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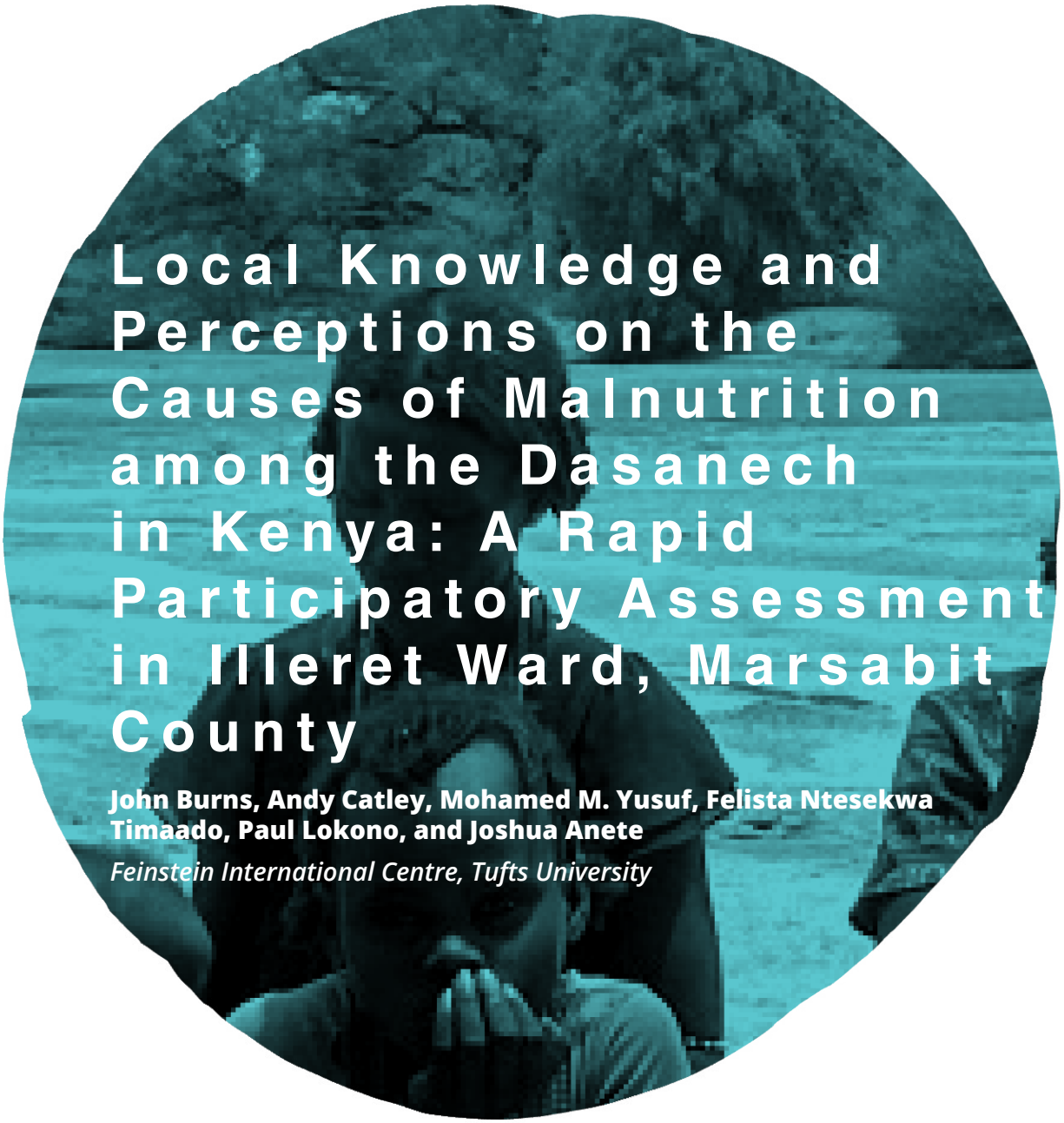

Local Knowledge and Perceptions on the Causes of Malnutrition among the Dasanech in Kenya: A Rapid Participatory Assessment in Illeret Ward, Marsabit County

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Nawiri

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Acronyms and Abbreviations

ASAL	Arid and semi-arid land
GAM	Global acute malnutrition
KES	Kenya shilling
PE	Participatory epidemiology
SMART	Standard Monitoring and Assessment of Relief and Transitions

Summary

This report presents the results of a participatory analysis of the causes of malnutrition in Dasanech children and mothers living in Illeret ward, Marsabit County, northern Kenya. The analysis was undertaken as part of the Nawiri project, the goal of which is to sustainably reduce levels of persistent acute malnutrition in Kenya's arid and semi-arid lands (ASALs). The analysis was carried out in 16 villages in Illeret ward in April 2022, at the height of a severe drought that had resulted in widespread malnutrition, which included several reported cases of child mortality. The assessment used participatory epidemiology (PE) methods in selected villages to investigate the causes of malnutrition and associated factors in mothers and children. These methods were complemented with focus group discussions, key informant interviews, and one-off participatory methods; results were triangulated with secondary data.

Key Findings

The key findings from the analysis were as follows:

Critical changes in physical access to land - until around 2010, the livelihood of the Dasanech community was highly dependent on the Omo delta and specifically the natural flood cycle of the Omo River, which flows from Ethiopia into the northern end of Lake Turkana in Kenya.[1] The delta provided a critical dry season grazing reserve for their cattle and good riverine farmland where they practiced dry season flood recession agriculture. Dairy products from cattle and crops from flood retreat farming were the two most important food sources for the Dasanech at the time. Seasonal migrations to the delta ensured the survival of their cattle as well as household food security for the better part of the year. During the pre-2010 period, participants indicated that cases of child malnutrition were rare and would mostly be attributed to disease. Over many years, there has been a gradual loss of delta land due to the rising water levels of Lake Turkana. A recent Kenya Government report attributes this rise to increasing precipitation and land degradation, as well as geological and tectonic factors.[2] This trend rapidly accelerated in around 2010. By 2012, the delta had become almost completely submerged, even during the dry season. This change in water levels and reduced access to land led to a cessation of seasonal migrations. Consequently, the Dasanech lost their two main livelihood resources, viz., their dry season cattle reserve and flood retreat plots for crop production, and their two main sources of food and income or exchangeable commodities.

Livestock losses - since 2012, the Dasanech community in Illeret has continued to practice mobile livestock production along Lake Turkana's arid eastern shoreline. However, with the loss of the dry season cattle reserve in the delta, over time cattle herds have diminished due to drought. These losses have been exacerbated by livestock diseases. Between 2010 to 2020, participants reported livestock losses of 60 percent. Losses had increased to 90 percent at the time of the assessment.

Changes in crop production - in response to declining access to flood plain land for cropping, people engaged in opportunistic rainfed crop production in seasonal riverbeds, but with disappointing results. Unlike flood retreat farming on the delta, rainfed crop production is limited by insufficient and unreliable rainfall, resulting in either small or failed harvests. There are limited opportunities for irrigated farming, as both the

1 This dependency on the delta was brought about through the loss of vast areas of what was historically part of Dasanech land over the past seventy years. The analysis focused on the more recent past and did not directly investigate the longer-term livelihood dynamics, which are comprehensively covered by Claudia Carr (2017).

2 See GOK and UNDP, 2021. Note that the report investigated rising lake levels in all of the rift lakes in Kenya, so therefore the relative importance of some factors may vary from lake to lake.

lake and ground water are brackish and therefore unsuitable for crop production.

Fishing practices - in the past, very few Dasanech engaged in fishing, and they only consumed fish in times of extreme hunger. However, by 2020 almost a third of the community had taken up fishing in order to survive. By the time of the assessment in 2022, 65 percent of the community were engaged in fishing. Although rich in protein, the nutritional benefits from fish have likely been offset by the absence of energy-rich staples, and the income benefits from fishing are minimal. Participants indicated that fish stocks are declining due to increasing competition over this resource. Similarly, for survival women have increasingly started engaging in time-consuming and energy-intensive activities such as the collection and sale of firewood, water, and charcoal. Women's workload has increased. Participants described this work burden as "unbearable" during times of drought.

Declining food availability - between 2010 and 2020, the assessment results show that total household food availability had more than halved as the community's access to delta land declined. They associated these changes with a rise in child malnutrition. At the time of the assessment, food availability had reduced to less than a third of the pre-drought food basket, and children were dying of severe acute malnutrition. Participants identified the very limited availability of livestock products such as meat, milk, and other dairy products as the most important factor contributing to both child and maternal malnutrition. They associated this problem with a decline in livestock herd sizes, specifically cattle numbers, as a result of losing access to their dry season grazing reserve on the delta. Insufficient food from crop production was identified as the second- and third-most important factors contributing to malnutrition in children and mothers respectively. Again, this was attributed to the loss of their flood recession farms on the delta.

Women's work - women's work burden was identified as the second-most important factor contributing to malnutrition in mothers and the fourth-most important factor contributing to child malnutrition. For mothers, this burden was associated with a marked discrepancy between the amount of work they do relative to the income and energy (nutritional) benefits they derive in return for their effort. For children, women's work burden led to long absences of the mother that resulted in inconsistent breastfeeding, skipped meals, and unhygienic practices due to the lack of adult supervision. Again, the increase in women's work was associated with the loss of livelihoods that was forcing women to engage in more labor-intensive activities to survive.

Declining income - insufficient income, primarily to purchase nutritious food, was identified as an important factor contributing to both child and maternal malnutrition. Again, this lack of sufficient income was directly associated with the loss of livelihoods and an increased dependency on cash to meet their food needs. This factor also relates directly to the other key factors discussed.

Gender, cultural, and social norms - several issues relating to gender, cultural, and social norms were identified as contributing to malnutrition. For example, no child spacing was an important contributing factor as it results in mothers getting pregnant while still nursing. This partly relates to a belief that the quality of breastmilk deteriorates when a nursing mother becomes pregnant, or that the mother cannot provide enough nutrients for herself, the nursing child, and the unborn infant, particularly in times of food scarcity and a heavy workload.

Other factors such as polygamy, divorce, and spousal neglect were also identified but not considered important relative to other factors. In most cases, participants felt that the relevance of these issues only emerged as a result of destitution brought about by the loss of livelihoods.

Human disease - various human diseases were associated with malnutrition, both as a symptom and a cause. These included diarrhea and brucellosis for both children and mothers and anemia for mothers only. Participants also frequently mentioned a disease locally know as "*bash raara*," which they associated with malnutrition in children and adults. *Bash raara* was

3 Ibid

translated as yellow fever due to the symptoms, but it was unclear if it is the actual disease known as yellow fever. Overall, disease was considered relatively less important than the other causes discussed. However, in the past when cases of malnutrition were rare, these few cases would mostly be attributed to disease.

Overall, the case of Illeret clearly shows how changes in land access have profound impacts on livelihoods, food security, and nutrition in a remote pastoralist community. These changes have taken place due to changing rainfall patterns and other external factors outside of the control of the Dasanech community in Illeret.[3]

Although the Dasanech have been remarkably adaptive over many years, the severe decline in livelihoods and food security since 2010 indicates that their adaptive capacity has reached a critical limit. Following the drought of 2021/2022, it's uncertain what the future holds for this community unless a clear pathway towards improved livelihoods can be identified and supported. Although emergency relief is needed and will save lives, long-term and meaningful investments in education, infrastructure, and services are clearly needed to support diversified livelihoods.

1. Introduction

Kenya's ASALs are characterized by high levels of child malnutrition, particularly global acute malnutrition (GAM) or "wasting," which is often estimated at between 10 to 20 percent.[4] Despite significant investments in food security, health, and nutrition programming, these areas have seen an increase in the prevalence of wasting in recent years.[5] The Nawiri project was launched in 2020 in direct response to this trend, with the objective of sustainably reducing levels of acute malnutrition in Turkana, Samburu, Isiolo, and Marsabit Counties. The project included a two-year design phase to better understand local drivers of persistent acute malnutrition, and to design evidence-based and contextually informed interventions for a second implementation phase.[6] As part of this design phase, a participatory epidemiology (PE) analysis was carried out in Isiolo and Marsabit Counties from February to April 2021. This analysis did not include Illeret ward, largely due to its small population size and a perceived absence of qualified researchers with the relevant language skills. In terms of nutritional surveys, between 2010–2020 only five nutrition surveys were carried out in Illeret.[7] The results from each of these surveys showed GAM rates well in excess of the emergency threshold of ≥ 15 percent, with two of these years being well above the extremely critical threshold (> 30 percent).[8]

Although Illeret is considered one of the more persistent malnutrition hotspots in northern Kenya, little is understood about the underlying causes of acute malnutrition in the ward.[9] With a view to addressing this evidence gap, Nawiri conducted a participatory analysis in Illeret in April 2022, towards the end of a protracted drought that had resulted in 12 reported cases of malnutrition-related child mortality.[10] The analysis had originally planned to investigate the causes and seasonality of maternal and child malnutrition using the same PE methods from the earlier analysis in Marsabit and Isiolo.[11] However, during preliminary discussions with community informants, it quickly became evident that seasonality was a less important factor contributing to malnutrition in Illeret than longer-term livelihoods shocks and trends. The PE methods were therefore adapted to investigate these underlying livelihoods changes and the relationship between these changes and the causes of acute malnutrition as identified and prioritized by the community.

1.1 Overview of the assessment area and population

Illeret is one of the more remote wards in Kenya, characterized by limited infrastructure and services. The ward is situated in the northeastern corner of Marsabit County on the border of Ethiopia, which lies to the north. Lake Turkana flanks the eastern boundary of the ward and Sibiloi National Park, a United Nations Educational, Scientific and Cultural Organization (UNESCO) world heritage site famous for its hominin fossil discoveries, lies to the south and covers over one-third of the land area of the ward. The climate is

4 See Ochola et al., 2021.
5 USAID/Kenya, 2015.
6 USAID, 2019.
7 These were humanitarian Standardized Monitoring and Assessment of Relief and Transitions (SMART) surveys
8 Ochola et al., 2021.
9 Theories proposed during Nawiri workshops and meetings largely focused on alcoholism, the reluctance of the Dasanech to eat fish, and other social norms generally alluding to cultural inferiority.
10 Komu and Walter, 2022.
11 See Burns et al., 2021a and Mahmoud et al., 2021

arid to semi-arid, with high spatial and temporal rainfall distribution. For example, 15 years of rainfall data collected by the Turkana Basin Institute (TBI) in Illeret and Koobi Fora between 2003 and 2021 showed average annual rainfall of 438 mm, with high variability between months and years.[12] Despite this variation, the rainfall pattern is generally bimodal, with the long rains from March to May and the short rains from October to November.

There are no permanent rivers in Illeret, but several seasonal streams (*lagas*) transect the ward from east to west. These provide one of the few sources of fresh drinking water, which is accessed through shallow wells in the dry riverbeds. The aquifer under Illeret is mostly brackish, with high levels of fluoride.[13] Although Lake Turkana provides water for camels and small stock, the chemical composition of the lake water makes it unsuitable for human consumption and is known to cause illness in cattle.[14] Fluoride levels in the lake are well above the acceptable limits for humans and livestock (all species) and are known to cause tooth mottling and skeletal fluorosis in people living near the lake.[15] The brackish lake waters are also unsuitable for crop production. It's estimated that about 90 percent of the lake's water comes from the Omo River,[16] which originates 400 miles to the north in the Ethiopian highlands. Other prominent geographical features include the relatively low-lying Surge hills and the Kokai range.

The majority of the population in Illeret belongs to the Dasanech community, who are traditionally pastoralists. Over time, they have diversified their livelihoods to include crop production and fishing.[17] During the first half of the last century, the Dasanech practiced expansive mobile livestock production, grazing their animals as far north as the Kibish River in Ethiopia, the contested Ilemi Triangle, and the rangelands south of the Ilemi Triangle on the western shore of Lake Turkana, as well as the eastern shores of the lake to the east and south of what is now Illeret ward.[18] Over time, they were forced to relinquish much of their territory and became increasingly concentrated along the lower Omo River and its delta on the northern end of Lake Turkana on the Kenya-Ethiopia border.[19] This loss of territory and mobility has likely contributed to increased hostilities between the Dasanech and their neighbors, often in the form of violent livestock raiding.[20] By the 1980s, the Dasanech had become increasingly dependent on the Omo delta, having diversified into flood recession agriculture and to a lesser extent fishing while still practicing mobile livestock production.[21] Gebre (2012, 23) describes this dependency on the Omo delta as follows:[22]

> During the rainy season, Lake Turkana fills up and water flows backward flooding upstream areas. Since the rain makes water and grass available in areas away from the lake and the river, people move with their livestock in different directions to exploit these resources. When the rain stops and the water level in the river and the lake recedes, most of the animals are taken back to the riverbank, the delta, and other permanent water points. The fertile alluvial sediment along the river and the delta is cultivated.

In addition to these food security benefits from flood retreat agriculture, the Omo floodwaters rejuvenate large areas of pasture, providing a valuable dry season cattle grazing reserve once they recede.[23]

12 Note that there were incomplete data for four years, including drought years of 2010 and 2011, so the long-term average could be lower than indicated.
13 Leakey, 2022.
14 Avery, 2013.
15 Ibid.
16 Carr, 2017.
17 Carr, 2017.
18 Ibid.
19 Ibid.
20 Gebre, 2012.
21 Carr, 2017.
22 Gebre, 2012.
23 Avery, 2013 and Carr, 2017.

