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Impacts of the COVID-19 pandemic on food security among East and West African pastoralists[☆]

Evan F. Griffith^{a,*}, Shaina Craige^{b,c}, Pablo Manzano^{d,e}, Loupa Pius^{f,g,h}, and Christine C. Jost^{b,i}

^aCummings School of Veterinary Medicine, Tufts University, North Grafton, MA, United States

^bUnited States Agency for International Development Bureau for Humanitarian Assistance (USAID/BHA), Washington, DC, United States

^cAmerican Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow, Washington, DC, United States

^dGlobal Change and Conservation Lab, Organismal and Evolutionary Biology Research Programme, Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland

^eHelsinki Institute of Sustainability Science (HELSUS), Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland

^fDynamic Agro-Pastoralist Development Organization (DADO), Kaabong, Uganda

^gArid Landscape Initiative (ALIN Africa), Moroto, Uganda

^hCoalition for European Lobbies on Eastern Africa Pastoralism (CELEP), Brussels, Belgium

ⁱGlobal Health Support Initiative III, Social Solutions International, Washington, DC, United States

*Corresponding author: e-mail address: fitzgeraldgriffith3@gmail.com

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1. Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease of humans caused by a coronavirus newly emerged in 2019—SARS-CoV-2. The COVID-19 pandemic has resulted in an unprecedented health crisis, with an estimated 176,037,471 cases around the world and 3,805,611 deaths as of June 2021 (Dong et al., 2020). Early in the pandemic high-income countries were disproportionately impacted, while low- and middle-income countries (LMICs) reported relatively lower morbidity and mortality rates (Dong et al., 2020). However, the true number of cases may be many more as testing and tracing have been a challenge and many LMICs do not sufficiently collect mortality data (Dahir, 2021a). Recently, however, reported COVID-19 cases have been surging in LMICs (Roser et al., 2020). For example, as of early June 2021, cases and deaths are increasing by 20% and 15%, respectively, per week in Africa, with Uganda reporting their highest number of new weekly cases since the pandemic began (WHO, 2021a).

The secondary impacts of the pandemic in LMICs due to quarantines, bans, and movement restrictions are resulting in significant development and food security declines (Mardones et al., 2020). Early in the pandemic it was argued that more industrialized systems were more severely impacted by COVID-19 (Rivera-Ferre et al., 2021). A recent study, however, found that in 11 of the poorest and most food-insecure countries, livestock keepers were among the most severely affected by restrictions put in place to control the pandemic. This was due to difficulty in accessing production inputs or selling products and restricted access to pastures, among other factors (FAO, 2021a). This has resulted in what the Food and Agriculture Organization of the United Nations (FAO) describes as an “economic and food security crisis” among livestock keepers in low-income countries (FAO, 2021e).

In this chapter, we will focus on the food security impacts of the COVID-19 pandemic among pastoralists in East and West Africa. Pastoralism is a livelihood and a food production system found all over the world’s rangelands and seasonally on large areas of farmlands, covering more than 50% of the global land area (Manzano 2015; Johnsen et al., 2019; ILRI et al., 2021). Primarily a herding system reliant on mobility to find pasture and water, pastoralism has a unique ability to convert non-human-edible fiber (cellulose) unpredictably distributed throughout highly variable ecosystems into meat, milk, livelihoods, and income (FAO, 2011). For this reason, pastoralism can be described as a specialization to take advantage of

environmental variability (Ministry of State for Development of Northern Kenya and other Arid Lands 2012). According to the African Union, over 268 million people rely on pastoralism as a livelihood in Africa (FAO, 2018). But the number of those who benefit from pastoralism is much larger, as these systems supply important value chains, provide critical ecosystem services, and contribute to maintaining landscape functionality (Hoffmann et al. 2014). Our analysis also includes agro-pastoralists, who practice some amount of crop production in addition to livestock rearing. However, among livestock keepers in the arid and semi-arid lands (ASALs) of East and West Africa, livestock provide the main source of income and household financial capital, independent of crop production (Catley et al., 2016).

Among rural populations in East and West Africa, pastoralism is a particularly interesting case study for the impacts of the COVID-19 pandemic. Morbidity has mainly affected older people that are the repositories of traditional knowledge systems that pastoralists rely upon for basic livelihood elements such as rangeland and herd management (Oba 2012; Salpeteur et al., 2015). Pastoralist livelihoods tend to occur at the periphery of socioeconomic systems (Manzano et al. 2021), which is particularly relevant in terms of the disconnection and disruption to extended social relationships that the pandemic has triggered. The disruption of markets is also important, given pastoralist's dependence on markets both for selling products and for buying food, particularly for poorer pastoralist households (Little et al., 2014).

We also analyze the impacts of the pandemic through a gender lens, as there are important gender dynamics (e.g., ownership, responsibility, resource management, decision making, norms, and power) in pastoral systems that influence household food security (Flintan, 2008). Pastoral women are key economic players in their communities and share household responsibilities with men (Flintan, 2008). Small livestock production (goats, sheep, poultry), collection and sale of milk, and the management of food and its consumption in the household are usually the responsibility of pastoral women (Flintan, 2008). Men are more involved with large livestock production (e.g., herding and migration), although this is not uniform and depends on specific local factors (Eba et al., 2020). While women are often responsible for caring for livestock, in general, they cannot make decisions about livestock consumption, sales, and exchange (Eba et al., 2020). Thus, the impacts of COVID-19 restrictions can affect men and women pastoralists differently. These topics are analyzed in more detail in the following sections. First, we look at COVID-19 related food insecurity trends among pastoralists in East and West Africa. We then look at the impacts of the pandemic on specific aspects of food security.



2. Food insecurity trends during the COVID-19 pandemic

As the main livestock producers and source of animal source foods (ASFs) in the worlds' drylands, pastoralists are key to food security in these areas (ILRI et al., 2021). Paradoxically, pastoralists are also prone to food insecurity and often have poorer food security compared to more sedentary populations in the same country or region (Catley et al., 2016). Pastoral areas, especially the Horn of Africa and the Sahel belt, are still characterized by very high levels of child malnutrition, with global acute malnutrition (GAM) in children under five often exceeding 10% and reaching levels of 20% or higher (Sadler et al., 2009). These high levels often persist over years, even in the absence of an acute crisis or shock (Young, 2020; Young and Marshak, 2017). For example, the Grand Kanem Region of Chad, a pastoral area, has been experiencing chronic emergency levels of acute malnutrition for over two decades with GAM levels over 15% (Young and Marshak, 2017). There are many contributing factors to this dynamic in pastoral areas of East and West Africa, including seasonal environmental variation, health status and infection, weak services and infrastructure, and ongoing shocks (e.g., desert locusts, drought, livestock disease outbreaks, floods, livestock raiding, food price increases and market closures) (Griffith et al., 2020b; Young, 2020; Young et al., 2021). There are also long-term trends in pastoral areas that contribute to food insecurity and malnutrition, including inequalities and poverty, governance of natural resources, and migration and displacement (Young and Marshak, 2017). Although not a focus of this chapter, conflict that causes population displacement and disruption of services, is a major driver of current food insecurity trends in pastoral areas of Eastern and Western Africa. Since the start of the pandemic, conflict has contributed to increased food insecurity in pastoral areas of South Sudan, Burkina Faso, Mali, and Niger (International Organization for Migration and Reseau Billital Maroobe, 2021; IPC, 2020a,d; USAID, 2020a,b).

