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Effects of COVID-19 on the fisheries value chain: A case for Uganda and Tanzania

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Preface

COVID-19 has reshaped the world and radically changed the way people, institutions, and systems function. Pre-existing economic, social, and institutional vulnerabilities have aggravated the impacts of the crisis, especially for less developed and emerging economies and their vulnerable populations.

In response, Southern Voice has partnered with both member and non-member think tanks across the Global South to generate evidence and analyses of the pandemic's impact in a variety of contexts. Through this research programme, teams of researchers, embodying different perspectives of the Global South, have produced new, evidence-based insights into the challenges as well as the opportunities presented by the coronavirus crisis.

Three core themes have guided this research initiative: social impact, economic and fiscal recovery, and accountable and inclusive institutions. Overall, the initiative aims to advance evidence-based policy solutions and recommendations to mitigate the middle- and long-term challenges of the crisis and to promote a better and more sustainable recovery.

The present study explores the impact of COVID-19 on the nodes of the fisheries sector value chain of Tanzania and Uganda. It does this through a value chain analysis to identify how the pandemic affected fishing communities that operated under a lockdown and those that continued in the absence of a lockdown. We hope that this joint publication by Southern Voice, the Science, Technology and Innovation Policy Research Organization (STIPRO), and the National Agricultural Research Organisation (NARO) will be useful in crafting appropriate responses to confront the middle-to-long-term challenges presented by the pandemic.

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and

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Abstract

This study seeks to understand the impact of the COVID-19 crisis on fisheries value chain nodes in Uganda and Tanzania. It compares a country that imposed a lockdown (Uganda) with one that did not implement a strict lockdown policy (Tanzania). The study investigates the effects of the interventions set in response to the pandemic, and the role that information and communications technology (ICT) played in ensuring sustainable fisheries continuity amidst the pandemic.

The research used a qualitative approach. Data collection included a desk review and primary data gathered through focus group discussions and key informant interviews. The study found that the interventions enforced to minimise the spread of COVID-19, such as curfews and social distancing measures, affected the industry. Health restrictions to contain infections resulted in delays in landing and offloading fish, which exacerbated fish spoilage and negatively affected fisheries' income. The pandemic had a bigger impact on Uganda's fishing industry more than Tanzania's. In addition, the cost of operating fisheries businesses across the whole value chain increased in Uganda, while in Tanzania, it remained relatively stable. ICT usage improved slightly with no new or advanced technologies introduced in both countries. The study recommends that both countries' governments and the private sector collaborate to invest in and improve fish preservation infrastructure and technologies, particularly for artisanal processing. Equally important are measures to create a robust procurement and distribution facility for fish and fish products and facilitate broader ICT integration in the sector through capacity building initiatives and deliberate reductions of ICT-related taxes.

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Acronyms and abbreviations

| | |
|-------------|---|
| FGD | Focus Group Discussion |
| ICT | Information and Communications Technology |
| KII | Key Informant Interview |
| SOPs | Standard Operating Procedures |
| WHO | World Health Organisation |

Effects of COVID-19 on the fisheries value chain: A case for Uganda and Tanzania

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Introduction

The COVID-19 pandemic has had a considerable social and economic impact worldwide. However, the aftermath of the crisis has been worse in countries and communities that were already vulnerable to external shocks prior to the pandemic. Managing the COVID-19 crisis demands unique planning and interventions targeted to the most vulnerable segments of the economy. Small enterprises and the informal sector account for a large percentage of the poor yet contribute significantly to Uganda and Tanzania's gross domestic product (GDP).

The fisheries industry is among the most vulnerable sectors in Eastern Africa. Communities along the lakes and the Indian Ocean rely on it for their livelihoods. For example, Lake Victoria has long been a source of income for the Kenyan, Ugandan and Tanzanian communities living along its shores. The lake is dominated by informal micro and small enterprises linked to the fisheries value chain. Its activities contribute to the achievement of the Sustainable Development Goals (SDGs) in this region. Specifically, they enable communities along the lake shores to earn a living and sustain their families (SDG 1: no poverty); provide communities with nutritious food (SDG 2: zero hunger); generate employment and contribute to GDP (SDG 8: decent work and economic growth).



**Managing the
COVID-19
crisis demands
unique planning
and interventions
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vulnerable segments
of the economy.**

Despite fishers' crucial role, their substandard living conditions do not reflect their contribution to the economy and food security, making them vulnerable to natural

disasters and disease outbreaks. During the COVID-19 pandemic, the standard operating procedures (SOPs) and regulations enforced to contain the spread of the disease have had devastating impacts on fishers. The restrictive guidelines not only disrupted the sector and its associated activities but also distorted the communal social fabric of those depending on it. For instance, fish trading activities experienced a disruption in the supply chain due to COVID-19 (Boney, 2020). Fishers' inability to transport and sell fish at their strategic sites has had livelihood and nutrition security implications (America et al., 2020).