The Dasanech population in Illeret is estimated to be just over 19,000.[24] Permanent settlements on Lake Turkana's northeastern shore emerged partly in response to the aforementioned concentration of the Dasanech around the Omo delta region during the 1980s, although seasonal livestock migrations into the area can be traced back much further.[25] Over the past decade, the Dasanech have become increasingly dependent on pastoralism organized around seven grazing areas running more or less parallel to each other from the north to the south of the ward.[26] Generally speaking, during the wet season livestock are moved to higher ground to the east of these seven grazing areas and then back to lower ground closer to the lakeshore during the dry season.[27] However, mobility is restricted by seasonality, the Ethiopian border, Sibiloi National Park, and conflict with neighboring communities,[28] most notably the Gabra who live to the east and southeast of Illeret.

In addition to livestock production, some communities within Illeret practice periodic crop production in the seasonal riverbeds when rainfall conditions are favorable. Other livelihoods activities include fishing, which is mostly done by men, and the collection and sale of firewood, charcoal, and water, which is done by women.[29]

24 KNBS, 2019.
25 Carr, 2017.
26 Mwamidi et al., 2018.
27 Ibid.
28 Ibid.
29 Interview with Nawiri staff from Illeret.

2. Overview of the Design and Methods

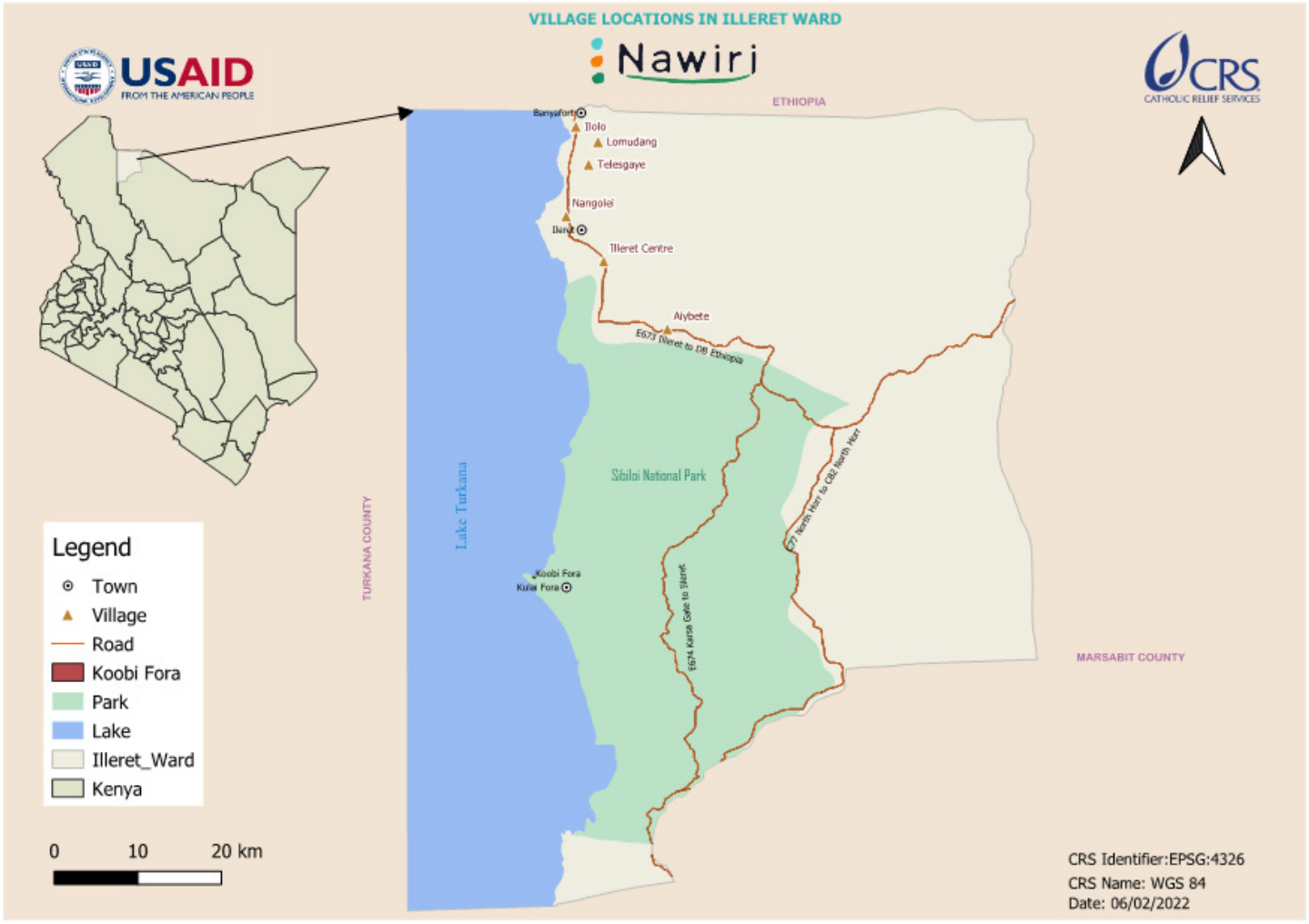
The participatory epidemiology (PE)[30] analysis was carried out from April 5–24, 2022 at the height of a severe drought. The exercise included a rapid ethnographic scoping exercise, which was carried out in four villages close to Illeret center. The ethnographic exercise involved focus group discussions to identify and document local terms for maternal and child health and nutrition and the perceived causes of malnutrition using photographs of malnourished women and children as prompts.[31] The exercise was also used to document local names for the different months and seasons and to identify activities or events associated with each of these months, as the assessment had originally planned to investigate the seasonality of malnutrition using the same approach as the earlier PE assessments in Isiolo and Marsabit.[32] However, it quickly became evident that in the context of Illeret, seasonality was less of an issue than longer-term livelihoods shocks and trends in terms of contributing towards malnutrition. The assessment was therefore adapted to investigate these livelihoods shocks and trends. Part of the scoping exercise was used to develop and test PE tools to this end. Following this modification, the assessment was structured around the following key questions:

- To what extent have cases of severe acute malnutrition changed over time?
- How have livelihoods and household food security changed over time?
- What are the differences in the diets of healthy vs. malnourished children in terms of specific food types?
- How do women describe and prioritize the causes of malnutrition in children and mothers?
- What are women's suggestions and priorities for improving nutrition, and what is the reasoning behind their views?

The PE exercise was carried out in 12 communities that were purposively selected to include villages with reported cases of child malnutrition and that were considered representative of the area in terms of livelihoods activities.[33] The selection was done by a Nawiri staff member and a research assistant, both from Illeret. In each village, focus group discussions were carried out with between 6–16 mothers. The focus groups were used to introduce the exercise and to discuss the causes of malnutrition in general terms using the local terms identified during the ethnographic exercise. These focus groups were also used to discuss livelihoods changes over time and to identify and agree upon key events or periods when major livelihoods changes occurred. This information was then used to identify three reference years: a typical year before 2010; a typical year between 2010 and 2020; the current year at the time of the assessment in 2021/2022. These three reference points were then used to assess changes in food security, livelihoods, and cases of child malnutrition for some of the PE exercises that followed. A typical year was described as one where there was sufficient as opposed to excess rainfall and an average crop harvest (where applicable) and average as opposed to excess or insufficient milk production. Drought years were obviously excluded, with the exception of the 2021/2022 reference year. Following these discussions, a joint analysis was carried out using the PE methods described below.[34]

30 See Catley et al., 2012 for more information on the PE approach.
31 See Annex II.
32 See Burns et al., 2021a and Mahmoud et al., 2021.
33 See Annex I for more details on the locations visited.

Figure 1. Map of the assessment area.



2.1 Proportional piling

Proportional piling was used to assess relative changes in food source contributions and livestock herd composition across the three reference periods identified. Participants were asked to distribute 100 stones to show the relative importance of different food sources in a typical year before 2010. The main food sources identified were livestock products, crops from their own farms, purchased foods, fish, wild foods, and relief food. Laminated visual aids were used to represent each food source, and participants were asked to distribute the stones across the six food sources (Figure 2). The more important the food source, the more stones would be assigned to it. Likewise, fewer stones would be assigned to less-important food sources. Participants were then asked to explain the scores and given a chance to change them if needed. Once consensus had been reached by the group, the stones were counted and the results recorded. Participants were asked to repeat the exercise for a typical year between 2010–2020, and then again for 2021/2022. Participants were then asked to explain the changes over time.

The same exercise was then used to show changes in livestock herd composition across the same three reference periods. Only animals used for food (milk, meat, etc.) were used; hence cattle, camels, and small ruminants were selected.[35] Sheep and goats were combined into one category.

34 In some of the villages, the participants were split into two groups after the introductory focus group, with one group doing the causal diagram and the other group doing the other scoring methods.
35 Poultry was excluded as it was not deemed an important food source, although this may be changing in response to increased sedentarization.

For both exercises (food sources and herd composition), participants were asked to provide scores for the community as opposed to an individual household or a specific village. This was done because during some of the reference years not all villages would have engaged in farming or fishing or own camels, yet the members of a nearby (neighboring) village might have owned camels or engaged in the other livelihoods activities.[36]

Figure 2. Examples of a proportional piling exercise.

Photos: John Burns

2.2 Before and after scoring using a nominal baseline

This method is similar to proportional piling but was used to assess changes over time for single indicators.[37] The method used 100 stones to represent a baseline value, and participants were asked to either add or take away stones to show changes against that baseline. This method was used to assess changes against the following indicators across the three specified reference periods:[38]

- Cases of child malnutrition;
- Livestock herd size;
- Overall food availability;
- Proportion of the community engaged in fishing.

For the food availability exercises, groups were asked to show the total food basket for an average family in the community during the specified reference year. For the livestock herd size indicator, participants were asked to show the total herd size (total number of cattle, small stock, and camels) for each reference year. In four of the villages, male elders and younger herders were invited to participate in this exercise. For both exercises, the nominal baseline of 100 stones was assigned to the pre-2010 reference year, and participants were asked to add or subtract stones for the other two reference years.

For the exercise on changes in child malnutrition, the reference year was 2021/2022, and 50 stones were used to represent the number of cases of children with malnutrition using a photograph of a malnourished 2-year-old child. Participants were then asked to add or subtract for the other two reference years.

For the exercise on the proportion of the community engaged in fishing, 100 stones were used to represent the entire community for each reference year. Participants were asked to show what proportion of households in the community engaged in fishing for each year by subtracting stones to represent this group.

As with the proportional scoring exercises, participants were asked to explain and give reasons for any changes observed in the scores across different years.[39]

2.3 Causal diagram

For the causal diagram method, participants were asked to identify and discuss the key causes of malnutrition for both women and children, using photographs of a child/mother with acute malnutrition as a visual prompt (Figure 3). Each identified cause was then represented using

36 This information emerged during the scoping exercise.
37 There are different ways to combine the two methods to show both actual and proportional changes. However, a number of these were tested during the scoping exercise and proved to be either time consuming or impractical.
38 Before and after scoring usually involves only two reference periods.
39 More details on these methods can be found at: Catley et al., 2014, https://fic.tufts.edu/publication-item/participatory-impact-assessment-a-design-guide/.

a diagram, and the causes were scored by the informants by dividing a pile of 100 counters against the causes to show their relative importance. Further questions were used to probe the scores and understand relationships and linkages between causes. More details on this method are available in an earlier Nawiri PE report.[40]

Figure 3. Example of causal diagram scoring exercise.

Photo: Felista Timaado

One of the features that distinguishes PE from more-conventional participatory tools is the standardization and repetition of the methods. This allows for datasets to be created from ranks, scores, or proportions that can be statistically analyzed even with relatively small samples. For this exercise, all the PE methods were carried out with 12 independent informant groups. The use of 100 counters for each of these methods enabled the results to be recorded numerically and a total or average score for all informant groups calculated. Further analysis used the Kendall coefficient of concordance (W) to assess the level of agreement between groups (Table 2).

After completing the causal diagram and scoring exercises, participants were asked to identify interventions that from their perspective will address malnutrition, taking into account the causes and other factors relating to nutrition that had been discussed. Some of the groups also ranked the proposed interventions in order of importance.

2.4 Other methods

In addition to the PE methods described above with informant groups, other participatory methods were used with key informants. These are described below.

Historical timeline - this was used to describe key events relating to malnutrition and livelihoods over time. It was used with three separate key informants during interviews.

Participatory mapping - this method was used twice with five key informants and described seasonal movements of people and livestock.

Seasonal calendar - a seasonal calendar combined with a scoring exercise was used to capture perceived changes in water levels for Lake Turkana. Three key informants, all male elders, were involved.

Monthly activity calendar - this was used with focus group participants during the scoping exercise and then further developed with a male elder who was regarded as an expert farmer.

Food security scoring calendar - this was used during one of the focus groups.

Key informant interviews - two key informant interviews were carried out with mothers to investigate the difference in diets between healthy and malnourished children under 5 at different stages in their development. The exercise was then repeated for mothers at different stages during pregnancy and then again after giving birth.

Where possible, the results from the different methods were triangulated with other sources, including key informants, and secondary data and literature.

40 Burns et al., 2021b, https://fic.tufts.edu/publication-item/using-participatory-epidemiology-to-investigate-the-causes-and-seasonality-of-acute-malnutrition-in-marsabit-and-isiolo-counties-northern-kenya-methods-and-experiences/.

2.5 Limitations

The assessment was carried out during a severe drought, and therefore the analysis was intentionally scaled back so as not to take up too much of people's time. As such, further investigation would be beneficial for filling in some of the outstanding evidence gaps. For example, the assessment was unable to unpack some of the more complex issues around gender such as men's control over assets and decision making. Similarly, it would be useful to further investigate and understand the local terms for health and nutrition such as *bash raara* (yellow fever).

There is also likely to be some recall bias given the time period being investigated. For example, many young adults have little memory of life before the delta became submerged. Further inquiry could help better establish some of the information around seasonal movements to the delta and other livelihoods dynamics during that period. The exact dates when key events such as the loss of the delta and other livelihoods transitions occurred would also benefit from further inquiry and triangulation. Therefore, the reference periods and even specific dates given in this report should be treated as indicative.

Much of the recent research on Dasanech livelihoods covers the community in Ethiopia, with less documentation on the livelihoods of the people living in Illeret. This report relied heavily on the Ethiopian sources for triangulation, and while there are certainly many similarities, there are also likely to be important differences. For example, the Dasanech living farther upstream on the Omo River in Ethiopia have different opportunities such as fresh water and better infrastructure and services, but they also face a very different set of challenges. These potential differences should be recognized and interpreted accordingly.

Figure 4. Near the mouth of Omo delta before 2012.

Photo: John Burns

3. Results

3.1 Livelihoods shocks and trends

While longer-term trends have impacted on the livelihoods of the Dasanech (section 1.1), more recently, much of the Omo delta has been submerged due to rising water levels in Lake Turkana (Figure 5). This rise in water levels has denied the Dasanech access to their dry season cattle reserve, and they are no longer able to practice dry season flood recession agriculture (Figure 8). Participants from every village visited attributed the associated loss of food from crops and animal products (specifically cattle) as the main reason for an increase in malnutrition. Although this loss of the delta has been gradual, participants largely identify the El Niño floods of 1997 to 1998 as the start of this process.

Following El Niño, informants suggested that most of the delta islands on the Kenyan side of the delta became submerged, forcing many people to stop practicing flood recession agriculture. However, some community members with relatives in Ethiopia were permitted to continue farming on the Ethiopian side of the delta, which had not been as badly affected. In 2000, there was a drought, which, in concert with the loss of both the delta farmland and carry-over crops from the previous season, resulted in widespread hunger. According to a key informant, this hunger forced many people to start eating fish for the first time. Prior to 2000, the majority of the Dasanech were averse to eating fish except in times of extreme hunger. Prior to 2000, only a small group of Dasanech (*dies*) specialized in fishing and regularly consumed fish.

Between 2000–2010, water levels receded, and some of the islands on the Kenyan side of the delta re-emerged. During this period, some of the community started flood recession farming again, where they could find pockets of suitable land. However, key informants indicated that it was not uncommon for farms to get flooded, resulting in crop losses, as the Omo floods and corresponding recession of the flood waters had become more unpredictable than in the past. For example, participants explained that they used to be able to accurately predict when to plant, as the timing of the retreat of the Omo flood waters corresponded with the migration of a bird locally called *enech*.[41]

Importantly however, the Dasanech continued to take their cattle into the delta during the dry season, as they were allowed to graze their animals on the Ethiopian side. In contrast to farmland, grazing areas are classified as communal land under customary law. Although cattle were taken to the delta during the dry season, small ruminants remained behind because they are unsuited to the wet environment and therefore are susceptible to certain diseases. During this period, sheep and goats would be herded outside of the delta by young men. They were continuously moved from one grazing area to another in search of pasture. During the dry season, some of the community would remain in the permanent settlements like Illeret along the eastern shore of the lake. This group would include the elderly and those unable to make the migration to the delta. A few lactating animals, including cattle, would be left behind to provide milk for this group. These lactating animals would be accompanied by young (adolescent) male herders.