The Integrated Phase Classification (IPC) is a widely accepted system for classifying the severity and magnitude of food emergencies. Based on common standards and language, the IPC allows analysts to classify food insecurity in households and areas according to a five-phase scale. The five phases include: phase 1: minimal, phase 2: stressed, phase 3: crisis, phase 4: emergency, and phase 5: catastrophe/famine. The overall food security trends in pastoral areas have declined significantly during the COVID-19

pandemic. A 2021 report by the Famine Early Warning Systems Network (FEWS NET), which is funded by the United States Agency for International Development, on food security in Somalia highlighted these declining trends. Many poor pastoral households had difficulty affording both their essential food and non-food needs. In Somalia's central pastoral livelihood zones where livestock holdings are low among pastoralists due to increased crop production compared to the other pastoral zones, most poor households were in Crisis (FEWS NET, 2021b). COVID-19 containment measures resulted in the decline of livestock sales due to domestic and international market closures. The cancellation of the Hajj, the Islamic pilgrimage to Mecca during the Eid al-Adha holiday, when many animals are slaughtered in offerings, resulted in a decline in livestock exports in June 2020 from Somalia. The loss of export income among better-off households impacted poor households by reducing labor demand throughout the livestock value chain, including those who earn income from animal feeding, watering, and marketing (FEWS NET, 2021b). Additionally, the impacts of COVID-19 weakened social and economic support to pastoralists. In Somalia, more wealthy pastoralist households usually receive remittances and redistribute them, thus providing support for many poor urban, internally displaced persons, and pastoral households that cannot meet their minimum food needs. External remittances to Somalia declined by an estimated 25–30% in 2020 (FEWS NET et al., 2020). COVID-19 containment measures drove a decline in social support for poorer households from middle and better-off households (FEWS NET, 2021b). These factors are reflected in the Global Acute Malnutrition (GAM) value that increased from serious (10–14.99%) to critical (15–29.99%) in the central Hawd Pastoral livelihood zone (FEWS NET, 2021b).

In 2020, a joint FAO-World Food Program (WFP) report highlighted acute food insecurity hotspots across the globe, including in pastoral areas of East and West Africa. In Ethiopia between July and September, an estimated 8.5 million people were projected in the report to be facing Crisis or worse levels of acute food insecurity in seven pastoral and agro-pastoral producing rural areas (FAO and WFP, 2020). In Sudan, skyrocketing inflation directly impacted agro-pastoralists, contributing to high levels of food insecurity in 2020 (FAO and WFP, 2020).

IPC food insecurity projections across East and West Africa pastoral areas illuminate current food security trends in the region. For example, in the pastoral Afar Region in Ethiopia, 83% of the population is in Crisis as of June 2021, while 17% is in Emergency (IPC, 2021a). The Eastern, West,

and Central Pastoral livelihood zones in Sudan (FEWS NET, 2011c) are at Crisis levels (IPC, 2020e). The South-Eastern Semi-Arid Pastoral livelihood zone in South Sudan is at Crisis and Emergency levels (IPC, 2020d). The Northwestern, Northern, Northeastern, Eastern, and Southern Pastoral livelihood zones in Kenya (FEWS NET, 2011b) are in Crisis, in contrast to more southern, non-pastoral regions that are at Minimal or Stressed (IPC, 2020c). In 2020, 1.8 million people in Kenya's ASALs were at Crisis or higher (IPC, 2020c). Across the Sahelian region, pastoralists are at Crisis or greater levels of food insecurity. The Wadi-Fira and Batha transhumance regions in Chad are in Crisis, while the Nord Kanem region is at Emergency (IPC, 2020b). Most pastoral areas in Mali are in Crisis, while the North Transhumant Pastoralism livelihood zone in Burkina Faso (FEWS NET, 2011a) is in Emergency (IPC, 2020a). Finally, pastoral areas in Mauritania are a mixture of Stressed and Crisis (IPC, 2021b). Examining the IPC Acute Food Insecurity Map (IPC, 2021b), shows that non-pastoral regions in the Sahel (more southern) are generally at lower IPC phases (e.g., Stressed or Minimal). Food insecurity across West Africa and the Sahel rose dramatically in 2020 in part due to the impact of COVID-19 related restrictions, specifically because of border closures disrupting transhumance and livestock markets for pastoralists (FAO and WFP, 2020). Overall, 22.1 million people were projected in 2020 to be facing a food security Crisis or Emergency in the region compared to 14.1 million during 2019 (FAO and WFP, 2020).



3. Impacts of the COVID-19 pandemic on food security

In this section, we focus our analysis of the impacts of the COVID-19 pandemic on the food security of East and West African pastoralists using a conceptual framework with three main categories: food availability, food access, and food utilization (Riely et al., 1999) (Fig. 1), while also taking into consideration stability and security (Burchi and Muro, 2016). A general understanding of pastoral livelihoods is necessary when using the Food Security Framework in pastoral contexts. Pastoralists' own production focuses on ASFs such as milk, meat, and blood. Milk provides the major source of income in most pastoralist households, while livestock are sold when milk production is low (e.g., during the dry season) and money is needed to buy food (Little et al., 2014). Some nutrition interventions in pastoralist areas of East and West Africa have promoted small-scale vegetable production at homesteads, and some development interventions have promoted riparian crop and/or fodder production (Ekaya, 2005). However, the

