five days) and in the dry season was sold at KES 5 per 20 liters.

facilities associated availability of milk during the rainy season with higher cure rates, even for children in nutrition programs. Similarly, a semi-qualitative evaluation of access and coverage (SQUEAC) study in North Horr in 2019 showed that the outpatient therapeutic program (OTP) cure rates surpassed the 75% threshold rates following the rains and scale-up of nutrition programs (Department of Health Services, 2019).

Table 5: Seasonal Calendar, Isiolo County

Indicator	Seasons			
	Short dry season	Short rainy season	Long dry season	Long rains (October to December)
Rainfall		●●●●●●●●	●	●●●●●●●●●● ●●
Livestock production				
Livestock prices	●●●●	●●●●●●	●●	●●●●●●●●●●
Migration of herds	●●●●●●	●●●	●●●●●●●●●●	●●
Calving/Kidding	●●	●●●●	●	●●●●●●●●
Availability of grazing resources	●●●	●●●●●●	●●	●●●●●●●●●●
Milk availability				
Camels	●●	●●●●●●	●●	●●●●●●●●●●
Cattle	●●	●●●●●●	●●	●●●●●●●●●●
Goats	●●	●●●●●●●●	●●	●●●●●●●●●●
Milk prices	●●●●●●	●●●	●●●●●●●●●●	●●
Household's diets				
Milk consumption	●●●	●●●●●●	●●	●●●●●●●●●● ●
Consumption of cereals	●●●●●●	●●●	●●●●●●●●	●●
Livestock diseases	●●●●●	●●●	●●●●●●●●●●	●●
Childhood malnutrition	●●●●●	●●●	●●●●●●●●●●	●●
Childhood Illness				
Diarrhea, fever and pneumonia	●●●●●●	●●●	●●●●●●●●●●	●●
Malaria	●●●	●●●●●●	●●	●●●●●●●●●●
Kala-Azar	●●	●●●●	●●●●	
Anemia (PLW)	●●	●●●●	●●●●	



3.2.2 Seasonality in milk consumption and access

To understand the relative changes in intake of animal milk by young children and PLW, their consumption patterns were assessed by examining the amount and frequencies of consumption. There was a significant difference in milk intake of children and PLW in the wet and dry seasons, as evidenced in the consumption calendar for the different seasons. In comparing the two counties, it was noted that children in Marsabit were more dependent on milk and had higher milk intake compared to Isiolo (Table 6). This may explain the higher levels of malnutrition in Marsabit, where reduction in milk intake had higher levels of impact on child nutrition. It was observed that the level of milk commercialization was higher in Isiolo, with producers having access to larger Isiolo and Nairobi milk markets. Children from areas with higher camel populations had also higher seasonal milk consumption, which may be explained by the higher milk output and lactation period compared to areas that depended on cattle, sheep and goats.

Table 6: Average daily milk intake by children during the different seasons

Season	Sericho	Chari	Cherab	Oldonyiro	North Horr	Dukana	Maikona	Illeret
Short dry season	400 ml	400 ml	400 ml	350 ml	500 ml	500 ml	400 ml	400 ml
Short rainy season	800 ml	800 ml	600 ml	500 ml	1,300 ml	1,300 ml	900 ml	800 ml
Long dry season	300 ml	300 ml	300 ml	250 ml	400 ml	500 ml	300 ml	300 ml
Long rainy season	1,000 ml	1,200 ml	1,000 ml	800 ml	1,500 ml	1,500 ml	1,500 ml	1,000 ml

Discussants highlighted children under age 5 were prioritized when milk was available. As a result, younger children consumed larger quantities of milk in all seasons. While children in the study areas were accessing more than the recommended daily milk intake of at least 500 ml for children aged 24-59 months (Dror & Allen, 2014; World Health Organization, 2005) in both the short and long rainy seasons, the daily intake reduced significantly in the two dry seasons. In the rainy season, when pastures and water were available, and there were lactating animals, most of which stayed close to the homesteads, milk was more available to children and PLW.

“During the Ganna and Agayya, when milk is available, we prefer to give them as much as they can take. Even those who do not have an adequate herd will get the support of relatives and neighbors. However, in the dry season, they are only fed on milk once or twice per day but will consume tea with milk and have other foods with milk.” FGDs Participants, Mothers/caregivers of children under age 5, Saru village, Dukana

The situation was worse in the long dry season when nearly all children in all the villages except in Dukana were consuming less than the recommended daily intake. For example, at the time of the assessment (middle of the long dry season) milk production in Isiolo, with camels providing almost 90% of the milk, production had declined dramatically to 0.98 liters from 1.35 liters the previous month, whereas, in Marsabit, household milk production per day dropped to 0.75 liters/household/day below the short-term average milk production of 1.6 liters (NDMA, 2021a, 2021b). The intake of sweetened tea with milk and cereal-milk mixes increased, while the frequency of milk alone reduced. However, better-off families (those with incomes or larger herds), still were able to access

milk from their herds or market. The FGDs participants noted that older children who were herding animals, especially camel herders, accessed milk away from the households as they milked the animals on a need basis (ad hoc). Also, discussions revealed the importance of kinship support in accessing milk during the different seasons. While most of the households have some milk during the wet season, the poorer households are usually given milk-free by their relatives and neighbors. For example, among the Samburu, it was considered taboo and unethical to refuse to give milk, especially by camel owners, if a person asks for milk.

Access to nutritious food such as milk was generally low for PLW. There was an unequal distribution of milk as with other foods, with mothers accessing the smallest share of food/milk. When food is scarce, women prioritize children and men, allocating themselves smaller portions or lower quality foods. As a result, milk consumption among PLW was generally low, particularly in the dry season and among poorer households. Even in the rainy season, when milk was said to be available, women consumed less milk even than men. In Illeret, it was clear from the relative sizes of the milk gourd that men had even higher milk consumption than children in the rainy season (Figure 3). The highest allocation of milk for PLW was in Dukana and North Horr, where they consumed up to 600 ml in the wet seasons, and about 200-300 ml in the dry seasons (in sweetened tea or diluted with water). Women in their menstrual cycle are not allowed to drink milk or to milk animals among the Dassenech, even when cattle milk is plentiful during the *Irguda* (short rains) and *Nyerube* (long rains).

In all the FGDs, participants reported that no special diet is prepared for children and pregnant and breastfeeding women; they are offered what is available to the family.

However, one key informant³ noted that women from better-off families, especially in the settlements, sometimes bought liver and offals during pregnancy. It was also noted that children and PLW in Oldonyiro Ward had better access to and were consuming fruits and vegetables compared to other locations.

The reduction in milk consumption by children and PLW in the dry seasons coincided with an increase in cereals consumption among pastoral producers. As a result, availability of income was an important determinant of access to animal milk to alternatives such as ultra-heat-treated (UHT) milk or powder milk and other commodities. The team inquired into the availability and pricing of milk in the study markets. As shown in Table 7, the availability and pricing of milk varied seasonally depending on several factors including the livestock species and the access and size of the milk market in the village. In Isiolo, producers had access to milk markets in both wet and dry seasons, with *Boda Boda* motorbikes collecting milk from distant camel herds. A limited amount of fresh livestock milk was available in the market in Illeret during the wet or dry seasons, leaving households without livestock to rely on UHT or powder milk during the dry seasons. As for the livestock species, camel milk was available in all seasons, followed by goat milk, with cattle milk only available in the rainy season.

In terms of pricing, milk prices were substantially lower during the wet seasons when producers had surpluses and were closer to settlements. Hence because milk is more readily available on the market at lower prices, more households can access milk. As well, during the dry season diets were less diversified, with households consuming more grains as income, milk and food supplies decreased and milk market costs were higher. In the dry season

Figure 3 : Milk Gourds for Fathers and Children – Illeret



³ Community Leader in Iresaboru, Sericho Ward. However, it was noted that in most of the small villages, meat was only available occasionally (retailing at KES 400-450 per Kg) as there were no formal slaughters.

the settlement households were dependent on a few lactating animals that remained close to the homesteads, on animal milk or milk alternatives (UHT and powder milk), or on more on cereal-based diets sourced from the market.