Participants from all groups interviewed identified the period between 2010–2012 as the time when most of the community stopped their seasonal migration to the delta, since by this time it had become almost completely submerged, including on the Ethiopian side (Table 1). In 2011, there was a severe drought, made worse by the loss of the

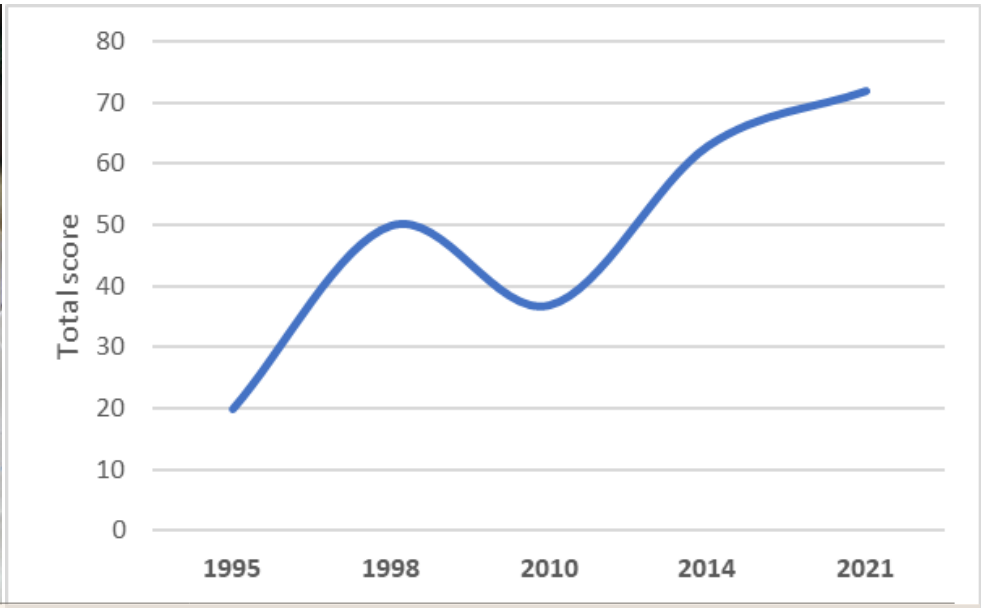
41 We were unable to identify this bird, although the description and behavior possibly suggest a striolated or house bunting.

delta cattle grazing reserve. Following this drought, the Dasanech herds (including cattle) were confined to the arid rangelands along the eastern shore of Lake Turkana.

Some informants suggested that a few people continued to visit the delta at certain periods after 2012, and even tried to farm but usually lost their crops to floods. For example, informants from one group suggested that in 2014 one of the islands re-emerged on the Kenyan side of the delta, and they managed to produce a small harvest. However, this appeared to be the exception rather than the norm, and the seasonal migration into the delta, including to the dry season cattle grazing areas, effectively ended. One group of elders suggested that the last time anyone from the Kenyan side went to the delta was in 2017; after that, it became completely submerged.

Some participants attributed the rising lake levels to climate change, while others were unsure, and some suggested it may be the result of a curse. Nonetheless, there was strong consensus as to when this process started happening and the key periods of flooding, which are supported by secondary data (see Figures 6 and 7).

Figure 5. Pattern of Lake Turkana water level changes, 1995–2021.

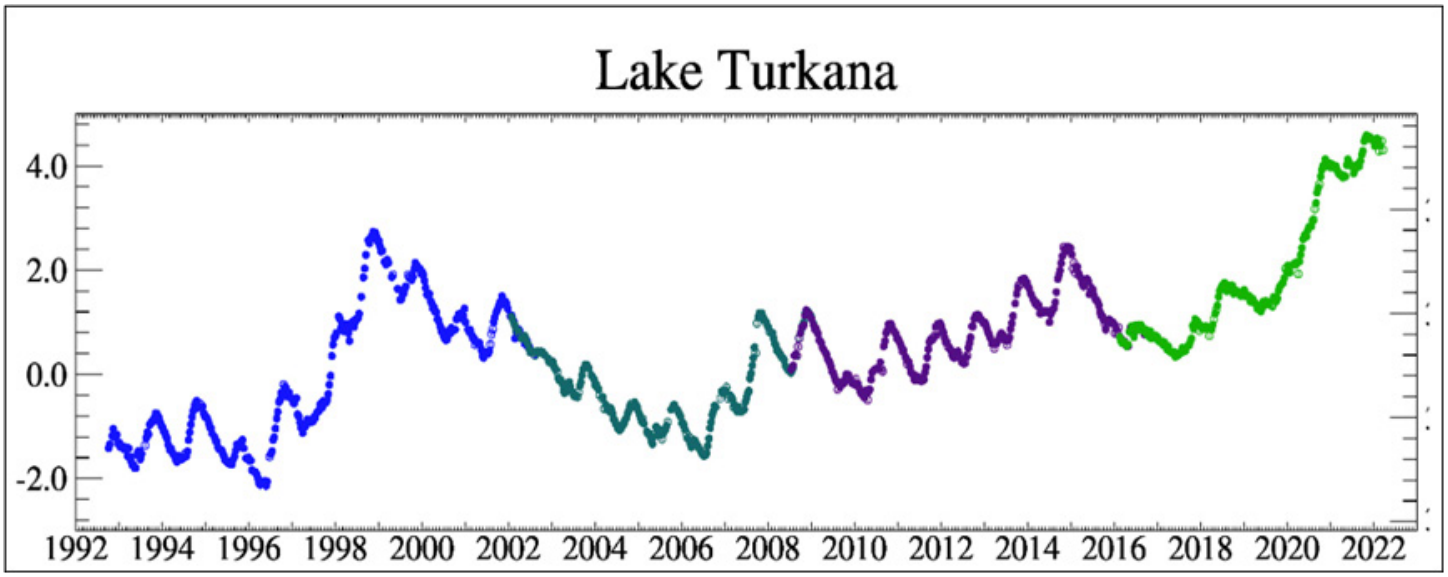


1995	Before the El Niño floods
1998	After the El Niño floods
2010	An island re-emerged on the Kenyan side of the delta
2014	The last time they farmed on the delta
2021	Current lake levels

Notes: Figure 5 shows perceived changes in water levels of Lake Turkana from five reference years from a focus group with key informants, including an expert fisherman. The reference years were selected based on relevant events identified by the informants. Using a nominal baseline of 20 stones for the 1995 reference year, participants were asked to distribute the stones across the four seasons to show seasonal variations in lake levels. Participants were then asked to repeat the exercise for the other reference years by either adding or subtracting from the nominal baseline of 20 stones. Figure 5 shows the total score for each reference year.

Photo: John Burns

Figure 6. Satellite estimates of Lake Turkana water levels over time.



Notes: Figure 6 shows relative height variation in lake levels from 1992 to 2022 computed from satellite altimetry data sets. The results show the same pattern as the one from the scoring exercise with key informants (Figure 5) from 1995 to 2021.

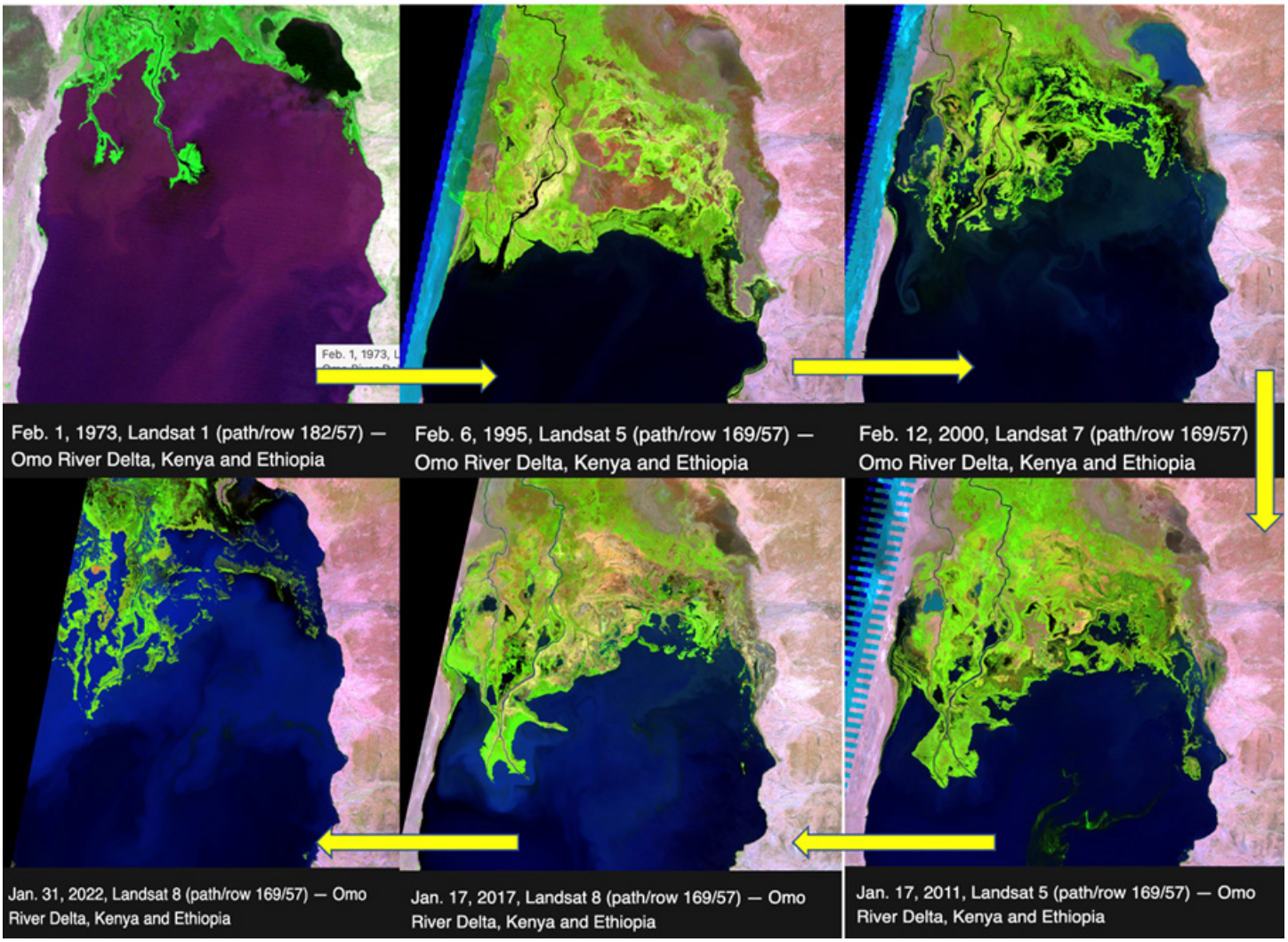
Source: United States Department of Agriculture (March 19, 2022)

Following the cessation of the annual migration to the delta after 2012, the Dasanech established more permanent settlements in Illeret ward. They continued to practice mobile livestock production, with the young men typically herding the animals in the various wet and dry season grazing areas (*fora*) within the ward. At first, participants maintained that the rangelands were in good condition, having been underutilized. However, over time they became more and more degraded due to the increased concentration of people and animals in the ward throughout the year. Between 2012 to 2018, participants reported a gradual but consistent decline in livestock numbers, particularly cattle (Figures 12 and 13). They attributed the decline to the loss of the dry season cattle reserve, livestock disease, and a reduction in the availability of pasture outside of the delta.

During this period (2012–2018), some communities also practiced rainfed farming (*rub-iriet*) in seasonal riverbeds and close to the lakeshore during the long rains, but with mixed and often disappointing results. From the discussions, it appeared as though not all households engaged in farming, and neither did all the villages. During some years when rainfall was sufficient, some of these villages would achieve a harvest and others would not. In other years, different villages might harvest some crops due to slightly more favorable conditions in that specific location. Participants who had successfully managed to harvest during one of these years indicated that a good harvest would yield about 150 kgs of sorghum per household. In contrast, they maintained that a good harvest from flood recession agriculture before 2010 could yield as much as 900 kgs of sorghum.[44] The last time that any of the communities realized a meaningful harvest was in 2017 in Aiybete village. However, this harvest reportedly used irrigation from a borehole and was supported by a development organization. During the same time (2012–2018), more people also started engaging in fishing (Figure 14) to compensate for the loss of livestock and crop-based livelihoods.

42 See Carr, 2017.
43 See Avery, 2013, and Carr, 2012 and 2017.
44 Note these figures should be treated as rough estimates based on the reported volume of granaries in the delta (90 kgs) and bag sizes (50 kgs) from one focus group.

Figure 7. Objective changes in land surface area of the Omo delta, 1973–2022.



Notes: Figure 7 shows changes in the land surface area of the Omo delta (in green) from 1973 to 2022 across six different data points, viz., 1993, 1995, 2000, 2011, 2017, and 2022 (clockwise from the top left). Between 1973 and 2005, the overall delta land surface area is estimated to have increased by about 500 km2 (fluctuations notwithstanding) due to receding water levels.[42] It was predicted that this trend would continue or even accelerate following the completion of the Gibe III dam,[43] although so far this has not been the case. The images on the top middle and top right give a comparison from before and after the El Niño floods, showing a reduction in land surface area. However, this was temporary, as water levels subsided to some extent. The 2011 image (bottom right) shows the delta at around the time the seasonal migrations of the Dasanech ended and the lake started to rapidly rise. The last time participants reported that anyone from their community had visited the delta was in 2017 (bottom middle), and the last image (bottom left) shows the remains of the delta land surface area in 2022. Overall, the pattern shows a dramatic but irregular decline in land surface area. The overall pattern, including the rapid acceleration in the loss of the delta after 2012, as well as the fluctuations following El Niño and after 2000, correspond with the PE findings. Although it's difficult to estimate scale or make accurate comparisons from the satellite images, the current delta is rapidly trending towards the 1973 baseline (top left), which would represent a loss of about 500 km2. of land surface area.

Source: United States Geological Survey

Figure 8. Dasanech cattle and sorghum farms on the Omo delta before 2012.

Photos: cattle: John Burns; sorghum: Caleb Swart

A severe drought in 2021, combined with livestock disease outbreaks, resulted in massive livestock mortality. Again cattle were the worst affected (Figure 12). Specific livestock diseases mentioned by key informants included anthrax and "pneumonia."[45] The drought continued into 2022, with the long rains being delayed by a month and a half and only starting in mid-April. The long rains coincided with the PE assessment. By this time, there was widespread malnutrition, as well as cases of malnutrition-related child mortality. At this point, most of the population had resorted to fishing as a survival strategy and had become increasingly dependent on relief aid (Figure 9).

45 Possibly contagious bovine pleuropneumonia (CBPP) and contagious caprine pleuropneumonia (CCPP).

Table 1. Timeline of key events

Event	Year	Description
Gala Kite	1992	In August/September 1992, severe food shortages in Illeret resulted in human deaths.
Kokai massacre	1997	Deadly battles between the Gabra and Dasanech in Kokai in the Sibiloi National Park result in deaths of more than 60 people, including 17 police officers. These made the local Dasanech in Illeret flee their homes and enter Ethiopia due to fear of an imminent retaliation by the Gabra. It took the Dasanech five years to return to their homes.[1]
Ir Ongara, "The black rain"	1998	El Niño rains. Most of the flood recession delta farmland on the Kenyan side of the border was submerged due to the floods.
Drought	2000	Due to hunger, the majority of the Dasanech started eating fish for the first time; There is a traditional song that commemorates this.
Start of the loss of the delta	2007	Dasanech started the gradual stop of the dry season migration into the delta. Some with relatives on the Ethiopian side were allowed to farm in Ethiopia. A few Kenyan Dasanech continued to farm in small pockets of accessible land on the Kenyan side of the delta. The Kenyan Dasanech continued to bring their cattle into the delta on the Ethiopian side during the dry season, as the grazing areas are considered common property.
Os Nyirara	2009	Dasanech raided the Gabra and rustled livestock. In response, the Kenyan army confiscated all the livestock of the Dasanech.
Mar Orange, "the drought of orange"	2011	Severe drought resulted in loss of livestock and humans. People depended on orange drink powder to survive. This was followed by flooding in the delta.
Bash Cholera, "Cholera outbreak"	2012	Outbreak of cholera in Sieslucho, Illeret, and the delta.
The end of the dry season returns to the delta	2012	The end of the seasonal migratory dry season returns to the delta by Dasanech, as by this time most of the delta had become submerged (including on the Ethiopian side). This likely contributed to several outbreaks of livestock disease between 2012–2020, resulting in considerable livestock mortality, particularly for cattle.

1 Galaty,2000.

Ir Ebetiteye, "Flooding"	2016	In April 2016, severe flooding in Illeret resulted in loss of livestock and humans.
Drought	2020–2021	Severe drought and livestock disease, resulting in high livestock mortality and malnutrition-related child mortality.
Dimi,[2] "The 1st daughter's ceremony"	From 1987	From 1987, Dasanech start Dimi ceremonies[2] within Illeret ward: 1987 (Bubua), 1995 (Chirarich), 1997 (Chirarich), 2003 (Ilolo), 2007 (Chirarich), 2012 (Il gele), 2016 (Nangole), 2017/18 (Chirarich), 2019 (Illeret), 2021 (Thurich).
Bilte (boys' circumcision)	From 2001	2001/2 (Ilungo), 2003 (Ileret), 2006 (Gooro), 2010 (Illeret), 2013 (Sabare), 2014 (Gooro); smaller Bilte held in 2014–2017 to cater to needs of school-going boys.
Gool, "The anointment of the wealthy"	From 1997	1997 (Ol Masech), 2000 (Ol Yierite), 2005 (Ol Neete), 2011 (Ol Irasho), 2014 (Ol Aya), 2020 (Ol Ini Arkorbich)

2 Dimi ceremony is undergone by those men who have fathered a daughter eight to ten years before. The father of the girl acquires the status of an elder, independently of his membership in a generation set.