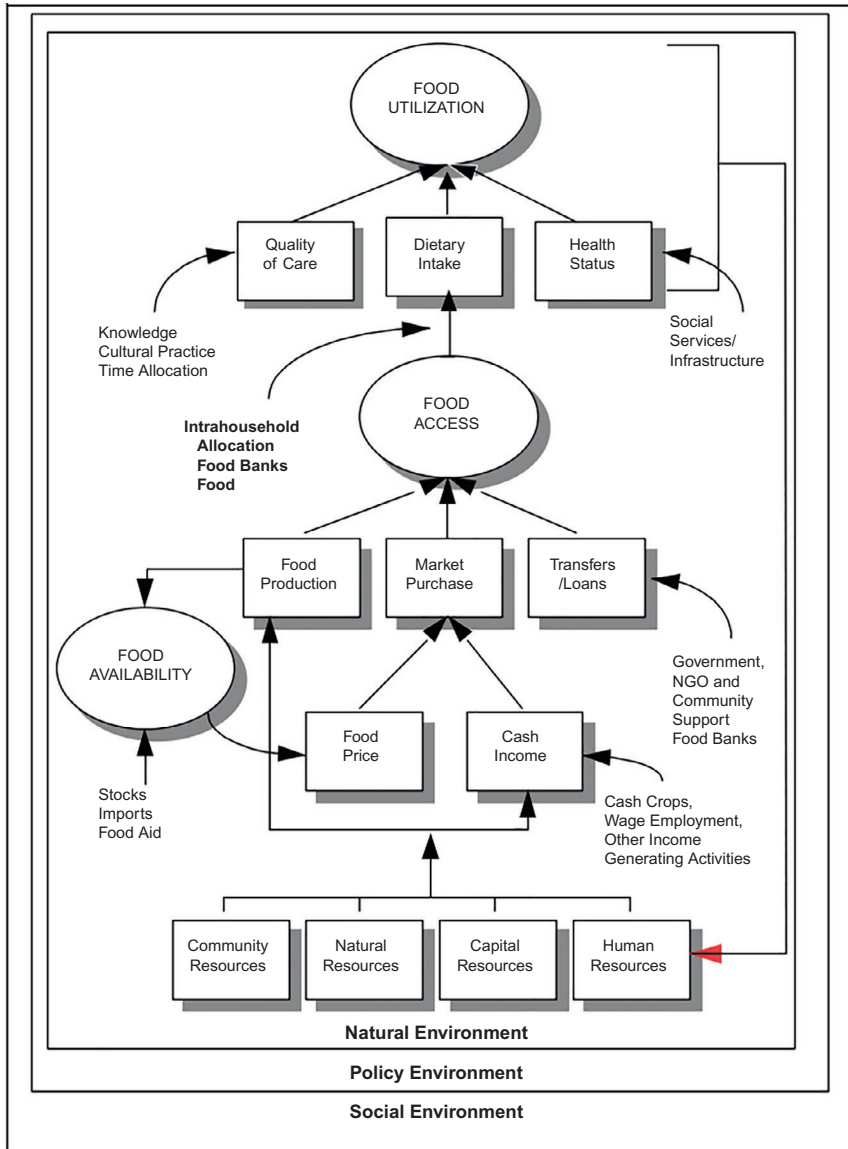


Fig. 1 Food security conceptual framework adapted from food security indicators and framework for use in the monitoring and evaluation of food aid programs (Riely et al., 1999).

majority of non-ASFs in pastoral diets, such as staple grains, are obtained through markets (Little et al., 2014). Food availability depends on enough food being consistently available. Thus, production constraints (e.g., lack of animal health inputs) limit the availability of ASF. Food access is ensured when households have adequate resources to obtain food.

Livestock production, specifically selling animals and their products, is the main source of income among pastoralists. Thus, reduced production, decreases in livestock prices, or increases in non-ASF prices result in decreased food access. Food utilization is the proper biological use of food, which is reliant on an individual's health and nutrition status.

3.1 Availability of food

The COVID-19 pandemic has hindered livestock and crop production and disrupted the movement of goods in pastoralist areas of East and West Africa, including production inputs and non-ASFs, generally resulting in a decreased availability of food (Graham et al., 2021). Milk is a key food for pastoralists, particularly as a readily available source of protein and micro-nutrients, and milk production levels depend on livestock health and nutrition (Sadler et al., 2010). During the COVID-19 pandemic, pastoralists have experienced decreased access to key inputs for livestock production, including animal health services, livestock feeds, and access to pasture and water.

Livestock diseases in LMICs have a strong negative impact on production, disrupt markets and trade, and compromise livelihoods, incomes, and food security (FAO, 2021b; Jost et al. 2021). Livestock diseases often rank as the main production constraint in pastoral areas (Little et al., 2014; Omondi et al., 2021). Furthermore, pastoralists often lack access to animal health inputs due to the limited national resources for the delivery of animal health services, economic non-viability of private veterinary services in pastoral areas, and the transhumant/nomadic nature of pastoral livelihoods (Omondi et al., 2021). The existing lack of veterinary drugs and services in pastoral areas has been worsened by the pandemic. For example, in South Sudan FAO and other non-governmental organizations (NGOs) carry out wet season mass vaccination campaigns for important animal diseases (e.g., anthrax, blackleg, contagious bovine pleuropneumonia (CBPP), and sheep and goat pox). In 2020, this vaccination campaign did not occur due to vaccine supply chain limitations and limited access to communities due to COVID-19 measures (Catley, 2020). Similarly, vaccination campaigns for peste des petits ruminants, CBPP, and Newcastle disease in Cameroon and the Central African Republic were disrupted due to COVID-19 measures and restrictions (Catley, 2020). In Karamoja, Uganda, the availability of veterinary medicines decreased between 29% and 80% as of August 2020 (Lotira et al., 2020). Access to veterinary pharmaceuticals in Karamoja was further decreased due to reduced availability and increased cost of public transport (Catley, 2020). In Mali, livestock vaccination campaigns were disrupted due to reduced household incomes

because of the pandemic (FEWS NET, 2020a). In Chad, livestock diseases, including CBPP and anthrax, and a lack of veterinary services were shown to harm animal production during the pandemic, with respondents in a phone survey identifying access to veterinary products and services as the main need to improve production (FAO, 2020). Similarly, pastoralists in Somalia reported livestock disease as a main production constraint during the pandemic, caused in part by difficulty accessing veterinary services because of higher prices than normal (63%) and insufficient income to access services (62%) (FAO, 2021b). In general, government budgets are being reallocated to Ministries of Health and other social service services to fight the pandemic, further limiting public sector veterinarians in their response to livestock disease outbreaks (Mercy Corps, 2020). Moreover, community animal health workers (CAHWs), who play a crucial role in animal health service delivery in pastoral areas in Africa, are unable to procure drugs due to liquidity problems and movement restrictions within countries (Mercy Corps, 2020).

The use of supplemental feeds is another key aspect of livestock production for pastoralists, particularly during the dry lean seasons. Pastoralists often buy feed from farmers or private vendors, prioritizing breeding stock that are needed to rebuild herds after production shocks (e.g., drought, raiding, disease) (Catley et al., 2016; Swallow, 1994). COVID-19 control measures have disrupted the production and distribution of livestock feed. For example, Somali pastoralists reported difficulty in accessing livestock feed due to their high cost and insufficient income to purchase feed (FAO, 2021b). Feed shortages were also reported in Niger, Senegal, Mauritania, Burkina Faso, and Nigeria (Catley, 2020). Reduced veterinary and feed inputs due to COVID-19 measures have compromised animal health and productivity, resulting in increased livestock morbidity and mortality, decreased body condition scores, and reduced milk production, thereby limiting consumption of ASFs among pastoralists and decreasing food availability (Catley, 2020; FAO, 2020, 2021b).

Pastoralists' access to pasture and water have been impacted by pandemic-related movement restrictions. Mobility is essential to pastoral production, driven by the nutritional needs of livestock. There are generally two types of mobility, short range (i.e., daily grazing mobility) and long range (i.e., migration), that allow for livestock production in ecosystems with highly variable natural resource availability and predictable spatio-temporal variation in rangeland conditions, respectively (Turner and Schlecht, 2019). In Ethiopia, movement restrictions in the Afar Region in combination with ongoing poor pasture conditions led to localized overgrazing during the pandemic (FEWS NET, 2020a). In Somalia, pastoralists reported

constrained access to water and poor access to pasture to be among the most important production constraints during the pandemic. Of those surveyed, 92% reported the need for livestock-related assistance, including access to water, animal feed, and veterinary services (FAO, 2021b).