Table 7: Prices of milk in the different seasons (KES per liter)

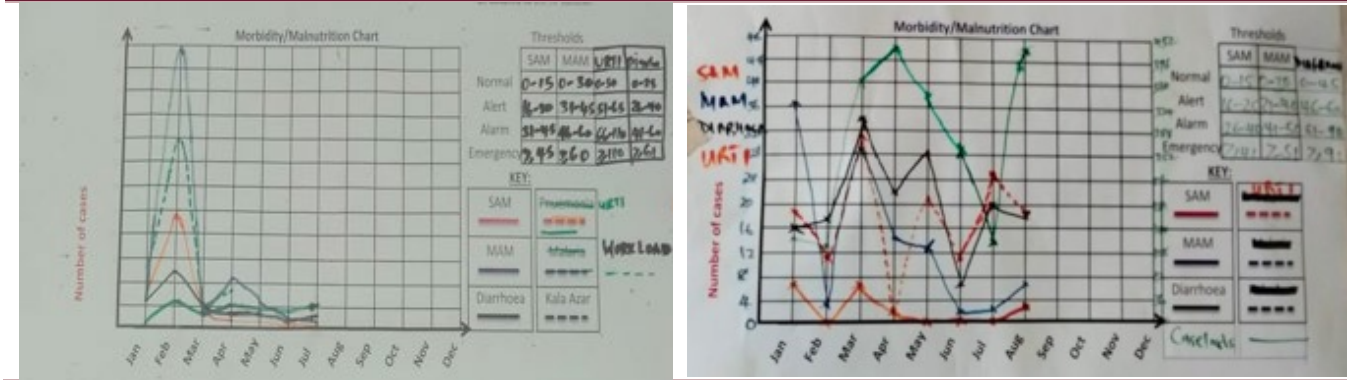
Milk	Season	Sericho	Chari	Cherab	Oldonyiro	North Horr	Dukana	Maikona	Illeret
Camel milk	Wet	50	50	50	50	60	60	50	50
	Dry	80	80	80	80	100	100	80	100
Goat milk	Wet	50	50	50	50	60	50	50	40
	Dry	80	80	80	80	100	100	80	80
Cattle milk	Wet	50	50	50	50	-	50	50	40
	Dry	80	80	80	80	-	100	80	80
UHT milk	Wet	200	200	200	200	200	200	200	200
	Dry	200	200	200	200	200	200	200	200
Powder milk	Wet	1,800	1,800	1,800	2,000	2,000	2,000	2,000	NA
	Dry	1,800	1,800	1,800	2,000	2,000	2,000	2,000	NA

3.2.3 Seasonality in child morbidities and caseloads of malnutrition

One of the biggest contributing causes of malnutrition, according to the health personnel interviewed, is co-morbidity. The caseloads at facilities usually increased during the dry season, when milk availability reduced, and food become scarcer because of a reduction in incomes from livestock and milk sales. The health workers also reported the commonality of childhood diseases such as common cold/pneumonia, malaria, fever, and diarrhea, as well as diseases of PLW such as anemia, malaria, and pneumonia whose occurrence varies seasonally. In Biliqi, which was prone to seasonal flooding, health workers also reported increased reports of Rift Valley Fever and abortions in animals following the flooding seasons. In areas around Sericho, Chari and Cherab, cases of Kala-Azar (visceral leishmaniasis were also reported).

While an outbreak of acute watery diarrhea was observed in villages like Biliqi during seasonal flooding, instances of diarrhea surged in other regions during periods of water scarcity throughout the dry season, putting children at increased risk of malnutrition. In FGDs, women noted that with their increased workloads, including water collection from distant water points, the children were left with siblings, neighbors or relatives, often resulting in reduced care standards. During the rainy seasons the situation improved because water was more readily available for personal hygiene and children had better access to milk, raising their immunity. In contrast, malaria cases were said to be at their greatest during the wet months of May–June and November–December, when vector mosquitoes are at their highest. These findings were corroborated by key informants in health facilities, who plotted seasonality in malnutrition rates in the area (Figure 4).

Figure 4: Seasonal morbidity and malnutrition caseload (Gus and Illeret)



3.3 Factors affecting milk availability and access in the dry seasons

The amount of milk yields and incomes for animals and livestock products, which are influenced by several factors, determine the success and nutrition of pastoral households. Despite being adapted to the local environment livestock productivity is susceptible to seasonal influences, and producers report significant reductions in outputs during the dry season. Low and unpredictable rainfall characterizes the climate in the studied areas, affecting pasture and water availability as well as animal health, reproduction rates and milk production, which are crucial assets for pastoral livelihoods. The lack of adequate year-round feed resources and water is considered the most important factor contributing to the low productive and reproductive performances of livestock compared to other production systems. This seems to be worsening with climate change, as the North Horr Ward administrator stated: "the dry seasons are growing more severe, there are no pastures, and more and more people are losing animals and living as destitute in the villages." Other key elements that influenced milk availability and access over the seasons included animal disease, migration, incomes and milk commercialization, as detailed below. Livestock producers also complained about the increasing rangeland degradation due to disruption of traditional grazing patterns, resource sharing and management mechanisms being disrupted by conflicts/ insecurity, poor governance, increasing settlements and water points.

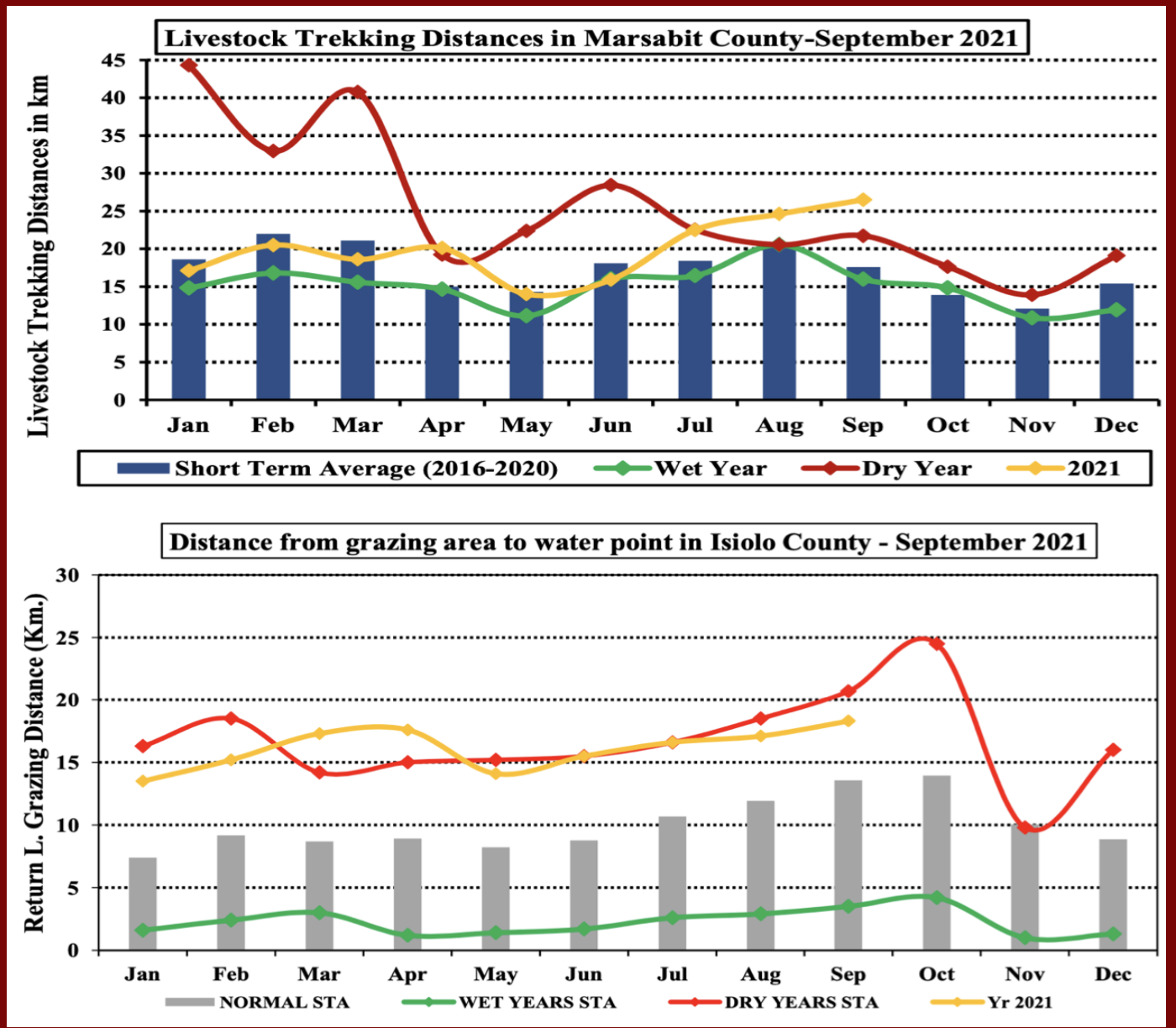
3.3.1. Migration and access to pastures and water