3.1.1 Changes in household food security and malnutrition

The results from the PE exercises show a marked deterioration in food security across the reference periods assessed, viz, pre-2010, 2010–2020, 2021–2022. During the pre-2010 period when people were farming on the delta, the most important food sources were livestock products followed by crops (Figure 9). Participants explained that when they were on the delta during the dry season, they still had sufficient milk, as the cattle had access to rich pasture on the delta. Fish and wild foods were also plentiful in the delta, but as milk products are preferred and were available, people rarely consumed fish or wild foods. For the same reason, they rarely purchased food except for specific items such as tea, coffee, and sugar. During this period, relief aid was uncommon, and participants indicated that it was rarely needed.

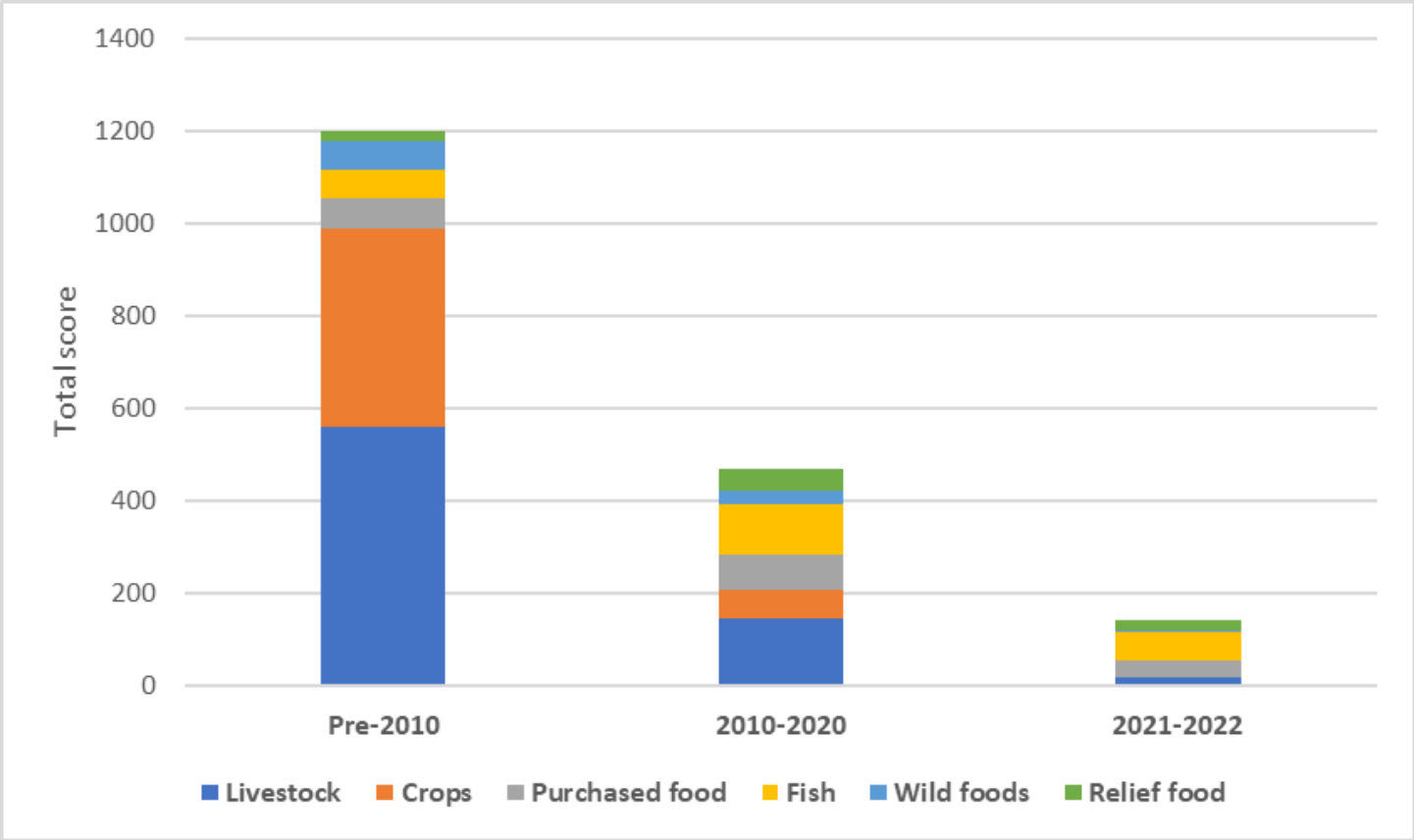
Participants explained that when they were on the delta (pre-2010), they could potentially expect two sorghum harvests in one dry season. The first harvest (*simak*) would be harvested in October/November after planting in August/September. However, *simak* could be risky, as the flood waters sometimes returned and destroyed the crop. On the other hand, if successful, a second harvest (*gabush*) could sometimes be achieved from the *simak* planting. The main sorghum harvest (*oldhim*) would be planted in September/October and harvested in November/December. Although sorghum was the main crop grown, other crops grown included maize, green grams, millet, sweet potatoes, tomatoes, onions, kale, and tobacco. Participants maintained that the harvest from the delta would easily last until the following planting season and sometimes until the next harvest.

Participants from one group estimated that about sixty percent of the community would migrate to the delta during that time.[46] Those remaining behind would include young men who would look after the sheep and goats in the fora and the elderly or disabled. Often one of the wives and children from a polygamous household would also remain behind. However, participants explained that there were regular visits both to and from the delta, with food being exchanged.

The assessment was not able to effectively capture the timing of seasonal movements to and from the delta, as participants gave different versions. For example, one key informant indicated that the cattle were taken to the delta during both the

46 This would take between one to two days depending on the location of the village relative to the delta.

Figure 9. Changes in food source contributions and availability.



Notes: Figure 9 shows proportional piling of food sources using 100 counters carried out with 12 independent groups of women, combined with before and after scoring using a nominal baseline of 100 counters to show overall food availability for the pre-2010 reference year with the same groups. The second exercise was used to weight the results from the first exercise.

short and long dry seasons, and another informant suggested that the cattle moved only when the community went to farm the delta during the long dry season. Nonetheless, in the past during the long rains, both people and livestock moved out of the delta.[47] Participants explained that the wetter conditions around Illeret allowed the cattle to survive, and milk from cattle and small stock would be plentiful during the long rains from March to May. Some communities would plant sorghum along the dry season riverbeds in Illeret during the long rains. During this period, food insecurity was rare. A food security scoring calendar carried out with one group only showed one month (September/*Garmar*)[48] where they might expect to have insufficient food (Figure 10), right before *simak* (the first harvest).

Once the seasonal migrations to the delta had stopped (post-2010–2012), the same scoring calendar showed four months (January, July, August, and September) when people would expect to have insufficient food (Figure 10). The results also show an estimated sixty percent decline in food availability in comparison to the pre-2010 period. During this period, the importance of livestock products and crops declined relative to other sources such as purchased foods, fish, relief aid, and to a lesser extent wild food (Figure 9). However, participants explained that from 2012–2020 the rains had by and large been reliable, so they still had adequate milk from their livestock. They also explained that when they first stopped going to the delta,

47 From some of the discussions, it appeared as though people and livestock had to move due to seasonal flooding determined by rainfall in Ethiopia.
48 Participants described Garmar as the month when old men die of hunger.

Figure 10. Changes in household food security.

0 = not enough food (food insecure) 1 = just enough food (food sufficient) 2= plenty of food (food secure)												
Reference year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Pre-2010	1	1	2	2	2	1	1	2	0	2	2	1
2010–2020	0	1	2	2	1	1	0	0	0	2	1	1
2021/2022	0	0	0	0	0	0	0	0	0	0	0	0

Notes: Figure 10 shows a food security calendar carried out with one focus group. Participants were asked to assign two counters for every month of the year that they would expect to have more than enough food, one counter when they expected to have just enough food, or no counters for months when they expected to have insufficient food for the household. The exercise was repeated for each of the reference periods.

they still had relatively large herds of livestock. As mentioned above, the rangelands around Illeret were in reasonably good condition, as they had up until that point been underutilized. As discussed, during some years, some communities also harvested crops from *rub-iriet* (rainfed farming) during the long rains.

By 2022, the food security situation had deteriorated considerably due to the ongoing and protracted drought. The results for this reference period show a significant reduction in the availability of food in contrast to a typical year before the drought (Figure 9). The results also show a marked reduction in the contribution of livestock and farm products to the household food basket and a corresponding increase in people's dependency on fishing, purchased foods, and relief food. Participants explained that income for food purchases mostly came from the sale of fish, water, firewood, and charcoal and to a lesser extent from recent unconditional cash transfers from various actors. Although typically people will increase their consumption of wild foods during times of food scarcity, the women explained that wild food production had been severely impacted by the protracted drought and delayed long rains in 2022.

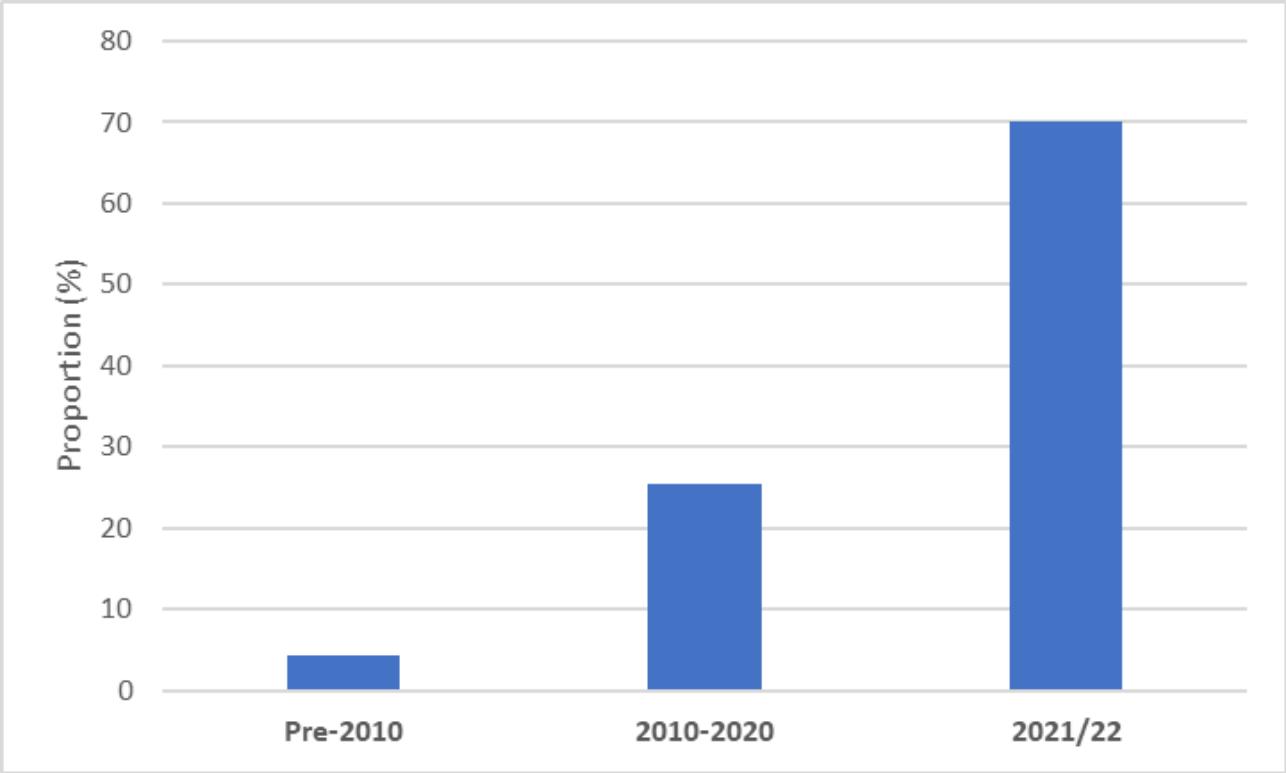
The deteriorating food security situation across the three reference periods conversely corresponds with an increase in the number of cases of child malnutrition. The results from the scoring exercise show a 20 percent increase in the proportion of cases of malnutrition from before 2010 and after, and then a further 45 percent increase since 2020 due to the drought (Figure 11). Participants explained that when they used to go to the delta (pre-2010), cases of child malnutrition were rare. They usually attributed these cases to disease or poverty. They described the poor as those families that had no cattle such as the "dies" who specialized in fishing and hence had no milk to give their children.

3.1.2 Changes in livestock ownership and herd composition

The livestock wealth of the Dasanech rapidly declined with the loss of their dry season cattle reserve, and the results from the PE show roughly a 60 percent reduction in herd size following the loss of the delta after 2010 (Figure 12). The drought in 2021–2022 resulted in a further 70 percent reduction in herd size. As discussed, participants attributed these losses to a combination of livestock disease, drought, and a reduction in both the quality and availability of pasture.

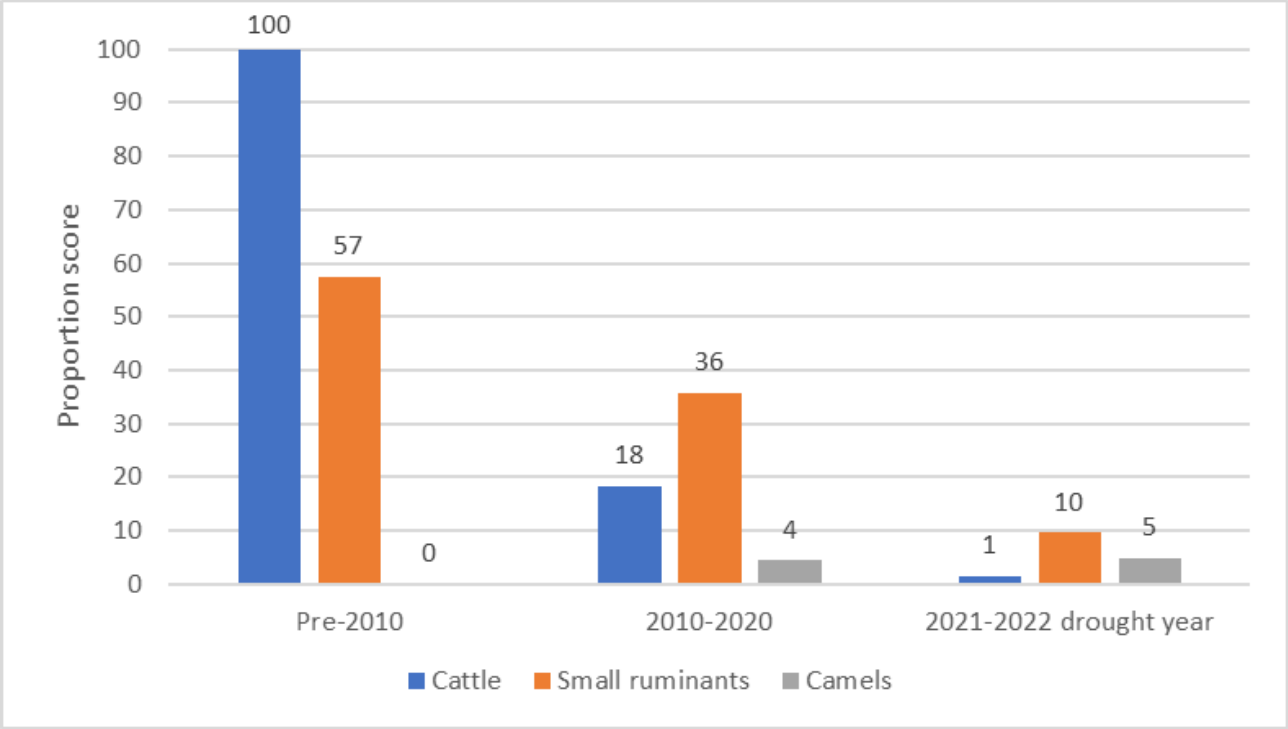
Prior to 2010 when they still had access to their dry season cattle reserve on the delta, cattle made

Figure 11. Changes in the proportion of cases of child malnutrition over time.



Notes: Figure 11 shows perceived changes in the number of cases of child malnutrition derived from before and after scoring using a nominal baseline of 50 counters for the 2021/2022 reference year. The exercise was carried out with 12 independent groups of women.

Figure 12. Changes in herd size and composition.



Notes: Figure 12 shows proportional piling of herd composition using 100 counters carried out with 12 independent groups of participants, combined with before and after scoring using a nominal baseline of 100 counters to show overall herd size for the pre-2010 reference year with the same groups. The second exercise was used to weight the results from the first exercise.

up over 60 percent of their livestock holdings,[49] with the remainder mostly comprising sheep and goats (Figure 12). During this period, very few people owned camels. However, following high cattle mortality after 2010, herd composition changed, with about 60 percent of their herds now being made up of small stock. Participants explained that as cattle declined, people switched to more drought-resistant species such as camels and goats in response to being confined to the more arid rangelands outside of the delta. After the 2021–2022 drought, cattle made up less than 10 percent of their animals. By this point, camels made up about 30 percent of the relatively few remaining animals (Figure 12).

Participants explained that camel ownership is a new practice for the Dasanech and only really began after the loss of the delta. One group explained that they adopted the practice from the neighboring Turkana. However, another group mentioned a restocking project following a drought where poor households were given camels. They also pointed out the irony that these same poor households were now the ones giving them milk during the current drought given the ability of camels to produce milk even during dry spells.