In West Africa, internal and cross-border restrictions on movement during the pandemic resulted in stranded herders with their animals and concentrations at key cross-border transhumance points. The Central Transhumance Corridor (CTC) spanning Ghana, Togo, Niger, Benin, Cote D'Ivoire, Burkina Faso, and Mali links Sahelian pastoralists to coastal resources and markets. Data collected in January 2021 through the Transhumance Tracking Tool (TTT) found a total of 1.5 million animals and 57,000 herders were stranded along the CTC (Fig. 2). Among them, 30% were due to COVID-19 restrictions (e.g., border closures) (International Organization for Migration and Reseau Billital Maroobe, 2021). Niger had the highest number of stranded herders unable to access residues on southern agricultural fields. Herders in Burkina Faso noted they had to leave their cattle in Cote d'Ivoire because of COVID-19 related border closures, thus preventing them from moving their animals back north during the early dry season when Sahelian pastures have their highest energy content (IOM and RBM, 2021; Jost, 2002). Herders and cattle who usually cross into Mali from Mauritania during the lean season were also stranded in July of 2020 (IOM, 2020). These conditions decrease the quality of pasture where animals are stuck, and limit feed and access to water. As a result, stranded herders were forced to reduce the number of animals per herd (IOM and RBM, 2021). In addition, pastoralists in Chad reported lack of availability of fodder and water points as a main production constraint (FAO, 2020). Poor pasture negatively impacts livestock production, including milk production, limiting household food availability (Sadler et al., 2010). The inability to return milking animals to homesteads has likely reduced the amount of ASFs available for consumption within households, particularly for women and children.

Most pastoralist households rely on buying non-ASFs at local and regional markets. Market restrictions have occurred across East and West Africa during the pandemic. In East Africa, COVID-19 control measures led to reduced regional trade in most food commodities during the second quarter of 2020. For example, 62,000 metric tons (MT) of maize was traded in the region during April-to-June 2020, 58% lower than the recent five-year average (FEWS NET, 2020a). In certain regions, the first half of 2020 was an excellent year in terms of rainfall which resulted in good pasture and water for livestock (Graham et al. 2021). In Ethiopia, good livestock

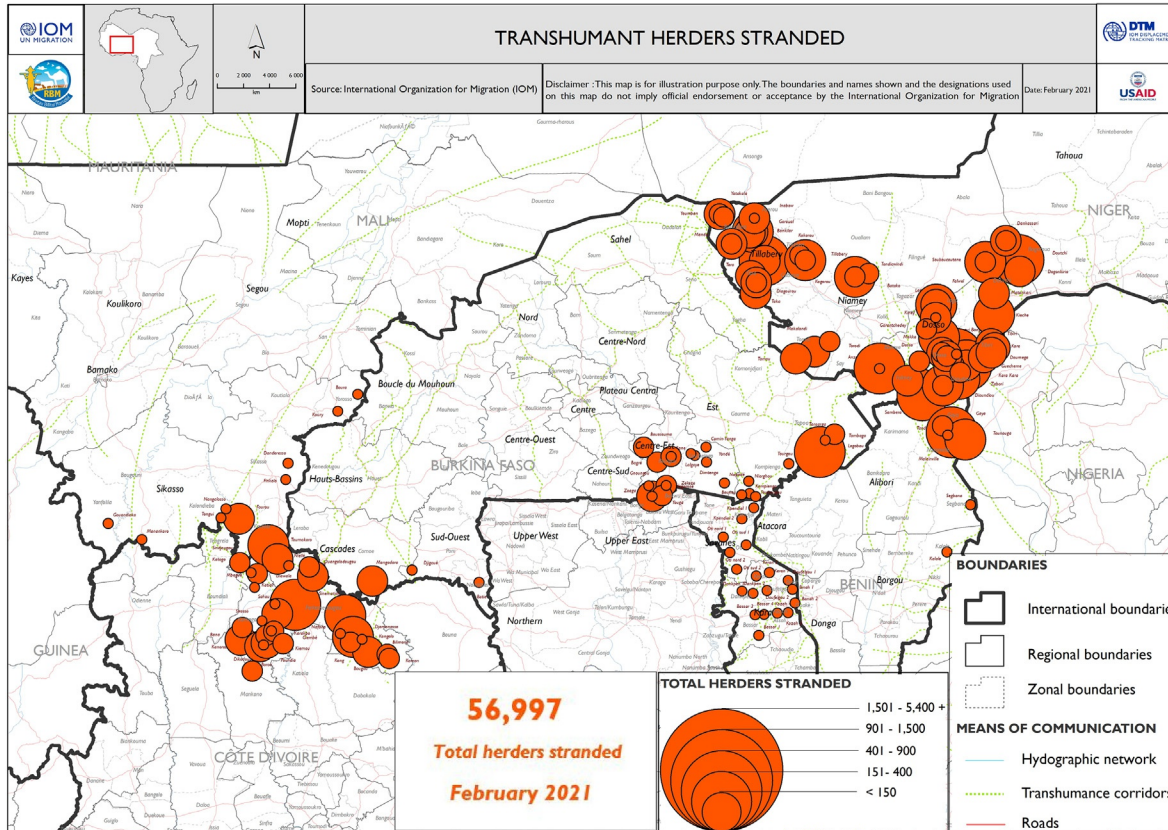


Fig. 2 Numbers of herders stranded in cross-border areas in January 2021. Source: International Organization for Migration (IOM) and Réseau Bilital Maroobé (RBM), (February 2021), Displacement Tracking Matrix (DTM), 2021.

body conditions from the adequate rainfall, in addition to a lower supply of livestock, led to higher-than-normal livestock prices. Due to this, the terms of trade (ToT) for livestock to staple foods increased by 16% as compared to the previous year. However, livestock prices did not increase at the same rate as staple food prices. This resulted in the TOT remaining below average. (FEWS NET, 2021a).

Movement restrictions affected multiple types of traders and vendors during the pandemic. For example, many of the food items sold in local markets in pastoral regions are sold by small scale vendors that move their goods on public transport, which in some cases has been reduced or halted. Road closures affect larger transporters and vendors of foodstuffs. And restrictions to the movement of people affect many market actors, large and small alike, for foodstuffs in pastoral areas. In the Karamoja region of Uganda, the availability of grains and vegetables has been limited by road and market closures as well as restrictions on transporters that have not allowed them to get their products to local pastoral markets that started in 2020 and have continued as new lockdown measures have been put in place recently due to a rapid increase in COVID-19 cases (L. Pius personal communication). In Isiolo County, northern Kenya, pastoralists reported decreased availability of foodstuffs and vegetables due to movement restrictions and increased transportation costs (Mohamed et al., 2020). These types of shortages impact pastoralist women, as they have primary responsibility in the household for day-to-day food provision, including going to local markets and purchasing non-ASFs. Moreover, pastoralist women are also responsible for managing small livestock, which provides milk and eggs for the household (Flintan, 2008). Reduced animal health inputs or feed because of the pandemic harms small livestock health and reduces milk production, limiting ASF availability (Catley, 2020).