Livestock migration is a crucial strategy for dealing with the communities' lack of year-round feed resources and water. In the FGDs, producers reported that in the wet seasons when water and pastures are abundant, livestock rarely migrates but stays close to home locations. However, with the reduction in grazing resources in the dry season, migration becomes more widespread. The distances to water points increases tremendously and watering cycles become longer. While calving and kidding reduce, the few lactating animals either dry up or significantly reduce their milk outputs. In addition, calving and kidding reduce during the dry season, circumstances which result in lower milk production for both household consumption and marketing.

As shown in Figure 5, the average household water distances to the main water source grew from 3.8 km to 4.1 km in Isiolo at the time of the assessment (September 2021), with the longest one-way journey being in Cherab, where residents walked to River Ewaso Nyiro traditional wells. For livestock, the distances increased from 17.1 km to 18.3 km, with the situation being alarming in Chari, Cherab, Sericho and Garbatulla wards. Figure 5 shows the distances to water points for livestock in comparison to normal seasons in Isiolo and Marsabit Counties (NDMA, 2021a, 2021b).

In normal (non-extreme) seasons the whole family migrates together, allowing household members to continue to benefit from their livestock products. However, when two seasons fail, to cope adequately, the households are forced to undertake abnormal migration to distant areas, with women and children typically left closer to settlements. Such migrations often result in relocations to areas further away from water, markets and health facilities, which could have a particularly negative impact on women and children when the entire family migrates. Despite being left with some lactating animals, more vulnerable children and women are left behind have less access to milk than those with bigger herds. This family splitting negatively impacts the food security and nutrition of those more vulnerable family members left behind and was said to be particularly dangerous when these include children, PLW and the elderly. Health workers noted that this period was most critical for children in nutrition programs, as it was common for them to default⁴ during such times.

Figure 5: Livestock distances to water points in Isiolo and Marsabit (September 2021)



⁴ In the nutritional programs, defaulters were children who were registered into the program, but have missed three consecutive visits to the health facilities.

Conflicts were noted as an additional risk for individuals who move with livestock to distant pastures in the dry season in Illeret, Dukana, Maikona, and Sericho, which have at times resulted in forced migration, livestock loss, and death as well as severely impacting on nutrition for livestock-dependent households. Seasonal migration in the study areas occurs within the traditionally demarcated clan habitats. However, as the dry season progresses herders may move into the grazing areas of neighboring clans, which fuels conflict: *“Conflicts by themselves limit producers from accessing different grazing areas. The areas around Buluq have some grazing resources, but because of risks of conflict, both the Gabra and Dassenech have to avoid the area,”* noted the North Horr Sub county administrator. He also noted that the clan conflicts have curtailed access to cross border markets for livestock in Dukana and complicated the movement of goods, all of which affect the pricing of goods and livestock in the ward, with potential impacts on food security and nutrition.

3.3.2 Livestock diseases

Several livestock diseases are endemic in the study areas, all of which have an impact on livestock productivity. Although some of these endemic diseases have lower incidence during the dry season, livestock weakened by dry seasons face extra risks associated with lowered immunity, due to poor nutrition. As well, the dry/ drought season can amplify the effect of parasites and infectious diseases through increased transmission of diseases at crowded water points. Although livestock producers and key informants were unable to estimate the amount of milk lost due to disease, they believe that livestock diseases are the second most important factor affecting animal productivity: *“Livestock diseases tend to reduce milk availability either through a reduction in milk yields, abortions or deaths,”* reported the North Horr Livestock Production Officer. These diseases were reported to be seasonal and vary in their relative impact and importance based on species affected, morbidity, mortality, production loss, treatment ease and cost.

Asked to rank the diseases of importance for the different species, the respondents highlighted:

- For sheep and goats, the most significant diseases were Peste des Petits Ruminants (PPR), sheep and goat pox, pneumonia (such as contagious caprine pleuropneumonia – CCPP), diarrhea, enterotoxaemia and abortions.
- For cattle, pneumonia (such as CBPP), foot and mouth disease (FMD), lumpy skin disease, ephemeral fever and anthrax were identified as the frequently occurring diseases in the localities.
- The most significant camel diseases were trypanosomiasis, mange, hemorrhagic septicemia, diarrhea, pneumonia and tick infestation, all diseases of economic importance.

Surprisingly, endemic diseases including worm infestation, mastitis and reproductive diseases, which were thought to be prevalent and have a direct impact on individual-level productivity, were not ranked highly. This could be because for pastoralists animals are largely a source of financial capital, hence diseases that cause mortality (and thus loss of financial capital) are prioritized and producers are less concerned with diseases that do not result in deaths. The seasonal prevalence of livestock diseases was described by communities studied using a seasonal calendar (Table 8).

Table 8: Seasonal Calendar, Livestock Diseases North Horr Subcounty

Indicator	Seasons			
	Short dry season	Short rainy season	Long dry season	Long rains (October to December)
Rainfall		●●●●●●●● ●	●	●●●●●●●●●●●●●● ●
Livestock Disease				
Sheep and goat pox	●●●●	●●●	●●●●●●●●●●●●	●●
Pneumonia such as CCPP	●●●●	●●●	●●●●●●●●●●●●	●●
PPR	●●●●	●●●	●●●●●●●●●●●●	●●
Enterotoxaemia	●●	●●●●●●●●	●●	●●●●●●●●●●●●
Tick borne diseases e.g., anaplasmosis	●●	●●●●●●●●	●●	●●●●●●●●●●●●
Worm infestation	●●●●●	●●●	●●●●●●●●●●	●●●●

In the dry season, diseases were a major concern as respondents said that drought exacerbates the impact of diseases. According to livestock producers, PPR the most contagious of sheep and goat diseases is often associated with the onset of cold dry periods in the long dry spell. This was due to increased transmission as animals congregate at limited water points, reduced feed and long trekking distances. According to FGDs, diseases such as CCPP and CBPP, PPR and sheep and goat pox have similar patterns of occurrence, peaking during the drier months of the year compared to diseases such as enterotoxaemia and orf (Poxvirus family), which were said to occur more frequently in the rainy seasons, while worm and tick infestation occurred through all seasons. During the dry seasons, animals were said to bring back diseases when they travel to new grazing areas and congregate at watering points.