While several studies have investigated the impact of the COVID-19 pandemic in different sectors, research that examines the complete value chain and factors in lockdown impacts is limited. Using the case of Uganda and Tanzania, this study looks at the fisheries sector value chain and analyses the pandemic's impacts at different segments of it.

Although individuals, communities and countries have felt the effects of the pandemic at different levels, the challenges experienced, and interventions applied offer opportunities for learning. The overall objective of this study is to understand key differences in impact between a country that implemented a full lockdown policy and one that did not. Moreover, it examines pandemic resilience strategies along with the key nodes of the fisheries sector value chain for minimising the overall vulnerability of fisheries-dependent communities.

Specifically, the study intends to: (i) compare the challenges that COVID-19 has posed on key fisheries value chain nodes in Uganda, which imposed a lockdown, and Tanzania, which did not; (ii) identify how COVID-19 interventions affected fishing activities and communities; and (iii) examine the role that information and communication technologies (ICT) have played in ensuring market continuity amidst the pandemic.

The study is divided into four sections. The introduction addresses the background of the study and its objectives. The methodology presents the study approach and data collection methods. The research findings are outlined and discussed in the third section, while the fourth section provides the conclusions and policy implications of the study.

Literature review and conceptual framework

Fishing communities often live in high-risk environments that are associated with natural disasters and economic instability, which can disrupt their livelihoods. For example, during the 2005 Hurricane Katrina, the state of Mississippi saw the destruction of 95% of its seafood dealers' businesses, preventing commercial fisherfolk from selling their

catch or buying fuel or ice from the dealers (Buck, 2005). In southern Sri Lanka, the 2004 Asian Tsunami almost paralysed the industry and the livelihoods of fishing communities dependent on the fishing fleet destroyed by the tsunami (de Silva & Yamao, 2007).

COVID-19, like many other external shocks, has tremendously affected the fisheries sector. The pandemic did not affect fish directly but affected the sector indirectly through changes in consumer behaviour, disruption in trading activities, difficulties in transportation, and border restrictions (Food and Agriculture Organization, 2020a). A study in India indicated that if the interruption of the demand and supply chain of agricultural sector commodities, such as fish and fish products, occurs for a prolonged period, it will directly affect 15 million people, depending on the sector (Purkait et al., 2020). Another study done in Kenya on the pandemic's impact cited curfews and lockdowns in major cities as primary factors that influenced fishing and fish trade (Aura et al., 2020). Additionally, the Food and Agriculture Organization (FAO) study indicated that fisheries of developing nations like those in Africa and Southeast Asia are most vulnerable to disasters (Badjeck et al., 2013).

In Tanzania and Uganda, fishing has long been a source of livelihood for communities. The sector's GDP share was 1.7% in Tanzania (Ministry of Agriculture, Livestock, and Fisheries of the United Republic of Tanzania, 2019) and 1.2% in Uganda (Ministry of Agriculture, Animal Industry and Fisheries of the Republic of Uganda, 2016). While small enterprises dominate the fisheries business in both countries, their direct and indirect contribution to job creation is significant. In Tanzania, the sector provides direct employment to about 183,800 fishers and indirect employment to more than four million people (about 35% of rural employment) (USAID, 2016). In Uganda, the sector employs around 1.3 million people (Ministry of Agriculture, Animal Industry and Fisheries of the Republic of Uganda, 2016).

The impacts of a lockdown policy on economic activities vary depending on the strength of the economy and the nature of the sector. There are differences between developed and developing nations that come into play when considering policy responses to COVID-19. For instance, Uganda and Tanzania have relatively younger populations and larger informal sectors compared to countries like Italy—a country that had one of the highest numbers of COVID-19 cases. Furthermore, the impact can be further differentiated according to the different stages of value addition within the same sector. These include production (where fishing takes place), processing of fish, trade and marketing, and consumption for the fisheries industry. These different factors, therefore, indicate the need to have context-specific interventions.

Several studies have already discussed the impacts of the pandemic and the associated intervention measures on the fishing supply chain (Food and Agriculture

Organisation [FAO], 2021; FAO, 2020a; FAO, 2020b; Organisation for Economic Co-operation and Development [OECD], 2020). The Sustainable Fisheries Partnership (2020) highlighted that the enforcement of social distancing measures has reduced processing capacity and that potential domestic fish markets such as hotels and restaurants have closed. Given that the sector employs a significant number of informal workers, mainly women, many of those employed in the supply chain are likely to have lost their jobs (Johnstone et al., 2020).

Each node of the fisheries value chain has been susceptible to the impacts of the pandemic. For instance, there has been a reduction in fishing time and the number of fishing trips on the production node due to curfews (Aura et al., 2020), especially in developing countries. Isingoma (2020) revealed that all fishing activities on Lake Albert (located in central Africa, on the border between Uganda and the Democratic Republic of Congo) were suspended for 32 days. Fish processing and export capacities were reduced along with the processing and trade nodes (Sustainable Fisheries Partnership, 2020). Additionally, vulnerable fishing communities could not find markets for their fish and fish products and adequate storage facilities to secure excess catch (FAO, 2020a). This increased post-harvest activities during the lockdown as bulky buyers found it costly to move products to reach the different market destinations.