Beyond market restrictions, the pandemic has also resulted in decreased crop production among agro-pastoralists who rely on subsistence farming to provide some amount of non-ASFs for their households. For example, in the Karamoja region of Uganda, the July/August (2020) harvest was below average due to reduced planting, limited access to quality seed, and crop damage due to desert locusts (FEWS NET, 2020b). These factors have contributed to limited food availability, and a growing food security crisis in the region (Mercy Corps, 2020).

3.2 Access to food

Trade in livestock and livestock products forms the backbone of pastoral livelihoods, providing income that is used to buy non-ASFs, household

goods, and inputs for livestock production (Little et al., 2014). Livestock trade in East Africa, driven by regional consumer demands, consists of domestic, cross border, and international pathways (Fig. 3). COVID-19 pandemic measures aimed at preventing disease transmission, including movement restrictions and market closures, have disrupted livestock trade and the selling of ASFs in East Africa, thereby decreasing pastoralists' income and access to food. The impact of these measures can be identified through examining livestock trade trends with and without restrictions in place. For example, during the second quarter of 2020, livestock exports from Somalia to Kenya declined due to quarantines, movement restrictions, and closure of livestock markets (FEWS NET, 2020a). Pastoralists from Kenya and Tanzania noted during a recent online forum that government restrictions stopped cross-border livestock sales and closed markets (Sternberg et al., 2021). In Kenya, initial COVID-19 control measures reduced the volume of livestock sold in April 2020 by 60% compared to February (Mercy Corps, 2020). In Ethiopia, the peak time for livestock sales are Orthodox Easter and Ramadan. In 2020, these holidays corresponded with market closures and resulted in a loss of income for Ethiopian pastoralists (Mercy Corps, 2020). In addition, livestock exports to the Middle East declined due to COVID-19 related restrictions, including the cancellation of the Hajj in 2020 (FEWS NET, 2020a). However, goat and camel exports from Ethiopia to Somalia for re-export to the Middle East increased because of Saudi Arabia lifting the ban on livestock imports during the second quarter of 2020 (FEWS NET, 2020a). In Somalia, in early 2021, pastoralists reported difficulty in selling livestock due to market closures, lower demand, high cost of transportation, reduced numbers of customers, and constrained market access (FAO, 2021b).

In East Africa, end-market demand has decreased because of international import and export bans, loss of consumer income (particularly in urban and peri-urban centers), and closure of more informal market outlets (e.g., butcheries and wet markets) during the pandemic, further harming the trade in livestock (Food Security Cluster, 2020). In Somalia, 80% of all livestock are exported to end markets in the Arabian Peninsula for the Hajj, (FAO, 2021d). Demand for sheep, goats, and cattle were reduced by 50% because of Saudi Arabia being closed to international travelers during the Hajj (Mercy Corps, 2020).

Livestock prices, because of reduced demand, have also decreased. For example, in the Karamoja region of Uganda, sheep prices in Kaabong District were 60% below seasonal averages early in the pandemic (Mercy Corps, 2020). As of July 2020, livestock prices in Somalia and Kenya were

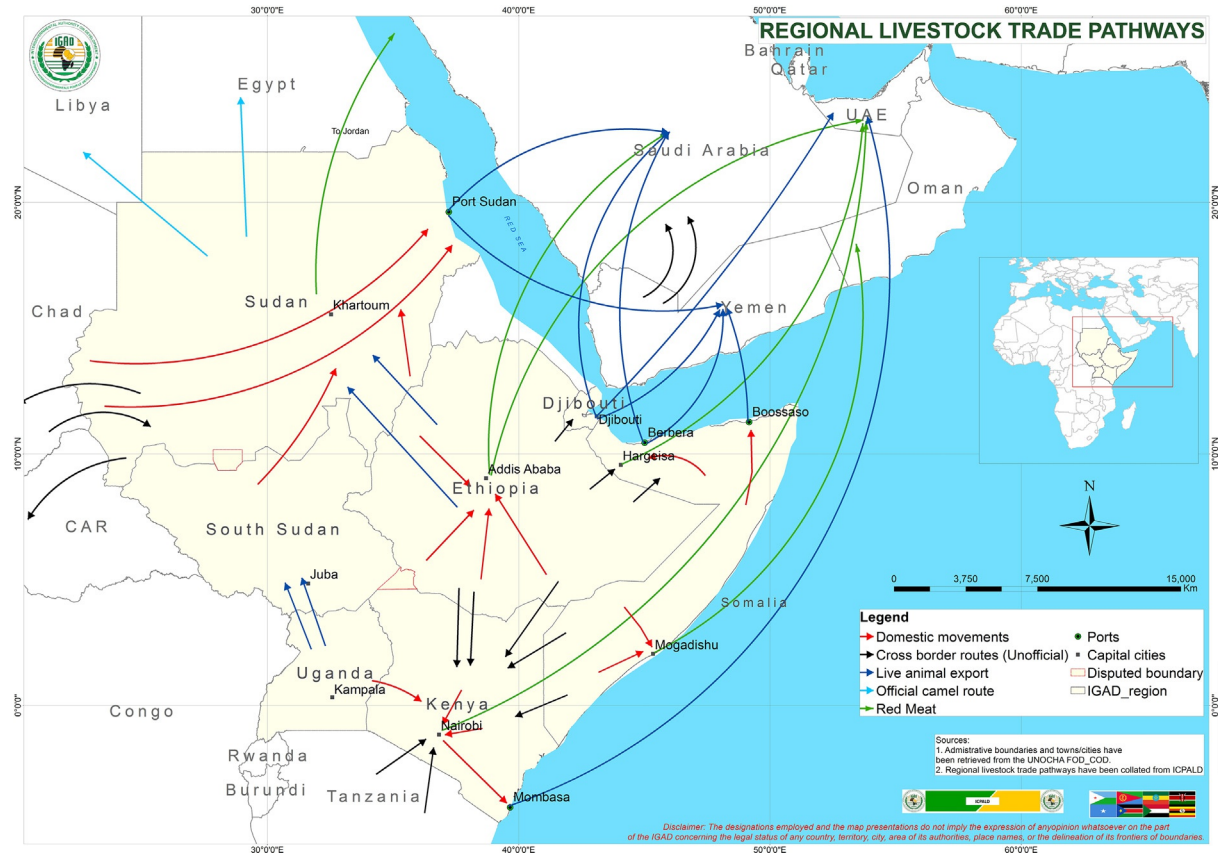


Fig. 3 The general flow of and trade linkages between the Intergovernmental Authority on Development (IGAD) region and the Middle East and Gulf States in terms of live animal, red meat export, domestic, cross border, and official camel routes. Source: IGAD/IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) (geonode.igad.int/documents/131#more).

following seasonal trends but tracking lower than pre-pandemic prices due to reduced Hajj-related demand (FEWS NET, 2020a). An increase of trade through informal channels at the expense of the now largely disabled formal channels (Graham et al., 2021) may be behind the reduction in sale prices. Such decreases in marketing opportunities, trade, and livestock prices reduce pastoralists' access to food by limiting their ability to buy non-ASFs.