3.1.3 Changes in livelihoods strategies—fishing

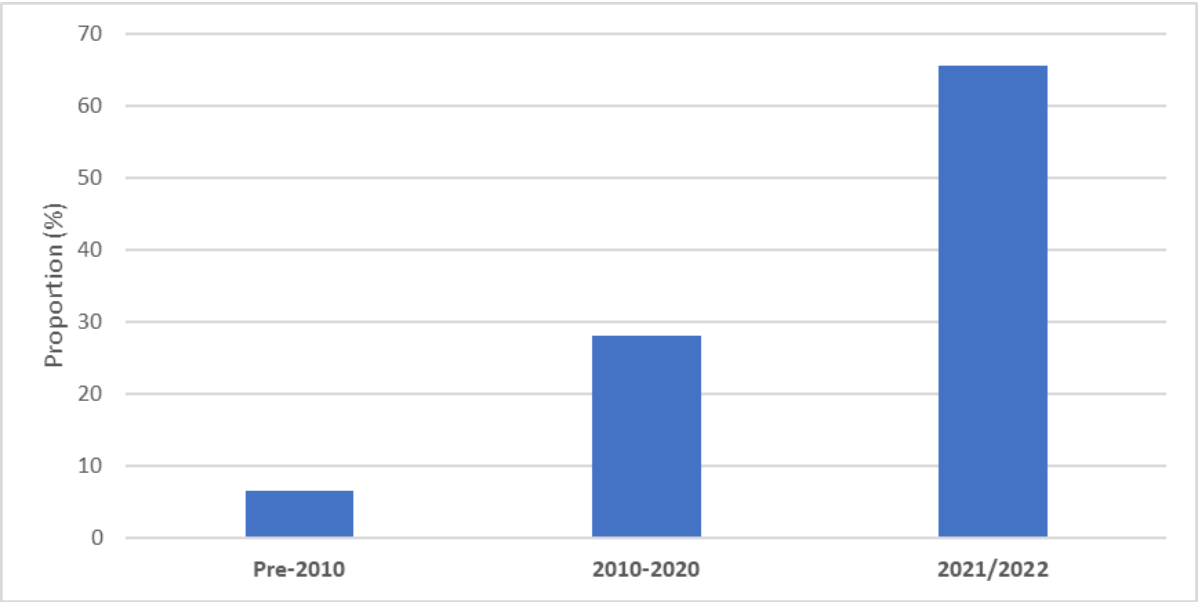
At the time of the assessment, participants estimated that about 65 percent of the community was engaged in fishing (Figure 14). They explained that fishing was one of the few remaining livelihood options to enable them to cope with the drought. Although the actual fishing is mostly done by men and boys, women and girls are involved in drying and selling the fish. They mostly sell the fish to Somali traders and Turkana fishermen. They explained that the fish is eventually sold in Busia and exported to Central Africa. The dried fish are sold for between Kenya shilling (KES) 5–10[50] depending on the size. Fresh or frozen fish can be sold for between KES 30–60[51] but most people don't have access to refrigeration, and opportunities to sell fresh fish are limited. One key informant who was considered an expert fisherman explained that fish production improves

Figure 13. Dasanech cattle and carcases on the lakeshore in Illeret in 2022.

Photo: John Burns

49 Excluding equines and poultry.
50 Between 4–8 US cents at the time of the assessment.
51 Between 25–50 US cents.

Figure 14. Changes in the proportion of households engaged in fishing.



Note: Figure 14 shows changes in the proportion of households in the community engaged in fishing. Results were derived using proportional piling with 100 counters. The exercise was carried out with 12 independent groups of women.

when the Omo River floods or when it recedes, but too much flooding has a negative impact. He also maintained that fishing is affected by the lunar cycle, and generally the fishing is better on dark nights.[52] The same informant maintained that in the past large catches were common, but fishing has now become more difficult due to rising lake levels and overfishing due to the increasing use of nets by Ethiopian and Turkana fishermen.

As many of the villages are situated some distance from the lake, participants from one village explained that those engaged in fishing would set up temporary camps along the shore and return every two to three days with their catch to sell and share with family members. These fishing camps mostly comprise men and boys; however, they are often accompanied by female family members. Typically, mothers with young children would remain in the permanent settlements.

The participants explained that like camel husbandry, fishing is a relatively new activity for the majority of the Dasanech. Although fish were plentiful on the delta, before 2010 only a small group (about 7 percent) of the Dasanech (dies) specialized in fishing (Figures 14 and 15). During that period, fish was rarely consumed except during times of extreme hunger, which was also less common. However, following a drought in 1999–2000,[53] fish consumption became more common. The adoption of this practice is commemorated in a traditional song.

Following the loss of the delta, more people were forced to engage in fishing to compensate for the loss of crop and livestock products. Participants estimated that between 2010–2020 over a quarter of the community had joined the *dies* and taken up fishing (Figure 14). However, they explained that unlike the *dies*, they are not very successful at fishing, as they lack the necessary skills and experience since they are primarily pastoralists.

52 Seasonality of fishing and fish availability on the lake is complicated, with different interpretations being given by different communities (See Carr, 2017, p. 164 for more discussion on this). Very different reports on the seasonal availability of fish were reported between the El Molo (fishing specialists) and Turkana (pastoralists who had recently diversified into fishing) during a PE study in Loiyangalani (see Burns et al., 2021a).
53 Likely compounded by the temporary loss of the delta due to the El Niño floods in 1997–98 and the loss of livestock and displacement associated with the Kokai massacre in 1997.

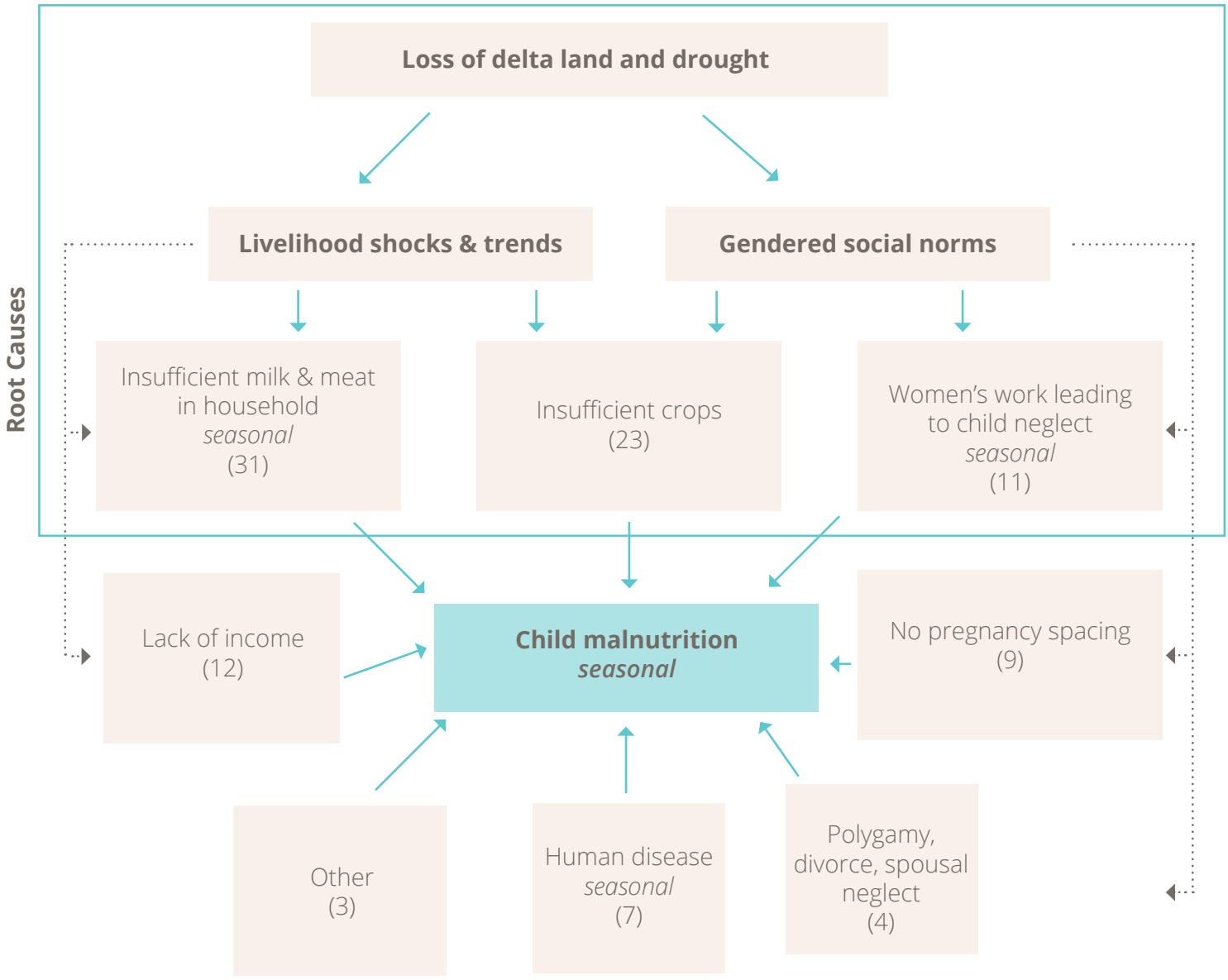
Figure 15. Dasenech fishermen "*dies*" on the delta in 2010.

Photos: Sienna Loftus Burns

3.2 Causes of malnutrition in mothers and children

The results from the causal diagrams were supported by explanations from the participants. These explanations reaffirmed that the root causes of malnutrition in Illeret largely stem from the recent livelihood trends and shocks associated with the loss of the delta and the 2021–2022 drought. As discussed, when participants had access to the delta for their cattle and dry season farming, cases of malnutrition were relatively uncommon. Participants explained that the Dasanech have a traditional practice of managing malnutrition (*buul*). For example, if a mother becomes malnourished during pregnancy, once she has given birth, they will isolate her and the child in a special place. Family members will contribute goats, which will be slaughtered, and the products will be prepared in different ways

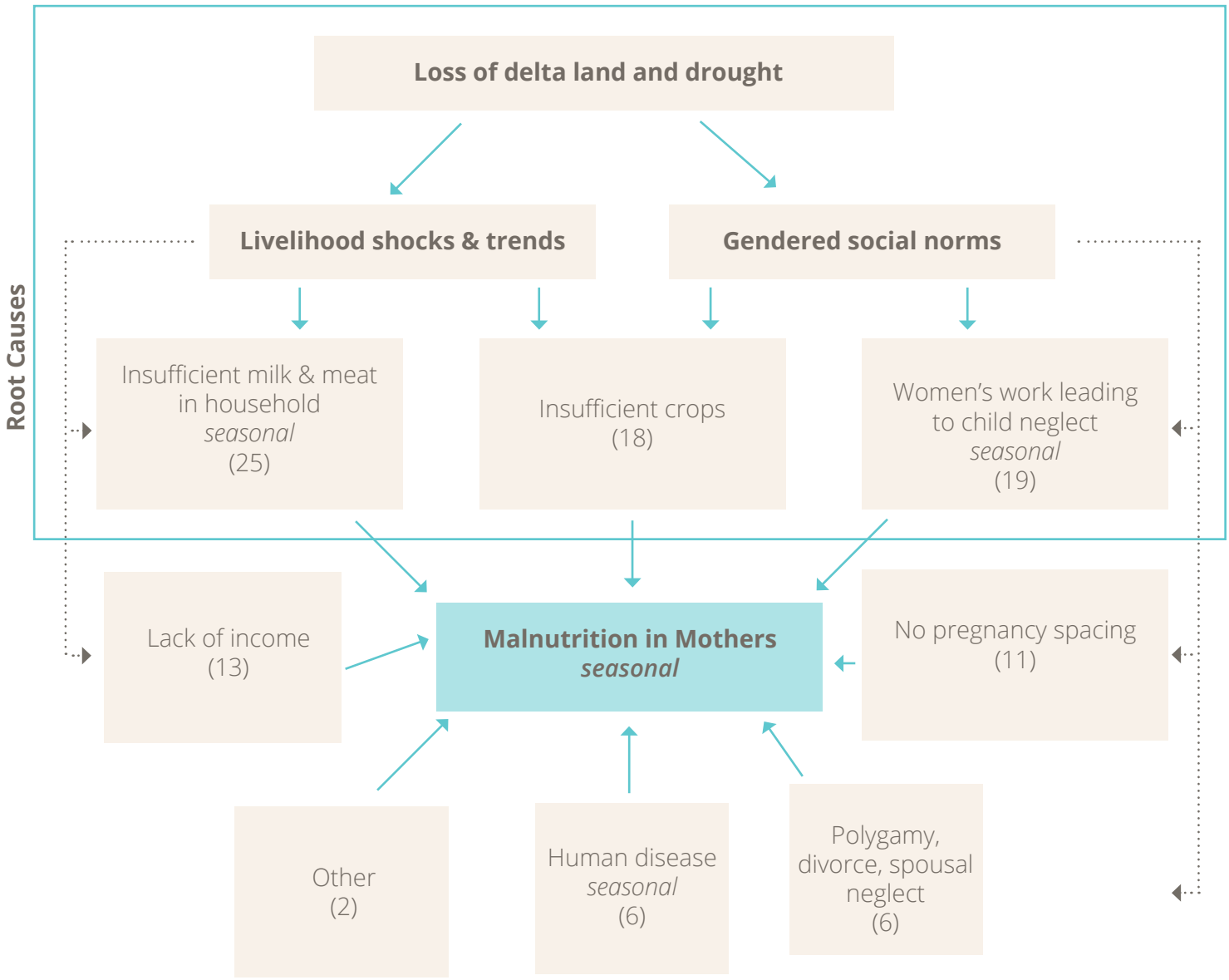
Figure 16. Causes of child malnutrition.



Other = Lack of control over assets (livestock), death of husband

Notes: Figure 16 derived from interviews with women in Illeret followed by proportional piling of causes with 12 independent groups of women. The figures in parentheses represent the scores from all the groups presented as a proportion of the total scores.

Figure 17. Causes of malnutrition in mothers.



Other = Lack of control over assets (livestock), death of husband

Notes: Figure 17 derived from interviews with women in Illeret followed by proportional piling of causes with 12 independent groups of women. The figures in parentheses represent the scores from all the groups presented as a proportion of the total scores.

and fed to the mother. This will continue until her condition improves. The participants explained that this practice can only be effective when there are enough animals and only a few cases of malnutrition. With the reduction in livestock from disease and drought, the women explained that they have become increasingly dependent on external assistance in addressing the issue of malnutrition.

3.2.1 Availability of livestock products

Overall, the results from the causal diagrams show that participants perceive the most important factor contributing to both maternal and child malnutrition to be insufficient livestock products such as milk, meat, fat, and milk products (Figures 16 and 17). As discussed, prior to 2010, cases of malnutrition were rare when people had access

to sufficient livestock products, including cattle milk during the dry season. Following the loss of the delta, cases of malnutrition started to increase in direct proportion to the reduction in livestock numbers (Figures 11 and 12). The drought of 2021–2022 further accelerated this trend.

3.2.2 Availability of food crops for consumption

Participants identified and scored insufficient farm produce as the second-most important factor contributing to child malnutrition and the third-most important factor contributing to malnutrition in mothers (Figures 16 and 17). Again, this was directly attributed to the loss of dry season flood recession agriculture on the delta, followed by disappointing rainfed crop yields due to drought and/or dry spells since 2012. Before 2010, participants could expect up to eleven months of relative household food security, in contrast to eight months of food security during a typical year after 2010 or zero months during a severe drought. As discussed, farming on the delta in a good year could produce enough food to last until the next dry season as well as surpluses that could be bartered for animals or other necessities. The women explained that the loss of this livelihood source had increased their dependency on purchased foods (see Figure 9), which they consider to be less nutritious than farm products. For example, participants maintained that the sorghum they used to eat in the past was far more nutritious than the commercially processed maize flour that makes up much of their diet today.

3.2.3 Women's work burden

Women's workload was identified and scored as the second-most important factor contributing to maternal malnutrition (Figure 17). The women explained that although they no longer spend as much time on activities such as farming or taking care of animals, they are far busier now than they were in the past. Again, due to the loss of livelihoods associated with losing the delta, women are now forced to engage in time- and energy-consuming activities such as fetching and selling firewood, water, and ochre and making charcoal to survive. For mothers, these activities can involve spending days on end collecting these products and then trying to find a buyer. They often go without food at these times. The women explained that with the loss of livestock, the responsibility of providing for the family has fallen on them and that they are now the main "breadwinners." Participants described this work burden during times of drought as "unbearable." During a typical day, the time and energy invested may not even yield enough income for one family meal. As such, the women explained they often will skip that meal so that their children can get enough to eat.

Participants also associated women's work burden with child malnutrition, with this being scored as the fourth-most important factor (Figure 16). The women explained that the long hours they are engaged in these activities means their children are often left at home without any adult supervision. Although they sometimes leave their children with neighbors, they explained that the neighbors are equally busy. The women maintained that these long absences resulted in inconsistent breastfeeding, which not only means that the infants are skipping meals, but they also associated the absences with a decline in both the quality and quantity of breastmilk. During these absences, they explained that older children missed meals and often ended up eating soil and getting sick as a result, with vomiting or diarrhea.