“Once the dry season sets in, disease incidences increase as animals congregate at the watering points, become weak to withstand diseases and producers do not have much money to treat them. However, in Biliqi, because of the occasional flooding just before the normal rains, outbreaks of diseases such as foot rot and rift valley fever occur.” Community Disease Reporter (CDR), Biliqi Village, Sericho Ward

Livestock producers were concerned that institutional responses to diseases were insufficient given the dire need for animal health services and extension workers. Markets for private inputs were also underdeveloped. Key informants in the livestock sector, on the other hand, stated that some community members were unwilling to vaccinate their livestock on time. They claim that these individuals only request vaccine services when an outbreak occurs locally. However, the interviewees acknowledged that the government generally lacked qualified personnel in the field and/ or has failed to respond to disease outbreaks on time. They also cited budget deficits and related logistical challenges in the counties as significant factors.

“The lack of appropriate animal health surveillance and effective animal health and extension system also pose problems whenever a disease spreads in an area. Although we continue to provide the county governments with surveillance data and reports the responses have not been timely.” Community Disease Reporter (CDR), Dukana Ward.

3.3.3 Access to incomes and markets

Market access (animals and commodities markets) remains critical for access to food and income from the sale of livestock and livestock products in the study areas. The two most important livestock-based sources of income are the sale of live animals (mainly sheep and goats) and milk. Animals were sold to households and middlemen in the settlements throughout the year, and milk was supplied to households and intermediaries in the communities. During the dry seasons the number of animals sold increased, as households needed to supplement their milk diets with cereals: *“During the prolonged dry seasons, we sell an average of four to six goats to cover our food needs,”* said a livestock producer in Saru, Dukana Ward. Local markets were crucial for the selling and purchase of animal products, particularly milk as well as cereals, in addition to the sale of livestock.

Respondents complained about a lack of markets for animals and livestock products in all the sub-counties. While producers in Dukana and North Horr were more organized, aggregating sheep and goats and transporting them to Nairobi for better prices, producers in other areas were reliant on distant markets in Isiolo and Marsabit or on middlemen in the settlements. Illeret had no livestock markets, therefore they have had to rely on Ethiopian markets, where it is more common to barter 30 sheep and goats for a camel and sell cattle for KES 10,000 and sheep and goats for KES 3,000-6,000. The average cattle prices per season are shown in Table 9.

Table 9: Livestock prices in the different seasons (KES)

Livestock species	Wet seasons	Dry seasons
Camels	50,000 - 65,000	30,000 – 40,000
Cattle	35,000 – 40,000	15,000 – 25,000
Goats	6,000 – 10,000	3,000 – 4,000
Sheep	3,000 – 5,000	2,000 – 3,500

Even though market conditions were deemed to be fair and supply to be good throughout all settlements, the market is prone to seasonal fluctuations. As the dry season progresses, livestock prices continue to fall as the number of animals sent to market increases (due to a greater need for pastoralists to sell animals to buy cereals), animal body condition deteriorates and the number of traders in the market decrease. Markets were also affected by livestock diseases, with the possibility of market closure increasing when outbreaks occurred, and prices dropping as traders avoided locations where outbreaks had been recorded. During dry seasons and outbreaks of disease, the drop in animal prices coincides with a rise in cereal prices, resulting in a reduction in food availability and access. Nutrition insecurity among children and other vulnerable groups, such as the elderly and PLW, is one of the resulting effects on food security.

“Livestock prices fall during the dry seasons and in drought, the animal conditions are so poor that nobody will buy them. There are no markets in either of our subcounty. We are lucky this time, the Kenya Meat Commission is doing emergency offtake and paying KES 4,500 per animal, even the young ones in poor condition.” Ward Administrator, Maikona Ward

In contrast to livestock markets, no significant changes in the prices of essential commodities were said to occur in the goods market. However, due to the poor livestock-to-cereals terms of trade, producers reported they faced challenges in purchasing cereals. Table 10 provides the prices of essential commodities in the different wards.

Table 10: Prices of Essential Commodities In The Study Areas

Commodity	Sericho	Chari	Cherab	Oldonyiro	North Horr	Dukana	Maikona	Illeret
Sugar kg	120	120	120	120	120	120	120	100
Rice kg	100	100	100	100	100	100	100	100
Wheat flour kg	100	100	100	100	100	100	100	100
Vegetable cooking oil 3 liters	240	240	240	250	250	220	230	250
Maize flour kg	60	60	60	60	60	60	60	100
Maize kg	40	40	40	50	50	35	35	50
Beans kg	100	100	100	100	100	120	100	100
Tea leaves Sachet	20	20	20	20	20	20		20

The inadequacy of common income sources to satisfy household requirements and purchase milk for children during the dry season, particularly among the poor⁵ in the settlements, was a prevalent theme in all the FGDs. Humanitarian aid, alternative livelihoods and cross-border markets for livestock and essential commodities were all highlighted as critical for these households' food security. Some emergency relief was delivered throughout all communities by NGOs, the county and national government, but coverage was deemed to be insufficient and quantities inadequate. Alternative livelihoods were limited to small businesses in the settlements and a few people, particularly in Illeret, were stated to be involved in fishing as well as the collecting and selling of firewood and charcoal.

In Illeret and Dukana, access to cross-border markets for livestock and essential goods was critical. These markets were said to cushion producers from the lack of local livestock markets, deteriorating livestock prices in existing markets and the poor livestock-to-cereals terms of trade. Unfortunately, conflict between the Borana and Gabra have resulted in the closure of informal cross-border movements of essential goods, thereby increasing prices. In contrast, cross-border markets in Illeret were found to be relatively well-functioning in terms of goods movement across the border. Furthermore, because of the Dassenech's close familial ties on both sides of the border, they were able to benefit from the relief provided on both sides of the border.

3.3.4 Commercialization and consumption of milk

In both Isiolo and Marsabit milk from livestock was consumed within the household, sold in the neighboring markets and/or gifted to needy relatives and neighbors. The study team wanted to understand how milk was allocated between these uses and how that may affect children's and PLW's access to and availability of milk. Women were in charge of allocating milk for various purposes (except when animals moved to distant grazing areas accompanied by herdsmen), such as keeping aside milk for children and selling milk. Women's FGDs stressed that being responsible for milking and its control, they prioritize children over other uses. However, species/milk yields, household size and number of children, availability of milk markets, cash needs of the household, and the need to maintain kinship relations, all influenced the quantities allocated to different uses. According to data from proportional pilling, only approximately 20% to 30% of the milk produced was sold, with the percentage being higher in Isiolo, where the milk market was more developed. During the dry seasons, women FGDs said that they adjusted these allocations based on the requirements of their children and household for necessary foodstuffs.

⁵ The proportion of households that were considered poor varied slightly from one location to another ranging between 25% and 40% of the population in the villages.

Milk sales, particularly camel milk, were a common strategy of disposing of surplus milk during the rainy season so that other essential commodities could be purchased. The amount of milk sold varies depending on whether it is rainy or dry, although camel milk is the most popular in both seasons. Milk sales were similarly influenced by distances to markets. Producers in Saru, Dukana Ward, and Lafey in Cherab, for example, noted that milk sales were generally low due to poor roads, even during the rainy season when milk surplus occurred. Across the settlements, there was a trend toward increased milk commercialization, particularly among the Borana and Gabra as opposed to Samburu and Dassenech communities. Key interviewees in Isiolo attributed the trend to the rising milk market in the region and milk delivery to Nairobi markets. There were also huge peri-urban camel herds that were commercialized in the Isiolo Central and Kulamawe that supplied Isiolo women milk cooperatives. Professional milk traders may now purchase milk from distant herds owing to the opening of roads and the introduction of *Boda Boda* motorbikes, resulting in a more flexible marketing system in locations like Isiolo, where milk demand is high.