Traders play a crucial role in the pastoral livestock value chain, buying animals from pastoralists to supply urban markets (Little et al., 2014). However, COVID-19 related control measures have restricted traders from accessing rural areas, thereby decreasing income in pastoral households for men and women. In the Karamoja region of Uganda, lockdowns have prevented potential buyers from connecting with pastoralists selling livestock and animal source products. Anecdotal evidence finds that since the lockdown pastoralists are consistently using mobile phones to contact traders and access informal markets (L. Pius, personal communication). However, few women in Karamoja own mobile phones and therefore must go through their male counterparts to sell their livestock (small ruminants), limiting their access to markets and income (L. Pius, personal communication). Furthermore, telephone charges continue to rise, and are not affordable to pastoralists with low incomes (L. Pius, personal communication). In Unity State of South Sudan, movement restrictions and border closures between South Sudan, Uganda, and Sudan resulted in a steep decline of animal prices due to the absence of livestock traders who generally come from Annet, Sudan (Mercy Corps, 2020).

Milk prices have also suffered because of COVID-19 measures, disproportionately affecting women. Pastoralist women are responsible for buying the daily allotment of vegetables, fruits, and legumes in the market, and buying staple grain when shocks like the pandemic keep the men away from the homestead, for example on migration due to movement restrictions or seeking casual labor opportunities to offset lower income from livestock husbandry. Most often they earn the income for making daily small purchases of food by marketing and selling milk and milk products (Eba et al., 2020). Not only do lower milk prices reduce women's income, but since women are responsible for immediate household needs, including non-ASF procurement, low milk prices, disrupted markets, and higher food prices result in decreased daily food accessibility. In Somalia, movement restrictions, market closures, and loss of consumer demand due to their own reduced incomes have made selling milk difficult with prices dropping between 5% and 50% below the five-year average during 2020 (Mercy Corps, 2020), although, favorable rainfall in East Africa in 2020 may have

also contributed to higher amounts of milk production and therefore lower prices (Graham et al., 2021). At the same time, food prices have spiked in some pastoral areas because of market closures and movement restrictions, limiting pastoralists' ability to purchase food. COVID-19 related restrictions resulted in the closure of the Dubai port, which led to a reduction in imports of staple food items in Somalia. "Imports of rice, wheat flour, and pasta declined by 16 percent from March to May" (FEWS NET, 2021b). As a result, in Somalia imported staple food prices spiked early in the pandemic. Staple food commodity price trends were especially high in South Sudan due to COVID-19 related panic purchases and restrictions in Uganda (FEWS NET, 2020a). In the Karamoja region of Uganda increased food prices exceeded typical seasonal increases, reaching 116% in some areas during the latter part of 2020 (Catley, 2020; FEWS NET, 2020b). Pastoralists from Kenya and Tanzania also recently reported that food prices rose during the pandemic (Sternberg et al., 2021). The combined impact of low live-stock prices and high food prices makes buying food especially difficult for pastoralists.

COVID-19 restrictions in West Africa, including internal movement restrictions and border closures, have resulted in limited access to markets and stranded herders with their livestock (IOM and RBM, 2021). Save the Children, an NGO that focuses on humanitarian aid and development, used Household Economy Analysis to measure the impact of the COVID-19 pandemic on household economies in West African countries. Pastoralists in the Bassikounnou District in Mauritania saw yearly livestock sales decrease from 212,933 before the pandemic to 195,188 (Save the Children, 2020b). Similarly, pastoralists in Chad saw their total annual income decrease by over 30% (Save the Children, 2020a). In addition, weekly markets have closed across West Africa, restricting pastoral income and ability to access food. For example, livestock markets in Togo were less crowded in late 2020, with 250–400 head of cattle being handled per day versus 500–750 before the start of the pandemic (The Food Crisis Prevention Network, 2020).

Beyond livestock products, many pastoral communities derive a significant proportion of their income from complementary activities, allowing for the purchase of non-ASF foods. In East Africa wildlife-based ecotourism and related sales of handicrafts are important income generating activities for pastoralists, including those that are not directly involved in livestock production (Homewood et al., 2009; Kutegeka and Roba, 2012). Wildlife tourism also helps build socio-economic resilience in pastoral communities (Yurco 2017; Krafte Holland et al., 2021). Tourism, however,

is highly dependent on international travel which has been severely reduced due to pandemic-related restrictions. As a result, pastoralists in Kenya and Tanzania have reported severely reduced income (Sternberg et al., 2021). Only when wildlife-related income is associated with conservation programs that are not directly dependent on the spending of tourists has wildlife-related income been more resilient in the face of the pandemic, most notably the Northern Rangeland Trust-supported community conservancies in Northern Kenya (McConnell, 2021).

3.3 Utilization of food

Food utilization is the ability of the body to maximize benefits from consumed food. This is reflected in the nutritional status of individuals, which is influenced by an individual's health status along with the quantity and quality of dietary intake (Riely et al., 1999). Health status plays an important role in an individual's ability to access and utilize the energy, protein, and micronutrients available in food that is consumed. Deficiencies in energy, protein, and specific micronutrients are associated with depressed immune function and increased susceptibility to infection. These effects are most pronounced in children (Naja and Hamadeh 2020), the impacts of which are measured as increasing rates of malnutrition in populations (Odjidja and Hakizimana, 2019).

Health status is influenced by access to and utilization of health services. Pastoralist areas in East and West Africa have some of the worst health indicators in the world, with health services being especially poor for women and girls (Catley et al., 2016; Griffith et al., 2020a). The availability of health services in pastoral areas is consistently lower than in other areas because of geographic factors (e.g., distance to health facilities and pastoral mobility); poor facilities and equipment, fewer supplies and health products, inadequate numbers of health personnel; prohibitive direct and indirect (e.g., transport) costs; and conflict (Gammino et al., 2020; Griffith et al., 2020a). Social structures and gender norms mean that women in pastoral societies have even less access to health services than men (Caulfield et al., 2016).

These issues have been exacerbated by COVID-19 related restrictions, which have increased physical and financial barriers to accessing healthcare and diverted healthcare resources toward the COVID-19 response (Haider et al. 2020). COVID-19 restrictions and reallocations of funds have limited the ability of health personnel. For example, pastoralists from Kenya and Tanzania reported that since the start of the pandemic, regular medical

check-ups by health workers have been canceled (Sternberg et al., 2021). In the Karamoja region of Uganda, pastoralists reported reduced availability and increased cost of healthcare services, shortage of medicines, and shift of health workers to COVID-19 quarantine centers (Lotira et al., 2020). As a result, pastoralists in the Karamoja region of Uganda reported an increase in malaria and an outbreak of cholera (Catley, 2020).