Again, this factor can be directly associated with the loss of livelihoods. For example, the women explained that although they were busy with activities such as farming in the past, and might spend long hours away from home, there was always plenty of milk for the children to consume. In addition, participants maintained that in the past, women would typically be able to take up to 40 days' post-partum rest whereas nowadays they have little choice but to return to work within 3–4 days of giving birth. Similarly, in the past pregnant women had a light workload whereas nowadays they have the same workload as non-pregnant women.

3.2.4 Lack of income

The lack of income was scored as the third- and fourth-most important factor contributing to both child and maternal malnutrition respectively (Figures 16 and 17). Lack of income was primarily in reference to their ability to purchase nutritious foods, on which they have become increasingly

dependent. The women consider nutritious foods to be livestock products, fish, pulses, oil, fruit, and vegetables. Although it is remote, food prices in Illeret are relatively low compared to other parts of Marsabit because foods are mostly sourced from Ethiopia. Nonetheless, as discussed, although the women might spend the whole day on an activity such as fetching and selling water, they typically only earn enough to buy one meal for the family. Similarly, income from fish sales is minimal relative to the time and effort involved.

This factor relates directly to the other three factors discussed (lack of animal and crop products and women's work), which again have all been impacted by livelihoods changes.

3.2.5 Human disease

Although participants associated human disease with malnutrition in children and mothers, they scored it relatively low compared to other factors[54] (Figures 16 and 17). However, women identified several diseases that could lead to malnutrition or might occur as a result of someone being malnourished. The most frequently mentioned diseases were diarrhea, anaemia, brucellosis, and "yellow fever" (*bash raara*). However, it was unclear if *bash raara* describes symptoms associated with malnutrition or the actual disease yellow fever.[55] Participants explained that it was called yellow fever because the person's hands, tongue, and urine would turn yellow. Participants from one group described how diarrhea could lead to dehydration and rapid weight loss in children. Diarrhea was often associated with eating soil/dirt. Women from one community that lived near the lake explained that during droughts they had no choice but to drink water from the lake, which causes diarrhea. However, some participants suggested that the diarrhea was caused by an algae bloom as opposed to the actual lake water.

Malaria, HIV/AIDS, pneumonia, cholera, and chicken pox were also mentioned, as was "*hethu*" (vomiting and diarrhea associated with unclean breastmilk). Participants associated maternal malnutrition with stress, largely caused by the loss of livelihoods and associated burden on women to support the family. In some cases, maternal malnutrition was associated with spousal abuse. Mental illness is also sometimes associated with malnutrition.

Participants often made a connection between the loss of appetite caused by diseases like malaria, pneumonia, and chickenpox and child malnutrition. They explained that a poor diet (malnutrition) made people more susceptible to certain diseases.

In the past, when levels of malnutrition were reported to be far lower, participants maintained that human disease was the most likely cause of malnutrition.

3.2.6 Gender issues and other causes of malnutrition

Participants identified several gender- and cultural-related issues that can contribute to malnutrition. The most important of these was the non-spacing of pregnancies, which contributes to both maternal and child malnutrition (Figures 16 and 17). In the case of children, participants believe that when a pregnant mother is nursing, the quality of the breastmilk deteriorates. In Dasanech, they refer to this as "*hethu*" (unclean breastmilk), which is associated with vomiting, diarrhea, and slow child growth.[56] The women pointed out that non-spacing has only recently become an issue as in the past they would cook fat from a goat with milk and feed it to the child every morning. It was believed that doing so would compensate for the "unclean breastmilk."

The association between non-spacing of pregnancies and maternal malnutrition was often explained by the fact that a mother would skip meals because she has too many children to feed. Participants explained that mothers who nursed while pregnant were unlikely to get enough food to nourish the growing and nursing child as well as the mother. However, they did qualify that the main reason for this was food scarcity, as in the past there was plenty of milk for the

54 For example, scores from the same PE method carried out with communities in Isiolo and Loiyangalani and North Horr were over twice as high as those from the analysis in Illeret.
55 Yellow fever is not endemic in Marsabit County. However, the county is considered high risk due to its proximity to Turkana County where yellow fever is endemic (Personal communication, G. Guyo, Marsabit County epidemiologist).
56 A similar association between the quality of breastmilk and pregnancy was reported during a PE study carried out with the Turkana in Loiyangalani and is locally referred to as Edos (See Burns et al., 2021a).

mothers to drink. Some groups associated non-spacing of pregnancies with early marriage, as the young mothers are more fertile. And although the women were all aware of family planning options, they explained that they had little choice over pregnancy spacing, as such decisions are controlled by their husbands.

Other gender and cultural issues included polygamy, early marriage, and divorce. Participants indicated that polygamy in concert with poverty could result in one of the wives and her children being neglected by the husband. During times of food scarcity, certain wives and children would be prioritized at the expense of others, given the control men have over livestock and income. However, the women explained that in the past this was rarely an issue as there were plenty of animals and milk for everyone. They maintained that due to increasing poverty, there is a trend away from polygamy. Male bystanders often concurred, having seen the consequences of trying to support large families with ever-diminishing wealth.

For similar reasons, the women associated divorce or the untimely demise of a husband with malnutrition. Again, as women have no control over livestock or assets, they are largely dependent on men for their survival. Therefore, when abandoned or divorced, they may struggle to provide enough for either themselves or their children.

Early marriage also came up as a potential cause of malnutrition. Some participants attributed this to inexperience on the part of the young mothers who are unable to properly take care of or nurse their children. Early marriage was associated with non-spacing of pregnancies. Participants associated early marriage with poverty, and some suggested that early marriage was less common in the past.

Key informants associated alcoholism among mothers with poor nutrition for both mother and child. However, this factor was only identified by one group of women in all the villages visited, suggesting that it is not perceived to be an important factor.[57]

One interesting causal factor identified in Ilolo village was "dependency on the delta." Participants were asked why the neighboring village of Lomudang was worse off in terms of malnutrition than Ilolo or many others in the area. They explained that the community in Lomudang was unable to adapt to the arid pastoralist life outside the delta. They elaborated that they don't know where the good pasture or watering points for animals are, particularly during times of drought.

Table 2. Level of agreement for PE scoring exercises

PE scoring exercise	Kendall coefficient of concordance W	P-value
Causes of malnutrition—children	0.831	< 0.001
Causes of malnutrition—mothers	0.773	< 0.001
Food source contributions	0.925	< 0.001
Herd composition	0.408	< 0.001

Notes: There is significant agreement between the 12 informant groups for causal diagrams and scoring exercises on food source contributions and herd composition. This agreement strongly indicates that the methods are reliable. Seen Annex III for reliability of the other scoring exercises.

57 High levels of malnutrition in Siesluchu, a predominantly Muslim community where alcohol is not available, tend to support the premise that alcoholism is a relatively unimportant factor in this context. However, interestingly, the one village where it was mentioned was Morte, which is a suburb of Illeret center. In a PE study from Loiyangalani, alcohol also only came up in villages close to Loiyanglani town (see Burns et al., 2021), suggesting that proximity to urban centers may be associated with increased alcohol consumption. This may partly be due to availability, but it could also be a symptom of destitution associated with the loss of livelihoods and cultural identity as pastoralists become settled.

3.3 Differences in diets between healthy and malnourished children and mothers

Women described the differences in diet between healthy and malnourished children, and between healthy and malnourished pregnant and nursing mothers (Tables 3–5). The main difference was that healthy mothers and children belonged to wealthier families who either have access to nutritious foods from their own livestock or could afford to purchase these. Healthy diets were largely associated with the consumption of high-quality animal proteins and fats. However, cereals and pulses, including sorghum beans and green grams, as well as fruit and vegetables were also associated with a healthy diet. Maize and meals made from maize flour without any quality proteins were associated with a poor diet. Although fish can be caught as opposed to purchased, women in the focus group discussions suggested that while fish is fine for older children and adults, they did not consider it suitable for children under 2 years.

Table 3. Diets of healthy vs. malnourished children

Age	Healthy children	Malnourished children
0–5 months	Exclusive breastfeeding (but not all healthy babies) Breastfeeding (from a healthy mother)	Breastfeeding while pregnant Insufficient breastmilk from mother Introduction of milk
6–9 months (up to 1 year)	Types of food • Breastmilk • Cow's milk • Sheep, goat, and camel milk • Ghee and "butterfat" • Mashed beans with oil and salt • Porridge (*uji*) with milk, oil, and salt • Commercial milk and or powdered milk • Fruit (mangoes, pineapple)	Types of food • Breastmilk (but likely from an anemic, sick, or pregnant mother) or the child is not breastfeeding well • Milk from goats or infected cows • Donkey milk • Weaning with maize only (no beans, oil, or salt)
1–5 years	Types of food • Breastmilk (up to 2 years) • Milk (cows, sheep, goats) • Meat or fish soup or stew • Meat or fish with rice • Beans or green grams (mung beans) • Eggs • Sorghum • Soya meal • Tea with milk	Types of food • Dry maize (sometimes with beans) • Porridge/gruel made from maize flour and water (without salt, oil, or milk) • Wild foods (water lily/arrowroot) • Black tea (without milk) • *Mandazi* (fried bread, similar to a donut but not as sweet) • Child will eat soil/clay

Table 4. Diets of healthy vs. malnourished pregnant mothers

Age	Healthy pregnant mother	Malnourished pregnant mother
2 weeks to 3 months (first trimester)	Types of food • Milk • Green grams • Maize (with beans, oil, and ghee or butterfat) • *Ugali* (stiff maizemeal porridge) with meat or fish soup • Eggs • Game meat • Tea (with milk and sugar)	Types of food • *Ugali* (without meat, fish, or beans) • Wild foods • Sorghum or maize (without any beans, oil, or butterfat) • Strong tea (without milk)
4–6 months (second trimester)	Types of food • Milk • Eggs • Kidney and liver • Meat fish and game meat • Animal blood mixed with milk • Beans/green grams (with butterfat) • Rice (prepared with beans, onions, tomatoes, and oil) • Green vegetables	Types of food • Maize or sorghum (without milk, beans, oil, or salt) • Rice (without beans or vegetables) • Mother will eat soil or clay • Wild foods • Use of alcohol or *miraa/khat* (in some cases)
7–9 months (third trimester)	Types of food • Roasted and or boiled meat • Bone marrow soup • Liver • Animal blood and milk • Green grams • Sorghum (with milk, beans, butter-fat, ghee, and vegetables)	Types of food • Sorghum gruel (without butterfat, milk, or oil) • Maize or rice (without beans or animal products) • Tea without milk • Use of alcohol or *miraa/khat* (in some cases)

Table 5. Diets of healthy vs. malnourished lactating mothers

Age	Healthy lactating mother	Malnourished lactating mother
Just given birth (first 2 weeks)	Types of food • Ghee and the fat from a sheep's tail provided immediately after birth • Butterfat provided to "clean the womb" • Porridge made from milk and sorghum flour • Goat or sheep soup • Meat	Types of food • No ghee, butterfat, or sheep's tail fat provided • Porridge/gruel made with maize meal and water (no milk, oil, or salt) • Plain sorghum or maize • Tea (without milk or sugar)
From 3 weeks to 2 years	Types of food • Meat and fish with *ugali* • Sorghum (with beans, ghee, oil, and salt) • Porridge with milk and oil • Bone marrow soup • Milk • Roasted meat • Green grams • Fruit and vegetables	Types of food • *Ugali* (without meat, beans oil or salt) • Wild foods • Black tea • Alcohol/khat (in some cases)

Table 6. Women's preferences for nutrition-related interventions (n=24 groups)

Type of support	Responses
Support in establishing savings groups and support to income-generating activities (IGAs), including cash transfers or credit	19
Restocking/livestock credit for camels and goats	18
Relief aid—food or cash transfer—including expansion of the Hunger Safety Net Programme (HSNP)	16
Support to the fishing sector: provision of fishing equipment, boats, refrigeration, training, establishment of fishing cooperatives and market linkages	15
Education: provision of schools, teachers, scholarships, bursaries	14
Support to farming, irrigation (boreholes/pumps), fencing, provision of seeds, weather forecasts	12
Human health services: mobile clinic, health center	6
School feeding program (combined with schools)	3
Other: provision of fodder during the dry season, veterinary drugs, clean water for human consumption, family planning awareness	4

Notes: Table 6 shows the different types of intervention preferences women identified for addressing both child and maternal malnutrition based on both the causal analysis and PE scoring methods. This was done with 24 groups of women from the 12 villages where the PE exercise was carried out. The chart shows the frequency of responses.

Table 7. Intervention preference ranking (n=12 groups)

Type of support	Ranks		
	1st	2nd	3rd
Support in establishing savings groups and support to income-generating activities (IGAs), including cash transfers or credit	1	1	1
Restocking/livestock credit for camels and goats	5	3	0
Relief aid—food or cash transfer—including expansion of the Hunger Safety Net Programme (HSNP)	0	0	0
Support to the fishing sector: provision of fishing equipment, boats, refrigeration, training, establishment of fishing cooperatives and market linkages	2	4	2
Education: provision of schools, teachers, scholarships, bursaries	3	2	2
Support to farming, irrigation (boreholes/pumps), fencing, seeds, weather forecasts	1	0	1
Human health services: mobile clinic, health center	0	0	1
School feeding program (combined with schools)	0	0	0
Other: provision of fodder during the dry season, veterinary drugs, clean water for human consumption, family planning awareness	0	0	0

Notes: Table 7 shows the number of times a selected intervention was ranked 1st, 2nd, or 3rd in terms of importance. The ranking was only done with the 12 groups that did the PE scoring methods; it was not carried out with the groups that did the causal diagrams.

3.4 Intervention preferences

Based on the analysis from the causal diagrams and the other PE scoring exercises, the women identified and ranked different interventions to address both maternal and child malnutrition (Tables 6 and 7). For most of the groups, the priority was support to livelihoods and income generation. The interventions are discussed in detail below.

Income support - the most frequently mentioned intervention was support in establishing savings groups and support to women's income-generating activities through the provision of cash grants and loans combined with business skills training (Table 6). Participants were familiar with both the Nawiri and BOMA project graduation models, which had or were currently being implemented in the area. They mentioned these models as examples. The women viewed this kind of support as a way of increasing their income so that they could purchase nutritious foods. The types of businesses they identified included establishing small shops and buying food commodities from Ethiopia to sell to fish traders.

Restocking - this was the second-most frequently mentioned intervention (Table 6) and ranked first more frequently than any other kind of support (Table 7). Participants viewed restocking as a way to increase milk production. The women emphasized that restocking should only be done with drought-resistant animals such as camels and goats.

Fishing - participants identified support to the fishing sector, including the provision of equipment such as nets, boats, refrigeration, and training. This support included vocational training on how to make nets. Many of the participants felt that if they could be supported in establishing their own fishing cooperatives with equipment and market linkages, they could compete with rather than be exploited by external fish traders. Although the restocking and support to the fishing sector would primarily focus on the men, the women recognized that the whole family would benefit from these interventions.

Farming - participants identified support to farming, including irrigation (pumps and boreholes) as well as seeds and fencing to protect their farms from animals.[58] One group requested weather forecasts before the long rains. They explained that if reliable rainfall was predicted they would be willing to invest the time and energy to plant. However, participants felt that farming was risky given the absence of fresh water and unreliable rainfall.

Food and cash transfers - given that the exercise was carried out during a severe drought, not surprisingly participants emphasized the importance of relief aid. Relief aid included both food and cash transfers and an expansion of the Hunger Safety Net Programme (HSNP) to include more people. Participants from one village raised concerns that when local retailers became aware of recent cash transfers, they raised their prices. However, this price rise coincided with a countrywide hike in food prices and was possibly exacerbated by an ongoing fuel shortage. Participants in some of the more remote villages raised concerns that aid was being diverted and not reaching them. Participants from some of the villages close to the Ethiopian border maintained that they were being excluded from assistance from both Kenya and Ethiopia, as officials in both places presume they are being assisted by the other country.

Education - participants acknowledged that relief aid, while much needed, is only a short-term priority as opposed to a long-term solution. They felt that restocking and support to income-generating activities, the fishing sector, and farming are at best only medium-term solutions. Both men and women felt that in the long term there is no real future in pastoralism, farming, or fishing and the only real prospects for their children will be through education. Participants from several groups explained that during the current drought, the only people who weren't badly affected were those who had family members with even some basic education as they could get employment. Education, and the provision of schools, teachers, bursaries, and scholarships, was therefore identified as one of the top interventions. It was frequently ranked in the top three in terms of importance (Table 7). In contrast, while lifesaving relief aid was regarded as an immediate priority (Table 6), it was never ranked in the top three interventions.

At present, there are only two primary schools in Illeret and no secondary schools. Some schools (or at least classrooms) have been built in several of the villages visited, but these are nonfunctional, as there are no teachers. The only options for secondary education are outside of Illeret in places like North Horr, Marsabit, Isiolo, and Meru. However, only the top-performing students are given places due to the limited number of scholarships currently being provided by the county government and the Turkana Basin Institute. Aside from the costs involved in sending children to boarding schools in other towns, language barriers, discrimination, and the absence of family or kinship networks were also raised as additional challenges by key informants.

58 In one of the villages, camels had eaten most of their harvest one year when they had successfully managed to grow sorghum from rainfed farming.

Health services - six groups also identified the need for improved health services (Table 6). At present, Illeret has two clinics but no referral hospital. The closest referral hospital on the Kenyan side is in Kalacha which is inhabited by their "enemies," the Gabra. The Dasanech are therefore reluctant to send patients there, and some participants maintained that patients who are sent to Kalacha never come back. Therefore, most people prefer to go to Omorate in Ethiopia. Not only is Omorate much closer than Kalacha, but people feel the quality of service is better than on the Kenyan side. Although they pay for the services in Omorate, they feel they are good value for money.