Asked about the use of incomes from the sale of milk, women indicated that with milk sales, they were able to purchase other foods from the market, access water and other services such as healthcare. It was obvious from the consumption calendar (Table 3) that several of these foods, despite being less nutritious than milk, were consumed by children and PLW. Although not investigated, other studies have noted the potential of higher incomes of milk from increased productivity, resulting from investments having the potential to improve access to WASH and other services, to purchase nutrient dense foods such as fruits and vegetables, and to increase the ability of households to respond to existing or new knowledge on nutritional improvements (Tangka et al., 2000). Key informants also stressed the relevance of milk commercialization in facilitating non-livestock owning households' access to milk for their children, through increased availability and lower prices. Women and caregivers, on the other hand, were aware of the dangers of poorer households selling most of the milk they produced to meet family needs rather than feeding it to children, as well as the misuse of milk income for some non-nutritive commodities like alcohol and miraa.

Asked which households were likely to sell milk, women's FGDs observed that while stock-rich households had surplus milk, poorer households were more market dependent as they devoted milk sales to purchase grains for their households.⁶ Regardless, it was evident that the decision to sell milk was largely influenced by its market exchange value, which fluctuates not just by season and which affects milk supply and pricing, but also by the producers' proximity to markets. For example, producers in Dima Adho, Marara, Biliqi, Iresaboru and Lakole had closer access to better markets and were more commercialized than those in Lafey, Illeret, North Horr and Dukana. It was interesting to note that in comparison to other locations, options to access through traditional kinship support were less mentioned in places where milk was commercialized.

3.4 Interventions to increase milk availability and access in the dry seasons

Because of the importance of livestock and milk in alleviating the burden of malnutrition, study participants believe that interventions that reduce livestock' vulnerability to shocks will have a major influence on population nutrition and well-being. As a result, KII respondents and men and women who took part in the FGDs proposed multiple actions at several levels: production, marketing and consumption, all of which would boost milk access and availability. As indicated below these interventions were divided into two categories: direct (livestock) and indirect (non-livestock) interventions.

⁶ As noted by Herren, 1990; and Holden et al., 1991, stock-poor households are more likely to abandon their reliance on milk and instead turn to milk markets to convert their below-subsistence milk into higher calorie-dense cereals. As a strategy to maximize milk outputs, these households tended to live close to the settlements.

3.4.1 Direct (Livestock) Interventions

Several direct (livestock) interventions were identified by the participants. Although these measures have the potential to reduce the prevalence of acute malnutrition, a more holistic integrated approach focused on risk factors would be more effective than single interventions. The following are interventions were highlighted:

Emergency feed/ fodder distribution to safeguard herds and sustain milk production in the dry season: Considering that access to feed resources and water were considered as most important factors in milk availability and access, FGD participants were asked about how they addressed it and what interventions will address related constraints. The participants noted the most common strategy was to migrate and split the herds, followed by emergency supplementation and water trucking. While most respondents still saw migration as a realistic strategy, they did point out a few limitations. They noted that while they used to practice wet and dry season grazing, the practice was no longer viable due to increased settlements and water points, as well as the breakdown of traditional governance systems. As a result, the area is now used for year-round grazing, which prompts herders to relocate their animals to the grazing pastures of other clans/ tribes, potentially causing conflict.

To ensure that households had access to milk, producers noted that they separate the herds into lactating and dry herds, leaving behind the lactating herd with larger households closer to settlements with few lactating animals, while the satellite (dry) herd will move with the younger men to distant pastures. To safeguard the remaining herd and sustain milk production, they would supplement the animals on collected local grasses and acacia pods, *Urba*. At the time of the study, women in Sericho, Chari and Cherab were collecting and chaffing indigenous grasses from far away locations to supplement animals that stayed in the households throughout the dry season. Livestock keepers in Chari and Cherab sourced harvested hay (in bales) from farming groups in Kinna, livestock keepers in North Horr from farming groups in Kalacha, and livestock keepers in Oldonyiro purchased hay from traders who sourced it from Laikipia and areas of the Rift Valley and Central Kenya for supplementation. In Biliqi and Iresaboru, livestock keepers were purchasing maize (100 kg at KES 2,700) and feeding lactating and weak animals during the dry season.

When asked about the alternatives for assuring long-term access to livestock feed, FGD members indicated both short-term and long-term solutions. They suggested targeted emergency feed supplementation for lactating herds that remain behind when satellite herds migrate in the short term, to target goats and cattle, as camels were less vulnerable, and sheep were not generally kept for milk production. As for the households to be targeted, participants identified poorer households (defined by herd size and incomes) who have malnourished children, or which have children under age 5 at risk of malnutrition. The intervention was considered significant in ensuring that lactating animals continued to produce milk, animals marketed had better body conditions and were able to attain better prices, and animals were protected from infections and mortality throughout this critical season.

Two long-term interventions were identified: improving access to alternative fodder markets and improving grazing management. Key informants highlighted that while fodder was available in Kinna and Kalacha and opportunities existed to meet gaps from other areas, the distribution and market system for fodder remains undeveloped. The use of vouchers for emergency voucher distribution and support to fodder farmers were seen as options to develop linkages between fodder producers and farmers. Improved water, feed, pasture and natural resource improvement and management were mentioned in Sericho, Chari and Cherab wards as well as in North Horr, Dukana and Maikona, though in all of these locations, informants highlighted challenges typical to implementing these interventions, particularly rangeland management.

Similarly, addressing conflicts and facilitating reciprocal grazing among neighboring communities was also highlighted, but informants felt that such interventions will require buy-in from both local and political leadership within the counties, which remains difficult. The author is aware that the Frontier Counties Development Council (FCDC), as well as the Livestock Market Systems Activity implemented in the two counties, are investing in facilitating legislative frameworks and policies in the two areas including Ward Development Plans, Rangeland Management Bills and Peace and Cohesion Bills in Marsabit and Isiolo Counties.

Improving animal health and productivity: Livestock diseases were ranked as the second most important factor in access and availability of milk during the dry season, being said to reduce milk yields and lead to mortalities. As a result, animal health interventions, particularly regular vaccination and treatment, were prioritized in all locations. According to informants, the situation was made worse in the two counties by the high endemicity of diseases, inadequacy of current preventive and surveillance measures by the county government, the poor animal inputs market and the unavailability of extension and animal services.

Asked what they were doing to manage risks and impacts of diseases, producers reported that they would avoid areas of reported outbreaks and that they attend their animals when sick. Asked what improvements need to be instituted, KII and FGD participants suggested improving animal health through either emergency treatment and vaccination, or long-term access to inputs, are the most important interventions at production level to increase productivity, access and availability to milk in the study areas. Livestock producer FGDs noted these interventions play a central role in mitigating impacts of diseases on milk production, particularly in the dry season when animals were too weak for their immunity to protect them from common diseases. While the animal health interventions were prioritized for all livestock species and throughout the seasons, participants noted the importance of such interventions for lactating and pregnant animals and young stock that are more vulnerable to diseases in the dry season, and that need to return quickly to higher levels of productivity and reproduction following the rains.

Another intervention recommended at productivity level by FGD respondents in Illeret, was improving local breeds, particularly of goats. It was observed that local Dassenech goats were smaller and less productive in comparison with the Galla goats kept by neighboring Gabra communities. Respondents suggested that considering that goats are the most important species for household milk production, improving productivity through crossbreeding with Galla goats, which were kept in similar environments, would have a direct impact on local productivity levels. Also, as livestock ownership was related directly to access and the availability of milk, restocking or animal transfer was seen as an important way of increasing the number of milking animals available to stock-poor pastoralists with inadequate or no livestock. Increasing the ownership of camels was said to allow for longer (due to longer lactation) and greater milk access to the households concerned (per milking and through ad hoc milk access when herding).