Shifting national and international priorities, movement restrictions, and social distancing policies have put crucial immunization campaigns against measles, polio, and yellow fever on hold in Africa (Schlein, 2021; Uwishema et al., 2021). Currently, fifteen countries, including Kenya, Ethiopia, South Sudan, Chad, Niger, and Mali in East and West Africa have reported measles outbreaks (CDC, 2021). Logistical constraints, staff shortages, and reallocation of resources in addition to more restricted access to healthcare services have contributed to disrupted childhood vaccination and health service delivery, putting women and children in low-income countries particularly at risk (Abbas et al., 2020; Saso et al., 2020). WHO has warned about the great risks posed by the disruptions that COVID-19 has caused to vaccination programs worldwide, threatening the health of 80 million children (WHO, UNICEF, and Gavi, 2020, 2021).

Since childhood vaccination rates are already significantly lower for pastoralist children compared to more sedentary populations because of service delivery constraints and pastoralists' mobile lifestyle, among other factors (Griffith et al., 2020a; Schelling et al., 2007), disruptions in childhood vaccination campaigns will hit pastoral communities especially hard. However, during the pandemic under-vaccination pastoralist populations were specifically targeted in some countries for vaccination services (e.g., polio immunization in Ethiopia) (WHO, 2021b). A benefit-risk analysis found that the deaths prevented by sustaining routine childhood immunization services outweighed the excess risk of COVID-19 deaths associated with vaccination, highlighting the importance of continuing these services for children even in the face of the pandemic (Abbas et al., 2020). Disrupted health services in pastoral areas negatively impacts health status, harming food utilization.

As of June 2021, COVID-19 infection rates and deaths are rising, particularly in East Africa. For example, in Uganda 1259 cases were recorded on June 4, 2021, the highest number in a single day during the pandemic (Dahir, 2021b). Similarly, Kenya is facing a COVID-19 surge (United States Embassy in Kenya, 2021). However, cases are still concentrated in heavily populated, urban areas in East Africa (e.g., Nairobi County has the

highest number of cases in Kenya, while Kampala is the hardest hit area in Uganda) (Republic of Uganda, 2021; Statista, 2021). While rising morbidity and mortality in East Africa will likely result in an increase in cases among pastoralists, pastoral areas thus far have been less impacted than urban areas. COVID-19 infections can cause long-lasting effects on metabolic health, thereby harming food utilization (Naja and Hamadeh, 2020). However, host-pathogen-environment dynamics in the ASALs that most West and East African pastoralists inhabit, where relatively young populations live mainly outdoors in sparsely inhabited hot and sunny drylands with relatively lower levels of population mingling, likely limits the SARS-Cov-2 virus's transmissibility (United States Department of Homeland Security, 2021). Sahelian Niger, where half of its 24 million people is under 15 years of age, has confirmed just 5500 cases of COVID-19 with 194 deaths by mid-June (Faucon, 2021).

The rates of zoonotic diseases, which are spread from animals to people, are consistently higher in pastoral areas (Egeru et al., 2020; Griffith et al., 2020a). Reduced access to healthcare and veterinary services during the pandemic in these areas may be leading to increased incidence of zoonoses in livestock and people. In Kenya outbreaks of Rift Valley fever (RVF) occurred in Isiolo, Mandera, Murang'a, and Garissa counties in 2021, with 32 human cases (14 confirmed positive, 11 deaths) and an unknown number of livestock cases (ReliefWeb, 2021). Outbreaks of RVF of this scale are somewhat unusual so soon after the large-scale RVF epizootic in East Africa in 2018 (Hassann et al., 2020). In May 2021 an unusually large and widespread outbreak of camel sudden death syndrome (CSDS), a disease of unknown etiology, began in the Somali and Oromia Regions of Ethiopia and adjacent Somalia (ProMED-mail, 2021b). While CSDS occurs sporadically in East Africa, this event is unusual because of its scale and geographic extent. It is also unusual in that cases of human illnesses have been associated with the outbreak (ProMED-mail, 2021a). While these unusual outbreaks cannot be directly attributed to the secondary impacts of COVID-19 pandemic control efforts on public health and veterinary services, such impacts may have had a role in their occurrence and scope.



4. Discussion

Given that globally we are currently amid the COVID-19 pandemic, and that as of this writing African countries have just begun to experience its most severe direct impacts to date (Steinhauser and Parkinson, 2021),

there are relatively few results available in the literature from quantitative analyses of the pandemic's impact on food security in pastoral areas of East and West Africa. Therefore, our analysis relies heavily on the gray literature such as reports from NGOs as well as the experiences of pastoralists themselves relayed through social media or directly to the authors. These reports have provided some specific examples of the impacts of the pandemic in pastoral communities to date. However, the information is still limited, especially at the household level and in terms of direct market analyses. A lack of pastoralist specific data is not unique to the COVID-19 pandemic. Pastoralists in sub-Saharan Africa are underrepresented in population data sets, including household surveys such as the Demographic and Health Surveys (DHS) Program due to mobility, dispersed distribution of their encampments, and cultural barriers (Wild et al., 2019). The use of census-based sampling frames results in the "statistical invisibility" of pastoralist populations (Randall, 2015).

"COVID-19 is a syndemic that uncovers the preexisting contexts and problems of health, social, economic, politics, and environment" (PMAC, 2021). It is likely that the populations disproportionately suffering the greatest impacts of the pandemic on food security, and as a result worsening food insecurity, increases in malnutrition, and reversals in development gains are those populations that had already been experiencing high rates of malnutrition, morbidity, and mortality, and slow development progress (PMAC, 2021). In Sub-Saharan Africa, these are the pastoral populations of most countries (Catley et al., 2016; Sadler et al., 2009; Young and Marshak, 2017). In addition, pandemic-related restrictions to travel and social gathering have also led to a rapid change in how food security is monitored in Africa's rural populations. During the pandemic, remote monitoring approaches such as phone interviews or short messaging service (SMS) surveys have often replaced face-to-face household level surveys (World Bank, 2021). Thus, the disproportionate development inequities faced by pastoralists such as lower rates of mobile phone ownership and higher rates of illiteracy, and within pastoral households women's disproportionately lower access to phones and higher levels of illiteracy, likely mean that the impacts of the pandemic on pastoralists, particularly women, are less documented even relative to more sedentary rural populations during this pandemic.

Overall, poor food security in pastoral areas relative to sedentary populations has been compounded by the ongoing COVID-19 pandemic. Thus, it is crucial to not only identify the disproportionate impacts of the ongoing pandemic on pastoralist populations, but also prioritize

interventions and solutions to the pandemic-related economic and food security crisis that are tailored to the contexts and needs of pastoralists. Given dependence to a very large extent on trade for their economic systems and wellbeing (Little et al., 2014), market closures and movement restrictions inevitably negatively impact the food security of pastoralists. As an example, and despite a very favorable season in terms of rainfall, herd size in Northern Kenya declined during the first half of 2020 (Graham et al., 2021). Complementary livelihoods associated with tourism and handicrafts have also been dramatically impacted, with the conservation sector only resisting the crisis in areas where donor money, and not tourism revenues, are the main income source (McConnell 2021). The Food Security Cluster (FSC) aims to coordinate the food security response during a humanitarian crisis, addressing issues of food availability, access, and utilization. The FSC is co-led by FAO and WFP, with global support team members including NGO, Red Cross, and Red Crescent members. The FSC has published detailed guidance and recommendations for emergency livestock actions in the context of COVID-19, which highlight policies aimed at supporting pastoral livelihoods and protecting food security in the short term. These include: (1) allowing cross-border trade for livestock products, inputs and services, (2) supporting access to animal health services, pasture, water, and livestock feed, (3) providing livestock to vulnerable households during the recovery phase, (4) actors across the livestock value chain taking into account the specific needs of pastoralists when planning pandemic containment measures, responses, and actions to reduce the impact of the pandemic, and (5) advocating for pastoralists at all levels of government (Food Security Cluster, 2020). These actions can help address food security in the short-term.