4. Discussion

4.1 Livelihoods shocks and trends

Overall, the results from the analysis provide an illustration of how recent livelihoods trends such as the loss of the delta and recent shocks such as the 2021–2022 drought have directly impacted household food security and nutrition. The loss of the delta and the associated loss of food from farming and livestock products ultimately left the Dasanech more vulnerable to the recent drought. Although it took a few years for the full impact of the loss of the delta to be realized, in a relatively short period of time, the Dasanech lost their two most important sources of food and income. Since 2012, the community has struggled to survive in the face of declining livestock herds and failed harvests from rainfed crop farming. Increasing numbers of people began to engage in fishing and other coping mechanisms to survive. As a result, women's work burden increased as did cases of child malnutrition. By 2021, the community's coping strategies had been stretched to the limit, with drought and livestock disease decimating their remaining herds and resulting in emergency levels of wasting.

The Dasanech have a remarkable ability to adapt. For example, Carr (2012) describes how from 1970–2010 the Dasanech of the lower Omo went through four major livelihoods changes involving various combinations of herding, flood retreat agriculture, and fishing. These transitions were largely driven by the Dasanech being forced to give up much of their land and consequently becoming dependent on the Omo delta for their survival.[59]

Supported by powerful testimonies from Dasanech elders, the same commentator describes diversification into flood recession agriculture and fishing on the delta as a "last resort survival" strategy[60]. At the time, there were concerns that the soon-to-be-completed Gibe III dam in Ethiopia would alter the natural flood cycle of the Omo River with "catastrophic consequences" for the delta as well as Lake Turkana.[61] It was predicted that changes to the Omo's natural flood cycle would have a major impact on fish production and flood retreat agriculture, raising concerns over the fate of the Dasanech given their dependency on these last two survival options.[62] Notably, these predictions were based on the assumption that the dam would reduce water inflow to Lake Turkana.

The findings from the PE assessment indicate that the main reason for the loss of the delta is rising lake levels, most likely unrelated to the Gibe III dam.[63] However, the predicted impact on livelihoods has effectively been the same. Although fish production has not been as seriously impacted, the Kenyan Dasanech have lost both their dry season farms and grazing reserve. It's reasonable to assume that even without the recent unanticipated rise in lake levels they would at least have had access to the grazing reserve, albeit a diminishing one, for some time. Ironically, a major expansion of the delta due to falling lake levels from the 1970s encouraged the in-migration of the Dasanech, who as Carr (2012) points out, would have faced imminent starvation.[64] This exact outcome has now been realized due to the loss of the delta since 2010.

59 Carr, 2012.
60 Carr, 2012, p. 141.
61 Avery, 2013, p. 49.
62 See Avery, 2013 and Carr, 2012.
63 Rising lake levels are largely attributed to climate variability and increased rainfall in the lake catchment area, as well as seismic activity in the Rift Valley; for example, see GOK and UNDP, 2021 and UNEP, 2021.
64 Carr, 2012

Livelihood diversification over the past decade is clearly captured in the PE results, including changes in the relative importance of food sources and diversification into camel husbandry and fishing. There is a common misperception in Kenya that the Dasanech don't eat fish even though it's readily available.[65] While it's true that in the past there was a stigma attached to eating fish and only the poorest (*dies*) consumed fish,[66] this is not the case today. As discussed, fish consumption started becoming more commonplace about twenty years ago. A decade later, "tens of thousands of Dasanech had become dependent on fish out of economic desperation."[67] This desperation was brought about by herd losses and land evictions in Ethiopia,[68] resulting in the loss of their farms. Essentially this is the same livelihood dynamic described by PE participants in Kenya. By all accounts most of the community in Illeret now regularly consumes fish, even though it is not their protein of choice. Despite the nutritional benefits of fish, these benefits are likely mitigated when fish is used to compensate for energy deficiencies from other staple foods.[69]

At the time of the assessment, fish represented the most important food source for the community (Figure 9). They regard fish as a "hunger food," one that is only eaten out of desperation. Its current position as their main food source illustrates the magnitude of the livelihood transitions that have affected them.[70]

The response to acute malnutrition in Africa's drylands has overwhelmingly focused on treatment, not prevention. Consequently, much of the programming emphasis has been on the immediate and underlying causes of malnutrition.[71] The case of Illeret clearly illustrates how critical systems and institutions are in understanding malnutrition in these contexts. For example, governance systems and political economies have been responsible for marginalizing the Dasanech since the 1950s and have contributed to their unique dependency on the Omo delta. More recently, climate variability largely accounts for the rapid rise in lake levels that resulted in the submergence of the Omo delta and a related loss of critical land for pasture and farming. In combination, the impact of these factors on livelihoods systems explains why Illeret is a hotspot for persistent acute malnutrition.

The Nutrition Framework for Africa's Drylands, which has been adopted by the Nawiri project, gives renewed emphasis to the systemic causes of acute malnutrition such as environment, climate and seasonality, livelihood systems, and institutions.[72] The findings from the PE analysis in Illeret underscore the importance of these systemic causes and the interrelationship between them.

4.2 Programming implications

In the short term, immediate lifesaving support including food and cash transfers and emergency health services are needed. However, there are limited programming or policy options that will address the systemic causes of malnutrition in Illeret, as the loss of livelihoods for many people is likely permanent and irreversible. The Dasanech have lost two key livelihood resources, their dry season grazing area and with it most of their cattle, and their flood retreat farmlands. It is possible that at some point the water levels in Lake Turkana will fall; the lake has shown fluctuations of almost 400 feet, including a 32-foot drop, between 1975–1993.[73] However, future changes to water levels are uncertain. Although reduced rainfall might theoretically lead to lower water levels in Lake Turkana similar to pre-2010 levels,

65 See CRS, 2021.
66 Sobania, 1988.
67 Carr, 2012, p. 153.
68 Ibid.
69 See Kawarazuka, 2010
70 Several studies have also shown high levels of malnutrition in fishing communities even where fish is regularly being consumed. For example, see Bandoh et al., 2018. This finding suggests that a diet rich in fish does not necessarily translate into positive nutritional outcomes. A Nawiri study also found higher GAM rates among Turkana fisherfolk relative to other livelihood groups. See Mercy Corps, 2022.
71 Young, 2020.
72 Ibid.
73 Spawls and Mathews, 2012.

it is not known how the upstream and large-scale hydropower and irrigation investments on the Omo River in Ethiopia would respond to these rainfall changes. It is assumed that north of the border, the livelihoods of the Kenyan Dasanech are not a priority relative to national energy needs and commercial farming interests. Lake Turkana receives about 90 percent of its water from the Omo River, and so the ecology of the lake and the livelihoods of people on its shores now depend heavily on the management of the Gibe III dam in Ethiopia.

This illustrates the importance of regional, cross-border approaches to understanding livelihoods change in pastoralist areas.

For some people, pastoralism probably represents the best option for the medium term. Pastoralism could be supported through restocking with drought-resistant species such as camels and goats, and improved animal health services. However, the rangelands around Illeret are already reported to be degraded. This trend will continue with increasing numbers of people and animals being concentrated in the ward. Mobility beyond the ward for the Dasanech is limited by neighboring enemies, national parks, international borders,[74] and the lake. Future droughts and livestock diseases will continue to represent a challenge for livestock production. For example, a recent study on livelihood transitions in Marsabit showed increasing numbers of people falling out of pastoralism due to poverty and decreasing numbers of people "moving up,"[75] or benefitting from pastoralism through commercial livestock trade.[76] Droughts, such as those experienced in 2011 and 2017, accelerated this trend.[77] However, the study showed a positive correlation between education levels and access to credit and those "moving up" and those successfully or voluntarily "moving out" of pastoralism as opposed to those "dropping' out."[78]

Although some participants suggested that irrigated farming might be a solution, this was partly in response to the loss of their delta farms being identified as one of the main causes of malnutrition. In reality, there are limited cost-effective options for irrigated farming, as both the lake water and groundwater are unsuitable for crop production. When conditions are suitable, rainfed crop production can be supported through the provision of inputs and climate forecasts. However, rainfed farm production has been unreliable over the last decade. In some years, rainfed farming may provide food security benefits to some households, but overall it will not begin to address the issue of acute malnutrition in the area.

Fishing will also continue to be more of a survival strategy than a meaningful sustainable livelihoods option. In the short term, the provision of fishing equipment and market linkages might help the Dasanech survive. However, there are several challenges. At present, the fishing sector is largely controlled by powerful commercial interests. At the bottom of this supply chain, the Dasanech are arguably exploited and unable to compete with actors who are better equipped and financed, and better connected to external markets. Furthermore, even a decade ago Dasanech fisherfolk faced the risk of violent confrontations with Turkana fisherfolk competing over dwindling fish stocks attributed to commercial fishing.[79] With increasing numbers of both Dasanech and Turkana diversifying into fishing, fish stocks are likely to become further depleted. This scenario does not even include the predicted impact on the lake's fisheries from hydropower and irrigation investments on the Omo River,[80] impacts that have likely only been delayed. Increased dependency on fishing will only make the Dasanech more vulnerable to another major livelihoods shock at some point in the future.

74 Mwamidi et al., 2018.
75 See Catley and Aklilu, 2013.
76 Kirui et al., 2022.
77 Ibid.
78 Ibid.
79 Carr, 2012.
80 See Avery, 2013; International Rivers, 2013; and Hodbod et al., 2019.

It's possible that with significant investments in infrastructure and services, new economic sectors such as tourism and cross-border trade might emerge. These industries and associated investments might bolster the existing livestock and fishing sectors and provide new livelihoods opportunities for communities in the area. However, for the Dasanech to benefit from these opportunities either within Marsabit or in external labor markets, meaningful investments in education are needed. Both male and female participants were clear that they do not see a future for their children in fishing, farming, or pastoralism. There's little evidence to suggest these livelihoods can continue to support increasing numbers of people. At worst, investments in education will more than likely be offset by the reduced costs of responding to future emergencies. Emergencies that, if current demographic and climate trends hold, will only multiply in scale and complexity.

Even without the loss of the delta, the history of the Dasanech over the past seventy years points to key structural issues around governance and access to productive resources. These issues will not be addressed through conventional livelihoods or resilience programming. It will require new thinking and ideas that support positive livelihoods diversification. Support to education might represent one pathway, but it may be time to explore other, more politically sensitive areas of intervention. Examples might include support to out-migration or legislation to ensure communities directly and equitably benefit from revenues generated from natural resources. Since its inception, the Nawiri project has recognized that malnutrition in the Kenyan ASALs will not be addressed by doing business as usual but will require new and innovative thinking and approaches. While the solutions may not be obvious at present, approaches to finding them will have to be cognizant of the limitations of current programming in addressing the systemic and structural issues that lead to malnutrition in places like Illeret.

References

Avery, S. (2013). What Future for Lake Turkana? The Impact of Hydropower and Irrigation Development on the World's Largest Lake. University of Oxford, African Studies Centre. https://www.mursi.org/pdf/copy3_of_pastoral-livelihoods.pdf. Accessed May 2022 ,9.

Bandoh, D. A., A. Manu, and E. Kenu. (2018). "Lacking in Abundance: Undernutrition in a Peri-Urban Fishing Community in Coastal Ghana." *BMC Nutrition* 20 :(1)4. https://www.researchgate.net/publication/324898312_Lacking_in_abundance_undernutrition_in_a_Peri-urban_fishing_community_in_Coastal_Ghana. Accessed May 2022 ,22.

Burns, J., A. Catley, and H. Mahmoud. (2021a). Women's Knowledge on the Seasonality and Causes of Child Malnutrition in Marsabit County, Kenya. USAID Nawiri project, Nairobi.

Burns, J., A. Catley, and H. Mahmoud. (2021b). Using Participatory Epidemiology to Investigate the Causes and Seasonality of Acute Malnutrition in Marsabit and Isiolo Counties, Northern Kenya: Methods and Experiences. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University. Nawiri project.

Carr, C. J. (2012). Humanitarian Catastrophe and Regional Armed Conflict Brewing in the Transborder Region of Kenya, Ethiopia and South Sudan: The Proposed Gibe III Dam in Ethiopia. African Resources Working Group (ARWG). www.arwg-gibe.org. Accessed May 2022 ,11.

Carr, C. J. (2017). River Basin Development and Human Rights in Eastern Africa – A Policy Crossroads. https://link.springer.com/content/pdf/2%10.1007F8-50469-319-3-978.pdf. Accessed May 2021 ,1.

Catholic Relief Services (CRS). (2021). USAID Nawiri Gender Youth & Social Dynamics Analysis to Explore Gender, Social And Cultural Norms Associated with Acute Malnutrition in Isiolo and Marsabit Counties of Kenya. Final report. CRS, Nairobi.

Catley, A., and Y. Aklilu. (2013). Moving Up or Moving Out? Commercialization, Growth and Destitution in Pastoralist Areas. In *Pastoralism and Development in Africa: Dynamic Change at the Margins*, ed. A. Catley, J. Lind, and I. Scoones. Ch. 7. Oxford: Routledge Publishing.

Catley, A., R. G. Alders, and J. L. N. Wood. (2012). "Participatory Epidemiology: Approaches, Methods, Experiences." *Veterinary Journal* 160–191:151.

Catley, A., J. Burns, D. Abebe, and O. Suji. (2014). Participatory Impact Assessment: A Design Guide. Feinstein International Center, Friedman School of Nutrition Science and Policy at Tufts University, Boston.

Galaty, J. G. (2000). *Time, Terror, and Pastoral Inertia Sedentarization and Conflict in Northern Kenya.* Boulder: Lynne Rienner Publishers.

Gebre, Y. (2012). Environmental Change, Food Crises and Violence in Dassanech, Southern Ethiopia. Research Report Series Peace and Conflict Studies 1. Berlin: Freie Universität Berlin, FB Politik- und Sozialwissenschaften, Otto-Suhr-Institut für Politikwissenschaft, Arbeitsschwerpunkt Friedens- und

Konfliktforschung. https://nbn- resolving.org/urn:nbn:de:-0168ssoar439836-.

Government of Kenya (GOK) and United Nations Development Programme (UNDP). (2021). Rising Water Levels in Kenya's Rift Valley Lakes. Turkwel Gorge Dam and Lake Victoria: A Scoping Report.

Hodbod, J., E. G. J. Stevenson, G. Akall, T. Akuja, I. Angelei, E. A. Bedasso, L. Buffavand, S. Derbyshire, I. Eulenberger, N. Gownaris, B. Kamski, A. Kurewa, M. Lokuruka, M. F. Mulugeta, D. Okenwa, C. Rodgers, and E. Tebbs. (2019). "Social-Ecological Change in the Omo-Turkana Basin: A Synthesis of Current Developments." *Ambio* 1115–48:1099. https://doi.org/10.1007/s3-1139-018-13280.

International Rivers. (2013). The Downstream Impacts of Ethiopia's Gibe III Dam: East Africa's "Aral Sea" in the Making? https://archive.internationalrivers.org/sites/default/files/attached-files/impact_of_gibe_3_final.pdf. Accessed May 2022 ,19.

Kawarazuka, N. (2010). The Contribution of Fish Intake, Aquaculture, and Small-Scale Fisheries to Improving Nutrition: A Literature Review. WorldFish Center Working Paper No. 2106. The WorldFish Center, Penang.

Kenya National Bureau of Statistics (KNBS). (2019 .(2019 Kenya Population and Housing Census. Volume IV: Distribution of Population by Socio-Economic Characteristics. December.

Kirui, L., N. Jensen, G. Obare, I. Kariuki, P. Chelanga, and M. Ikegami. (2022). "Pastoral Livelihood Pathways Transitions in Northern Kenya: The Process and Impact of Drought." *Pastoralism: Research, Policy and Practice* 12:23.

Komu, N., and J. Walter. (2022). Drought Visits Death and Misery on Residents of the Arid North. Nation Media Group. April 2022 ,18. https://nation.africa/kenya/counties/marsabit/drought-visits-death-and-misery-upon-residents-in-the-arid-north3785748-. Accessed May 2022 ,5.

Leakey, A. (2022). World Water Day – March 2022 ,22. Turkana Basin Institute Website. https://www.turkanabasin.org/03/2022/world-water-day-march2022-22-/. Accessed May 2022 ,17.

Mahmoud, H., J. Burns, and A. Catley. (2021). Women's Knowledge on the Seasonality and Causes of Child Malnutrition in Isiolo County, Kenya. USAID Nawiri project, Nairobi.

Mercy Corps. (2022). USAID Nawiri Learning Briefs: Measuring Nutrition Dynamics over Time to Illuminate Critical Trends and Relationships. Longitudinal Study Learning Brief.

Mwamidi, D., J. Gabriel Renom, A. Fernández-Llamazares, D. Burgas, P. Domínguez, and M. Cabeza. (2018). "Contemporary Pastoral Commons in East Africa as OECMs: A Case Study from Daasanach Community of Ileret, Marsabit Country, North of Kenya." *Parks 24*, Special Issue, June.

Ochola, S., J. Munga, and E. Odundo. (2021). Malnutrition Hotspot Analysis and Mapping for the Nawiri Project in Marsabit County.