Although little research exists, comprehensive animal health has been found to boost milk production in terms of both volume and lactation duration (Sadler et al., 2012; Simpkin, 1985). However, the interventions need to address weaknesses in their design and implementation as identified by study participants. A common complaint is *“the timing of livestock vaccination is always poor, coming for short periods and mostly when animals are too weak.”* From the discussions, it is clear that livestock producers still think it’s the role of the government and NGOs to provide animal health services. Some inputs were available in all local markets and producers were buying them, e.g., the several SIDAI linked agrovets in Isiolo (Sericho, Merti, Kinna, Garbatulla and Oldonyiro).

Strengthening livestock and milk marketing: Improving milk marketing and increasing its availability in markets through the formation and strengthening of women’s groups/ cooperatives was suggested as important. However, although some women in FGDs highlighted the importance of availability and pricing for households in the settlements, for livestock producers they saw the intervention as improving access to incomes and food for the households, rather than as significant to child nutrition. Asked about the type of milk to be targeted, the women FGD participants prioritized fresh camel and goat milk, considering existing high demand in the settlements. However, in a few locations such as Saru in Dukana ward, where milk surplus and spoilage were reported to occur in the rainy season, FGD participants recommended better preservation and value addition of milk.

Some key interventions recommended to strengthen livestock and milk marketing included:

- Targeted management of diseases that affect milk production, plus markets and improvements in access to grazing and fodder resources.
- Improve handling and storage skills and transportation facilities for milk and livestock value chains.
- Introduction of standards and quality controls to ensure the safety of livestock products.

- Traders' capacity development, training, strengthened market linkages and promotion.

Milk supplementation for malnourished children and PLW was recognized by one key informant as a significant intervention for improving milk access and availability. S/ he feels that offering milk vouchers or conditional cash transfers to malnourished children and PLW would enhance immediate consumption while also stimulating milk markets. In this case, milk traders from Boda Boda, who have access to remote milking herds, would be hired to redeem vouchers from the targeted community participants, incentivizing them to bring milk to market.

3.4.2 Indirect (non-livestock) interventions

Cash transfers: This was one of the most common interventions in the study area, with Nawiri, the Hunger Safety Net Program and other government safety nets in process of being implemented. At the time of the assessment, Nawiri was implementing 3 months of cash transfers at KES 5,000 per month. It is therefore not surprising that cash transfer was the highest prioritized intervention. Asked how cash transfers would improve access to milk, increased consumption through market purchases was the identified mechanism, with nearly all FGD participants saying that milk for tea and children is a common expenditure item, alongside sugar, tea leaves and other food items. A few participants also reported using part of the cash transfer to purchase veterinary drugs and ensure the health and productivity of their animals. In contrast to other locations, in Illeret, food aid distribution was reported as an important non-livestock intervention. This may have been because food aid distribution was ongoing at the time of the study on the Ethiopian side of the border and some study respondents, particularly in Ilolo village, had benefitted from it.

According to a recent systematic review of the effects of cash on children's nutritional status (Manley et al., 2020), cash transfer programs to households with young children improved linear growth and contributed to reduced stunting, with the most likely pathways being increased dietary diversity, including increased consumption of animal-source foods and reduced diarrhea. However, the impact on availability and access to milk for the child may be diluted because the money received may not just be used for the child's needs, especially during the difficult dry season when cereal requirements to supplement household diets and other seasonal expenses are considerable. It is therefore important that the size of cash transfers meant to increase access and the availability of milk for children in the dry season should be adequate to cater to both the child's specific needs and the needs of the entire household. Such interventions would also need to be complemented with other child nutrition-sensitive interventions like behavior change communication (BCC) for better nutrition and health (e.g., USAID, 2011), through more stringent targeting criteria and also addressing the underlying causes of milk scarcity.

Strengthening income-earning opportunities: Access to incomes to purchase nutritious foods was considered very important and the lack of alternative earning opportunities, outside livestock, identified as a constraint by women. While milk sales and small businesses were seen as important sources of income, women observed that the low business acumen of owners, the risky environment they operate in, and limited capital investments have curtailed the expansion of growth sectors and the realization of new opportunities. Asked about what interventions would be necessary to support these businesses, women reported that the provision of small grants, business and entrepreneurship training and market linkages would be important. They also identified other opportunities such as supporting dairy goats, poultry, bee production and supporting financial access through village saving and loans associations as some options in the settlements. They noted that there are several active women's groups in all the settlements, some of them running businesses such as guesthouses and lodging facilities.

Strengthening existing nutrition programs for the management of child and PLW malnutrition: The health facilities in the study were running outpatient and supplementary therapeutic feeding programs (OTP and SFP) targeting children under age 5 and PLW. These services are providing nutrition screening and assessments, distribution of nutrition supplements, health education and counselling among other services, and were implementing the surge model to monitor the performance of related OTP and SFP services. The health workers met and women's FGDs reported caseloads being highest in the dry seasons, impacted by low access to milk for the children and general household food insecurity. The women/ caregivers reported positive changes in children enrolled in the programs such as improved nutritional status, improved feeding/ appetites and weight gain for children, improved health of PLW, increased breast milk for lactating mothers and more knowledge on child health, nutrition, breastfeeding

and good hygiene practices. However, concerns were raised about the stockout of supplements and essential medicines in local facilities. It was therefore recommended to strengthen the current nutritional program through ensuring sustained access to nutrition supplements and essential medicines and strengthening integrated outreach services to reach malnourished children in hard-to-reach villages, which will remain a critical component in addressing the malnutrition burden in the two-county acute malnutrition hotspot locations.

3.5 Implications of the interventions on mother's/caregiver's workload and childcare practices

While women generally work for long days, with their daily routine starting as early as 4am and continuing to 9pm, this increases during the dry season. As well as their roles in taking care of animals and milk-related activities, they were also responsible for the daily and time-consuming tasks of childcare, food preparation, water and fuel collection, which on average took up to 6 hours per day. Their workload peaks during the long dry season usually in July and August, when women spend longer hours caring for children, fetching water and firewood, tending to small stock, kids and calves, and cooking for the family. Women's workload may reduce during the rainy season, but not drastically if compared to men's workloads then.

In the FGDs, mothers/ caregivers of children under age 5 were asked about childcare practices, including initiation of breastfeeding, what foods they gave their children in different stages and in the different seasons. It was encouraging to see that, as suggested by UNICEF and WHO, mothers reported starting breastfeeding within the first hour of their baby's birth. However, pre-lacteal feeding with water was also said to occur. Unfortunately, mothers were not aware of the risk of exposure to contaminants when giving infants water, which can easily cause infant diarrhea. They commonly reported that complementary feeding started between six and eight months, and that after one-year young children were mostly offered the food prepared for the family, rather than anything specially prepared for them. The most common complementary foods were fresh milk or powder milk, porridge and tea (mostly with some milk). Animal milk, which was most preferred, was said not to be always available, particularly for poorer households.

Women said that their increasing workload was an impediment to mother-child interaction and associated it with poor nutritional status among children and PLW. Combined with child/ early marriages, which remain rampant particularly in Illeret Ward, mother-child interaction was said to be affected more by poverty and poor traditional attitudes to education of the girl child, and poor child spacing, making most women fatigued. The increased mother's workload and their poor nutrition, particularly during the dry season, was also said to exert additional pressure to provide other diets to children. In such instances, animal milk alongside other foods such as tea with milk, powder milk, porridge and other foods were immediately introduced.

Through discussions with mothers/ caregivers of children under age 5, the study sought to know how they understand the likely impact of proposed interventions to address issues of access and the availability of milk during the dry season on women's workloads and decision making. Women were also responsible for the lactating and pregnant animals, most of which stayed close to homesteads during the dry season. Asked whether additional time will need to be allocated by women to animal husbandry as a result of the interventions, respondents noted that care of small ruminants, young stock and pregnant/lactating animals will remain an activity undertaken by women. While some women did not consider their livestock responsibilities to be a burden, many others believed that livestock added significantly to their daily workload.