Also worrying are the long-term impacts of the pandemic on the food security of pastoralists in East and West Africa. One of the main methods of self-insuring against risk among pastoralists is to accumulate food stocks and marketable assets (i.e., livestock) (Swallow, 1994). Due to limited durability of foodstuffs, livestock are the major form of wealth and insurance substitutes (Swallow, 1994). Pastoralists respond to crisis in steps, with the last “risk-taking to survive” step consisting of households selling animals (i.e., asset depletion) (Swallow, 1994), which is occurring at a greater rate among pastoralists due to the pandemic (FAO, 2021a). For example, 75% of livestock experts polled in Chad in 2020 noted higher than normal destocking rates (FAO, 2020). Similarly, in the Karamoja region of Uganda, agro-pastoralists are selling their animals at a higher-than-normal rate

(L. Pius, personal communication). While short-term asset depletion can help pastoralists offset some of the impacts of the COVID-19 pandemic, this strategy can have serious long-term food security consequences, leading to a cycle of poverty in which depleted herds do not allow pastoralists to respond to future shocks (e.g., drought) (FAO, 2021a).

Disruption to childhood vaccination campaigns will pose a problem in the medium term with increased prevalence of preventable diseases such as measles and increased long-term consequences on individual food security due to poorer food utilization. The closing of schools for up to a year is likely to have multiple negative effects. The likely increase in dropouts will reduce opportunities for future complementary livelihoods, which are key to guarantee an adequate level of income for food access in future scenarios (Manzano and Yamat, 2018). But access to education is also key to empower pastoralist women and prevent future conflict—insecurity and instability being major factors that affect food security (Burchi and Muro, 2016; de Haan et al., 2016)—by reducing social tensions around access to dowry and by reducing polygamous marriages (Cevallos and Manzano, 2021). The experience of the HIV pandemic in Africa during the 1990s and 2000s also shows how a disease-mediated poverty trap can drive to unsustainable use of natural resources, reduced resilience and hence threatening food security in a long term downward spiral, creating an overall backslide in development gains (Bolton and Talman 2010). While the loss of traditional knowledge played a role there, the higher impact of COVID-19 on elderly population is likely to exacerbate such problems and requires it to be monitored with care.

However, factors unique to pastoralists in East and West Africa provide potential opportunities for interventions that are adapted to the unique context of pastoral populations, particularly interventions that support indigenous solutions to food insecurity during the pandemic and beyond. Diverse misguided interventions and policies are known to undermine pastoralist systems (de Jode, 2010). The tendency of isolation and disconnection of pastoralist populations from the sociopolitical centrality (Manzano et al., 2021) has been exacerbated by the COVID-19 pandemic, but it may be paving the way for innovation within communities that has proven to be a fertile ground for tailor-made solutions (Manzano 2017). Pastoralists have already pointed out how the pandemic allowed them to show how they could rely on their own food production and income generation to avoid COVID-19 outbreaks associated with cities, transmitting a very positive message on how pastoralism is viable and capable of avoiding risk

(Sternberg et al., 2021). Coping mechanisms based on information and telecommunication technologies (ICT) and mutual support networks have been determinant in other regions to guarantee food security during the pandemic (Lopez-Ridaura et al., 2021). Developing such opportunities further, basing them on enabling environments and endogenous development (Manzano 2017), is an opportunity for African pastoralist systems.

The proposed new Conceptual Framework for Addressing Acute Malnutrition in Africa's Drylands recognizes the challenges unique to pastoral areas of East and West Africa and embraces the types of ingenious solutions advocated for in this chapter (Young, 2020). The new framework recognizes the three main underlying causes of malnutrition: insufficient household food security, inadequate social and care environment, and insufficient health services and unhealthy environments. However, it deepens our understanding of the basic causes of malnutrition by recognizing the livelihood systems, formal and informal institutions, and environments and seasonality, including climate variability and extremes, that underpin pastoral food security.

A One Health approach is also critical to improve food security in pastoral areas because of COVID-19 and other shocks. One Health aims to promote human, animal, and environmental health through multidisciplinary and multisectoral approaches, while also addressing the social, economic, and environmental determinants of health; highlighted in partnerships across health, economic, and environmental sectors (Griffith et al., 2020b; Jost et al., 2021). The complex and interconnected determinants of food security among African pastoralists, including access and utilization of health services, access to markets, droughts and environmental variation, conflict, and more recently the COVID-19 pandemic, cannot be addressed by one sector or group of stakeholders. It instead requires a One Health approach in which intersectoral collaboration across groups of stakeholders generates broad solutions that combat the combined impacts of the pandemic and other livelihood shocks (Egeru et al., 2020; Griffith et al., 2020b; Yousuf et al., 2020). As it relates to the pandemic, One Health provides the opportunity to implement targeted public health measures in combination with livelihood support, overall resulting in improved food security (Food Security Cluster, 2020; Griffith et al., 2020b; Mardones et al., 2020). One Health also can contribute to preventing SARS-Cov-2 transmission along livestock value chains (i.e., protecting workers), securing food security (FAO, 2021c). Importantly, One Health can lead to community empowerment, giving a voice to often overlooked pastoralists through bottom-up collaboration,

for example through emphasizing the importance of community animal health workers and community health workers as a crucial part of interdisciplinary teams and community actions (Food Security Cluster, 2020; Griffith et al., 2020b).

Ultimately, the direct health risks of COVID-19 as well as the impacts of pandemic control measures are only likely to be abated only when vaccines are efficiently deployed in most of the world's populations (Wouters et al., 2021), including remote areas such as pastoralist lands where vaccine cold chain conditions (e.g., ultra-cold freezing) remain a sizable challenge (Forman et al., 2021). To address such challenges, the COVID-19 response can learn from the successful Global Rinderpest Eradication Campaign (Mariner et al., 2012; Njeumi et al., 2012) and the current Peste des Petits Ruminants Global Eradication Program (Taylor, 2016). At the same time and given the huge economic resources being currently allocated to the pandemic response, the infrastructure and innovations adopted for COVID-19 vaccine deployment may be of extraordinary usefulness for other public and animal health challenges in pastoral areas such as polio and Rift Valley fever. The early evidence presented in this chapter indicates that food security of pastoralists in East and West Africa have been among the hardest hit by the impacts of efforts to control the COVID-19 pandemic calling for innovative solutions based on the unique attributes of pastoralism.

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