Sobania, N. (1988). "Fisherman Herders: Subsistence Survival and Cultural Change in Northern Kenya." *Journal of African History* 56–29:41. http://www.rhinoresourcecenter.com/pdf_files/1175862362/117.pdf. Accessed May 2022 ,16.

Spawls, S., and G. Mathews. (2012). *Kenya: A Natural History*. London: Poyser.

United Nations Environment Programme (UNEP). (2021). Support to Sustainable Development in Lake Turkana and its River Basins. Results of Modelling of Future Scenarios of Lake Turkana and its River Basins. Technical Report. UNEP-DHI Centre.

United States Agency for International Development (USAID)/Kenya. (2015). Feed the Future Northern Kenya 2015: Zone of Influence Interim Assessment Report. Westat, Rockville, MD and USAID/Kenya. Mid-term assessment of Kenya's Feed the Future Program.

USAID. (2019). Request for Applications for Fiscal Year 19 Development Food Security Activities in Kenya. USAID Office of Food for Peace (FFP).

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

Annex I. Locations for PE Methods, Illeret

1	Kerech
2	Baulo
3	Morte
4	Namugusiai
5	Nangolei
6	Guor sibil
7	Nyumba kumi
8	Watalii
9	Aiybete
10	Ilolo
11	Lomadang
12	Telesgaye

Annex II. Language for Different Health Conditions and Different Causes of Malnutrition

Child

Gon mantia	Healthy
Gon hi gaa idha	Someone who is sick
Dhadai	Underweight (not healthy)
Gar nya	Stunted growth (short) but healthy; may include "dwarfism"
'Joloo	Recurring bouts of weakness and retarded growth (illness but they never really recover)
Gon nyingir dabiya	Malnourished due to poor diet
Nyokot	Highly malnourished, emaciated, can see the bones and the skin is loose; all the veins are visible
Nadhee	Extreme—follows *Nyokot* and the child cannot even walk—very weak (severe acute malnutrition)

Mother

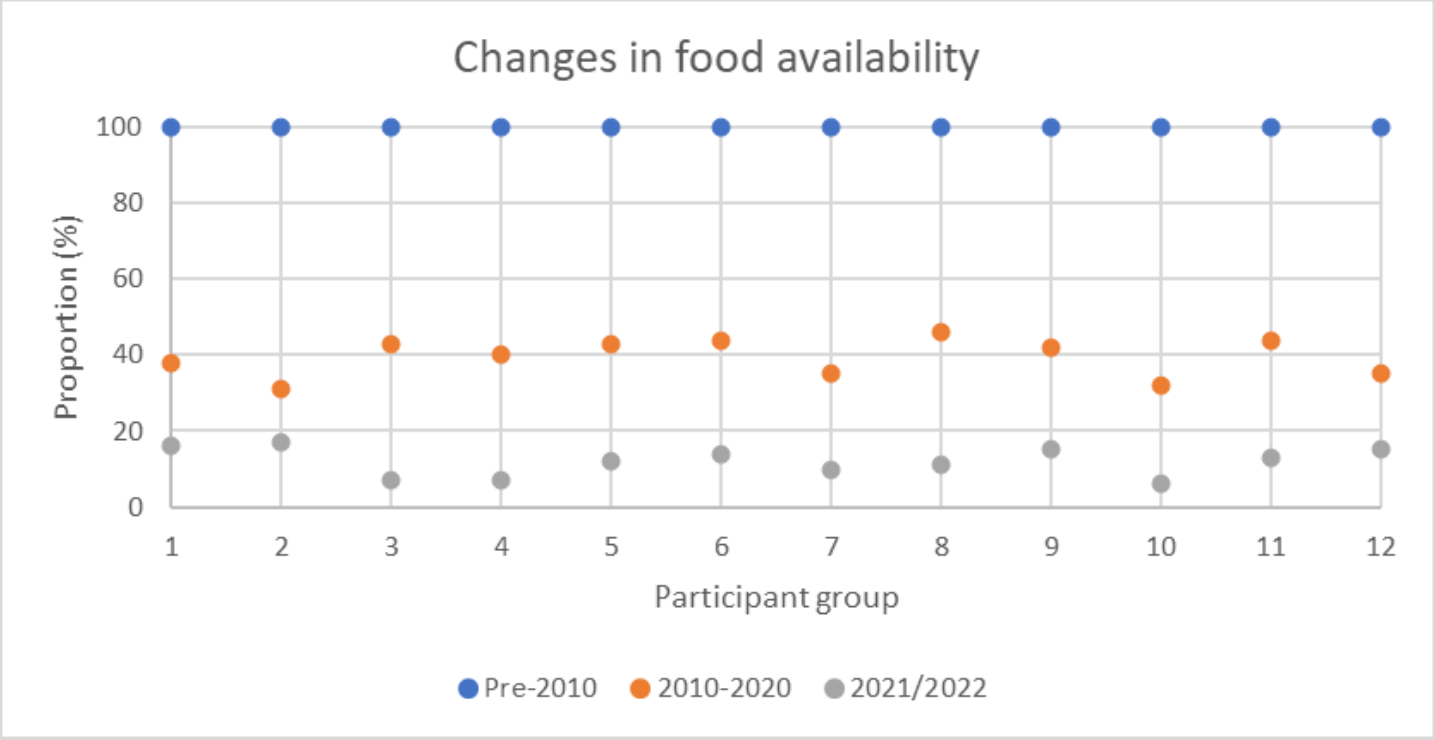
Gon waagiet	Healthy
Gon hi fasman	Pregnant mother—not sick but anemic—lacks balanced diet (can get tired easily)
Il giente	Onset of pregnancy (morning sickness), no appetite and food preferences/cravings
Gon jam dabiye (accent above d)	Malnourished due to poor diet (same as *Gon nyingir dabiya* for children)

Anyone

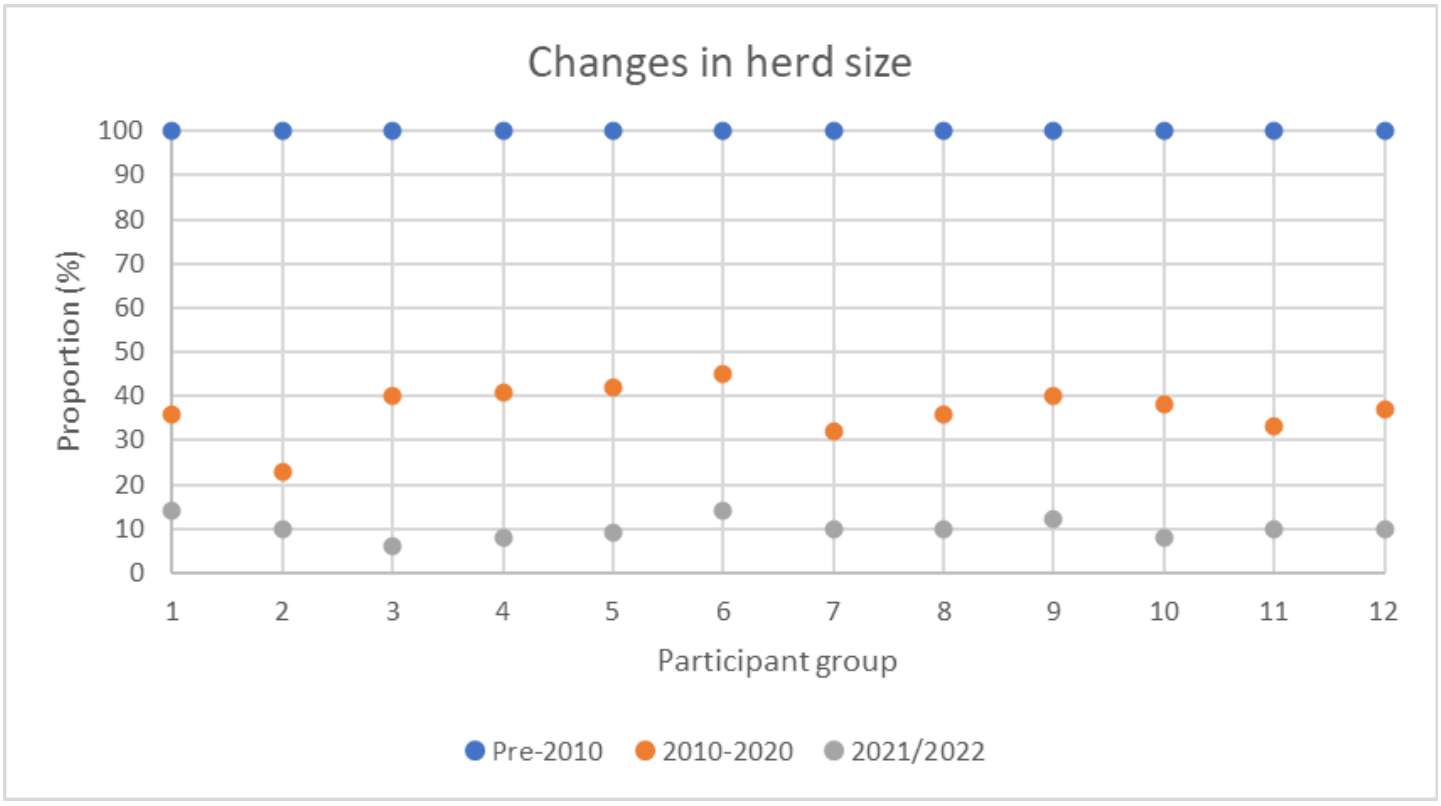
Dam yie	*Dam* means dryness; skin gets dry and wrinkled
Garmar makotil gayoo (2-week hunger)	Height of the drought (hunger season)

Notes: Slightly different interpretations of these terms were given in different communities. The ones presented here were based on revisions by Dasanech translators in Illeret.

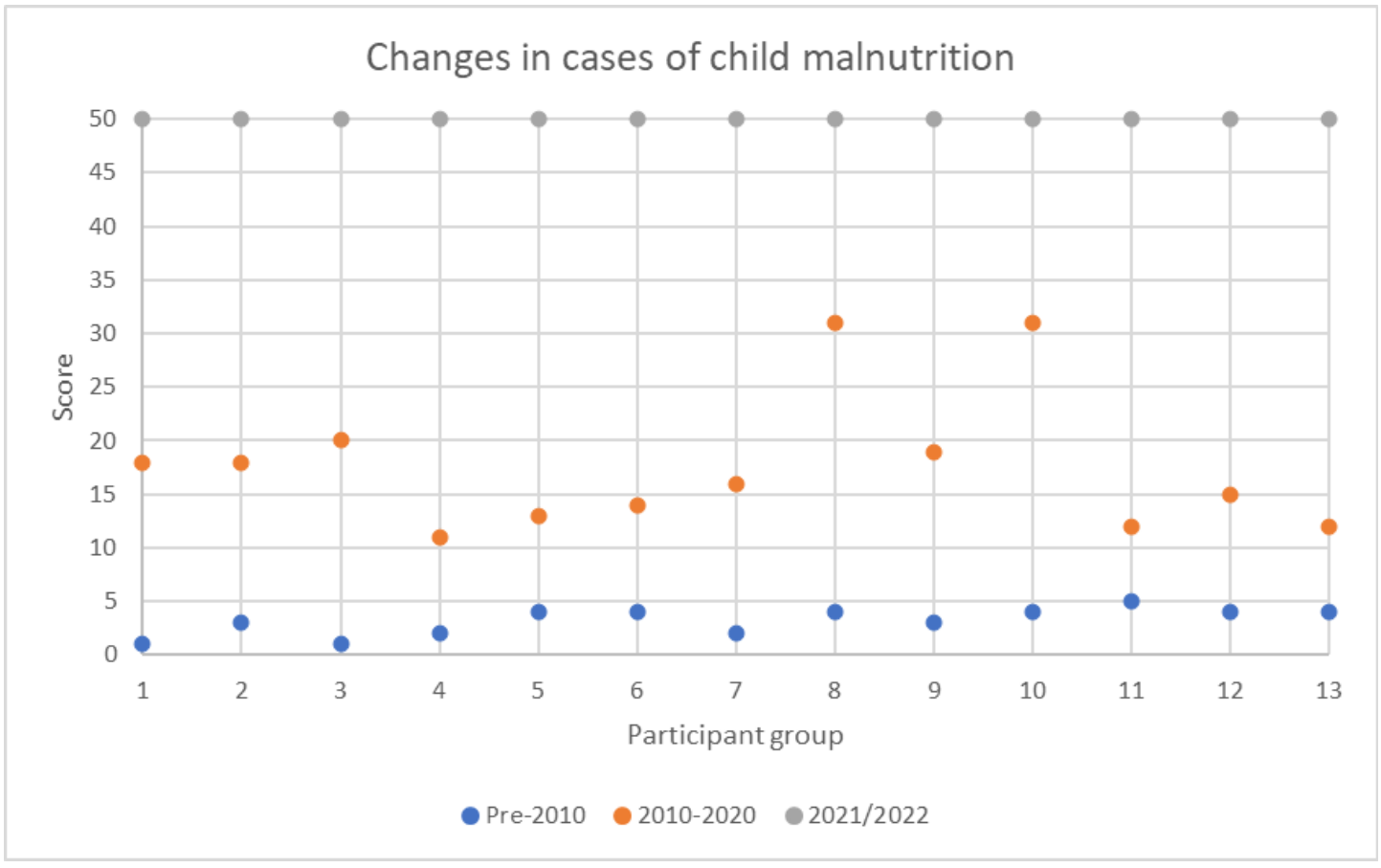
Annex III. Inter-Participant Group Reliability for Selected Variables



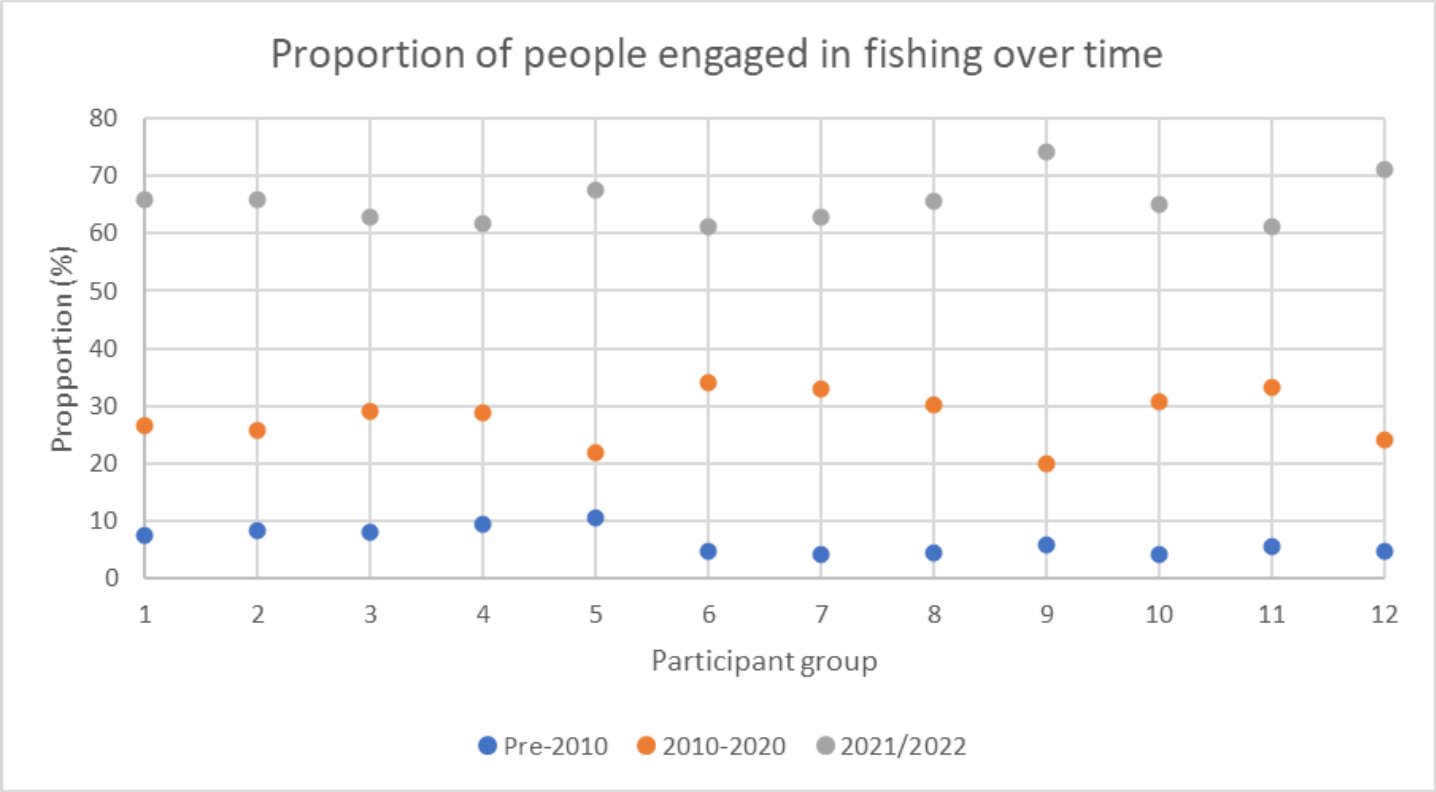
Note: Proportional piling method used standardized 100 counters for the pre-2010 period for all groups.



Note: Proportional piling method used standardized 100 counters for the pre-2010 period for all groups.



Note: Scoring method used standardized 50 counters for the 2021/2022 period for all groups.



Note: Method used proportional piling with 100 counters for each group.

Nawiri