"Women will still do these activities whether interventions are implemented, at least we are sure that with such interventions, children will have more milk and surplus can easily be sold considering the local demand."
Women/caregiver FGD participant, Dima Adho village

Emergency feed/ fodder distribution for livestock remaining close to homesteads during dry seasons was thought to reduce the time and labor required for full days, as well as for feed collection and management, onerous tasks for women and children. As for the improved commercialization of milk, it was observed that with the advent of

motorized transportation (*Boda Bodas* and *matatus*) of milk⁷, women in Chari, Cherab and Sericho were relieved of frequent travel to markets that would have left less time for childcare and other household responsibilities. While animal health interventions were said to benefit the family, women FGD participants thought that fodder supplements and improvements in the milk value chain will be of particularly higher benefit in terms of generating benefits directly from their herds. The women observed they had control and access to all milk in the households, allocating it to different uses. As a result, interventions targeting these animals for animal health, feed supplementation, and the strengthened marketing of milk were perceived as more likely provide more milk and incomes that will either increase the consumption of milk by children and PLW or provide women with incomes they can use to enhance their children's nutrition.

As recommended in the Livestock Emergency Guidelines and Standards (LEGS) Gender Briefing Paper (Beth A. Miller, solid gender analysis should be included during the assessment phase⁸ for each recommended potential intervention, the intervention targeting should include women and the monitoring and evaluation, and livelihood impact assessments should provide gender-disaggregated data and indicators for women's empowerment or rise in status. The Women's Empowerment in Agriculture Index (WEAI), designed by the International Food Policy Research Institute (IFPRI), remains an important tool to capture women's empowerment and inclusion levels in the agricultural sector (International Food Policy Research Institute (IFPRI), 2012), all resources to draw on as related interventions are rolled out in Phase II.

⁷ The common practice was women loading milk on the milk transport and clearly marking on the jerrycan the name of the trader to who the milk will be delivered and after the milk was sold, the trader will send back the essential commodities needed to the producers by the same means of transport.

⁸ The Briefing Paper recommends the "1/3" women guideline (used in many African and Asian countries) as a minimum for women's representation during all interactions with communities.

4.0 Conclusion and Recommendations

Nutrition sensitive agriculture and food sector measures, as well as nutrition specialized interventions, are thought to play a critical role in reducing the debilitating effects of malnutrition (FAO, 2017). Nutrition-sensitive agriculture, according to FAO, 2017, comprises the long-term cultivation of a varied range of economically affordable, culturally acceptable and safe animal/ plant-based foods in sufficient quantity and quality to meet population dietary needs. This study aimed to identify appropriate context-specific community-defined interventions that will increase milk production, directly or indirectly, over one calendar year and particularly during dry seasons. Given the long-term changes in livestock ownership, it focused on both livestock and non-livestock interventions that will form the basis to co-design interventions that will be integrated into CRS Nawiri's phase II activities, to improve the availability and access of livestock milk and the health of children and PLW in Marsabit and Isiolo Counties.

The study demonstrated the importance of milk for the nutrition of children and PLW. Milk, the most common food among pastoralists, is a good source of high-quality protein and vitamins and a significant contributor to overall energy consumption. As a result, boosting milk consumption protects young children from acute malnutrition as well as stunting (Sadler et al., 2009). While in the wet seasons, children had adequate access and intake of milk as per WHO recommendations of at least 500 ml for children aged 24-59 months, there was a significant reduction in intake during the dry seasons. According to the FGD and KII respondents, as found in other research, reduced milk access and availability was associated with increased malnutrition rates. The main factors related to reduced access and availability of milk in the dry season were lack of year-round feed resources and water that contribute to the low productive and reproductive performance of livestock, combined with animal diseases which impact on livestock productivity, migration, conflict, access to incomes and markets, and milk commercialization.

In the study, communities prioritized several livestock and non-livestock interventions that will increase milk production directly or indirectly, over one calendar year and particularly during dry seasons. They identified several potential intervention areas including animal health, emergency feed/ fodder distribution to protect herds and maintain milk production during the dry season, water, feed, pasture and natural resource management, strengthening livestock and milk marketing and restocking, all of which could help ensure that children have access to milk during the dry season and drought periods. These interventions are in line with the FAO key recommendations for improving nutrition through agriculture, "Guiding Principles on Agriculture Programming for Nutrition" (FAO, 2013), and the Livestock Emergency Guidelines and Standards (LEGS, 2014). However, the design and implementation of these interventions should take into consideration several contextual issues to ensure their contribution to improvements in the nutrition and health outcomes of children and PLW and their long-term sustainability. Associated recommendations are discussed below:

4.1. Recommendations

Previous Milk Matters studies in Ethiopia and Karamoja demonstrate livestock-based interventions as a cost-effective dry season/ drought strategy to preserve milk production and the health and nutrition status of vulnerable community members, thereby helping avoid expensive treatment measures for severe acute malnutrition. Proposed livestock and non-livestock interventions, therefore, have clear potential to increase milk production, directly or indirectly. However, these interventions alone will not be enough to address malnutrition burdens in Isiolo and Marsabit counties. Further, as noted in this study, the design and implementation of livestock-based interventions have often been criticized by participants and evaluators, including for their sustainability challenges. See below some recommendations to address these issues:

- *Adopt a multisectoral approach to solving malnutrition and increasing multi-sector coordination:* As long experienced, malnutrition cannot be solved through single sector approaches but requires more comprehensive and coordinated approaches. The nutrition and development communities are increasingly

aware of the need to address nutrition-related problems both directly (via nutrition-specific interventions largely in the health sector), as well as to address the determinants of nutrition through a variety of preventive, nutrition-sensitive interventions across sectors (e.g., Levinson & Yarlini B, 2013). Working on multiple fronts simultaneously over time has the potential to leverage synergies and generate results that go beyond what sector-specific programs can achieve on their own (e.g., Fanzo & Pronyk, 2011).

- Take into consideration the role of markets and cash transfers in the design and implementation of the interventions: The previous Milk Matters interventions were designed and funded in humanitarian contexts but noted the potential for markets to play a role in the design and implementation of sustainable approaches to addressing malnutrition. For example, USAID East Africa Resilience Learning Project, 2015 highlights the importance of market analysis at design stage and recommended the piloting of voucher schemes in this context. FAO, 2011 summarizes the opportunities for using different types of cash transfers (unconditional cash transfers, conditional cash transfers, cash for work, indirect grants and vouchers), to support different LEGS interventions⁹ (including veterinary services, feeding resources, livestock provision, water provision, destocking and provision of shelter). The author notes that the decision on whether to use cash transfers is context-driven as factors of market function, project scale, security, target population preferences, donor and agency preferences all need to be considered. Once an assessment including market analysis is complete, the feasibility of using different potential transfer options can be decided on.
- Strengthen nutrition-related social and behavior change communication (SBCC) to promote positive choices: In the study context livestock plays multiple roles, household nutrition being one of them. Strengthening nutrition-related SBCC is very important in promoting the right choices, by increasing nutrition-related knowledge and education and by fostering wider community environments conducive to sustained positive change and lasting impact. Further, effective SBCC can help ensure that anticipated increased productivity and market opportunities realized from the interventions allow for increased household incomes, without reducing foods kept for own household consumption by children and PLW at home. That interventions do not result in the consumption of less nutritious foods and do not inadvertently increase the risk of malnutrition.

Also, as Nawiri seeks to improve access and the availability of milk, food safety risks of animal source foodstuffs need consideration, as they impact on health and nutrition. Foodborne gastrointestinal infections (diarrhea and/ or vomiting) have been linked to camel milk and vegetable market chains in Kenya (e.g., Kaindi et al., 2012). In Isiolo and Marsabit Counties, milk sourced from animals was rarely treated, use of antibiotics and other inputs was not well regulated and withdrawal periods for drugs was not observed. While SBCC activities can help create awareness on instituting best livestock management practices, the need to pasteurize or adequately heat/ treat camel milk before consumption, interventions to ensure milk quality and safety, such as good milking environment hygiene, using appropriate containers (for example stainless steel that is easy to clean), cooling milk immediately after milking and boiling or pasteurization before consumption, need to be implemented. In addition, Nawiri will need to work closely with partners such as VSF Germany that is implementing the One Health Project in the study area.

- Robust measurement of actions implemented: Interventions targeting livestock have traditionally led to improved productivity. However, it is also important to understand whether and how increased productivity leads to improved nutrition. It is therefore important that the design of the interventions include clear nutrition objectives, indicators and methods for assessing related objectives and indicators. For the livestock interventions, it is also important to measure at least some intermediate outcomes such as consumption (at the individual level), e.g., the volume of children's/ PLW's milk intake. Relatively simple tools for measuring nutritional impact, such as participatory impact assessment and the dietary diversity index, can also be used (Kate Sadler & Emily Mitchard, 2012).

⁹ Livestock Emergency Guidelines and Standards (LEGS)

Annexes

Literature cited

Beth A. Miller. (n.d.). *LEGS Gender Briefing Paper: enhancing the integration of gender into the 2nd edition of LEGS*.

Burns, J., Catley, A., & Mahmoud, H. (2021a). *Using Participatory Epidemiology to Investigate the Causes and Seasonality of Acute Malnutrition in Marsabit and Isiolo Counties, Northern Kenya: Methods and Experiences*.

Burns, J., Catley, A., & Mahmoud, H. (2021b). *Women's knowledge on the seasonality and causes of child malnutrition in Marsabit County, Kenya*.

Catley A. (2005). *Participatory epidemiology: A guide for trainers*.

Catley, A., Alders, R. G., & Wood, J. L. N. (2012). Participatory epidemiology: Approaches, methods, experiences. *The Veterinary Journal*, 191(2). <https://doi.org/10.1016/j.tvjl.2011.03.010>

Department of Health, I. C. (2020). *Isiolo County Integrated SMART Survey Report*.

Department of Health Services. (2019). *Semi Quantitative Evaluation on Access and Coverage Report: North Horr Sub-County, Marsabit County*.

Dror, D. K., & Allen, L. H. (2014). Dairy product intake in children and adolescents in developed countries: trends, nutritional contribution, and a review of association with health outcomes. *Nutrition Reviews*, 72(2). <https://doi.org/10.1111/nure.12078>

Fanzo, J. C., & Pronyk, P. M. (2011). A Review of Global Progress toward the Millennium Development Goal 1 Hunger Target. *Food and Nutrition Bulletin*, 32(2). <https://doi.org/10.1177/156482651103200207>

FAO. (2011). *The use of cash transfers in livestock emergencies and their incorporation into Livestock Emergency Guidelines and Standards (LEGS)*.

FAO. (2013). *Synthesis of guiding principles on agriculture programming for nutrition*.

FAO. (2017). *Nutrition-sensitive agriculture and food systems in practice: Options for intervention*.

FAO, UNICEF, & Washington State University. (2020). Seasonality of malnutrition: Community knowledge on patterns and causes of undernutrition in children and women in Laisamis, Marsabit County, Kenya. In *Seasonality of malnutrition: Community knowledge on patterns and causes of undernutrition in children and women in Laisamis, Marsabit County, Kenya*. FAO and UNICEF. <https://doi.org/10.4060/ca8749en>

Fujita, M., Roth, E. A., Nathan, M. A., & Fratkin, E. (2004). Sedentism, seasonality, and economic status: A multivariate analysis of maternal dietary and health statuses between pastoral and agricultural Ariaal and Rendille communities in northern Kenya. *American Journal of Physical Anthropology*, 123(3). <https://doi.org/10.1002/ajpa.10310>

Government of Kenya. (2021). *Nutrition Situation Communication Brief*.

- Herren, U. (1990). The Commercial Sale of Camel Milk from Pastoral Herds in the Mogadishu Hinterlands, Somalia. *Pastoral Development Network Paper No.30a*, ODI, London.
- Holden, J. S., Coppock, L. D., & Assefa, M. (1991). Pastoral Dairy Marketing and Household Wealth Interactions and their Implications for Calves and Humans in Ethiopia. *Human Ecology* 19(1): 35-59.
- Hussein A. Mahmoud. (2020). *Nutrition ethnographic study in Isiolo and Marsabit Counties*.
- International Food Policy Research Institute (IFPRI). (2012). *Women's Empowerment in Agriculture Index (WEAI)*.
- Kaindi, D. W. M., Schelling, E., Wangoh, J. M., Imungi, J. K., Farah, Z., & Meile, L. (2012). Risk Factors for Symptoms of Gastrointestinal Illness in Rural Town Isiolo, Kenya. *Zoonoses and Public Health*, 59(2). <https://doi.org/10.1111/j.1863-2378.2011.01425.x>
- Kate Sadler, & Emily Mitchard. (2012). *Impact of livestock support on animal milk supply and child nutrition in Ethiopia*. *Field Exchange* 44, December 2012.
- LEGS. (2014). *Livestock Emergency Guidelines and Standards, 2nd Edition*.
- Levinson, F. J., & Yarlini B. (2013). *Addressing Malnutrition Multisectorally: What have we learned from recent international experience?*, UNICEF Nutrition Working Paper.
- Manley, J., Balarajan, Y., Malm, S., Harman, L., Owens, J., Murthy, S., Stewart, D., Winder-Rossi, N. E., & Khurshid, A. (2020). Cash transfers and child nutritional outcomes: a systematic review and meta-analysis. *BMJ Global Health*, 5(12). <https://doi.org/10.1136/bmjgh-2020-003621>
- Muehlhoff E., Bennet A, & McMahan D. (Eds.). (2013). *Milk and dairy products in human nutrition*. Food and Agriculture Organization.
- National Drought Management Authority. (2018). *SMART survey final report conducted in the laisamis and North Horr Survey Zones of Marsabit County*.
- NDMA. (2021a). *Drought early warning bulletin for September 2021: Isiolo County*.
- NDMA. (2021b). *Drought early warning bulletin for September 2021: Marsabit County*.
- Sadler, K., Kerven, C., Calo, M., Manske, M., & Catley, A. (2009). *Milk Matters: A Literature Review of Pastoralist Nutrition and Programming Responses*.
- Sadler, K., Kerven, C., Calo, M., Manske, M., & Catley, A. (2010). *The fat and the lean: review of production and use of milk by pastoralists*. <https://doi.org/10.3362/2041-7136.2010.016>
- Sadler, K., Mitchard, E., Abdi, A., Shiferaw, Y., Bekele, G., & Catley, A. (2012). *Milk Matters: The impact of dry season livestock support on milk supply and child nutrition in Somali Region, Ethiopia*.
- Simpkin, S. P. (1985). *The effects of disease as constraints to camel productivity in northern Kenya*.
- Sophie Chotard, John B. Mason, Nicholas P. Oliphant, Saba Mebrahtu, & Peter Hailey. (2006). *Fluctuations in wasting in vulnerable child populations in the Greater Horn of Africa*.
- Tangka, F. K., Jabbar, M. A., & Shapiro, B. I. (2000). *Gender roles and child nutrition in livestock production systems in developing countries: a critical review*. (ILRI. Socioeconomics and Policy Research Working Paper. No. 27. 64p. Nairobi (Kenya): ILRI.). International Livestock Research Institute.