In the Hatay province of Turkey, trade was the most affected node. Demirci et al. (2020) found that fish exports decreased by 65%, followed by wholesale (35%) and retail (17% for fishing products and 14% for aquaculture products) trade. Demand for fresh and processed fish across Uganda and Tanzania during the pandemic was severely affected by the limited opportunities to export to world markets (Mukiza, 2020). The closure of borders worsened business losses as some fishers opted to market fish products at lower prices (Sustainable Fisheries Partnership, 2020).

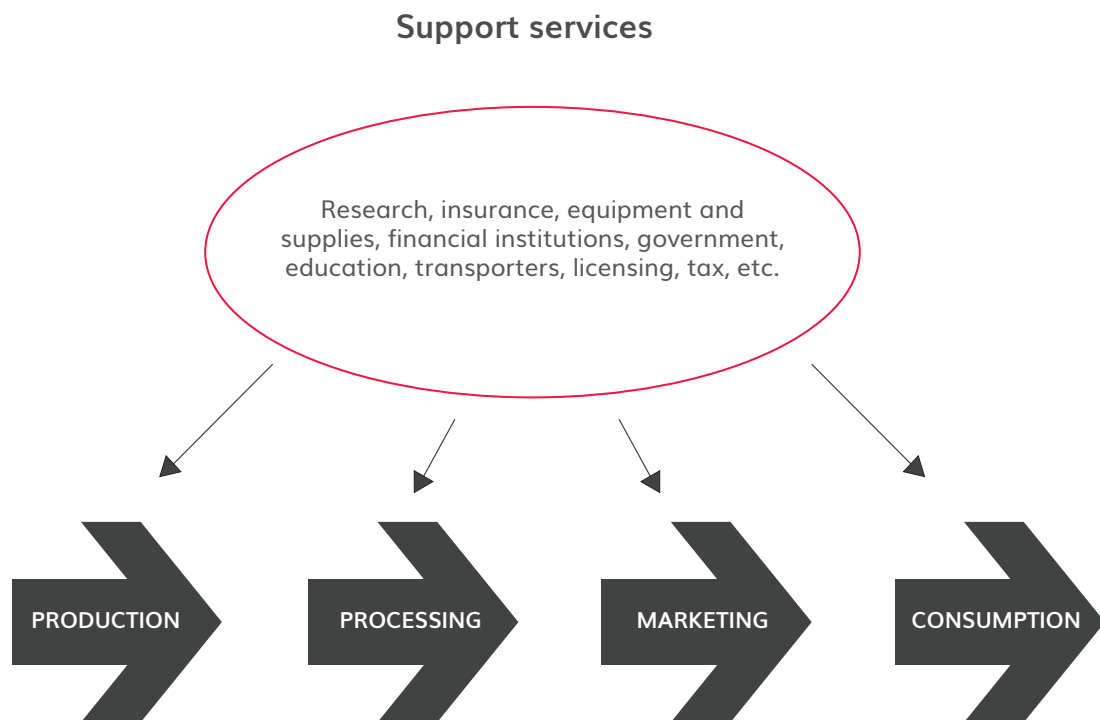
With such disruptions across different value addition activities of the fisheries sector, value chain analysis plays a vital role in assessing the impacts of the pandemic shock by examining every section of the value chain.

Michael Porter first introduced the concept of the value chain in the 1980s. Porter outlined the primary activities of a value chain in five sets of activities: inbound logistics (the inputs toward production); operations (the transformation to goods and services); outbound logistics (distribution of the finished goods); marketing and sales; and service (Porter, 1985). Generally, the value chain concept describes the full range of activities undertaken from the conception stage to the end product. A fisheries sector value chain is non-linear around its nodes. It incorporates secondary activities that support the primary functions of the sector, as illustrated in Figure 1.

The fisheries value chain has four major nodes: (i) production, where fishing or fish harvesting takes place; (ii) fish processing, which can be artisanal or industrial processing; (iii) marketing and trade; and (iv) consumption enhancement. Moreover, the number of activities within a node vary; hence some value chains are longer than others. Therefore, the value chain analysis approach involves connecting all activities from the raw material stage to production, processing, and distribution and analysing each phase in relation to others. The number of activities in the fisheries value chain also depends on the specific region where the sector is being studied and the economic, environmental or social value of the fish species. Consequently, fish of economic importance would support employment generation and livelihood sustenance. That of environmental importance would help secure ecosystem function, and the third kind is important to maintain cultural heritage, recreational services and human health (Lynch et al., 2016). Thus, fish with economic value would have longer value chains compared to those that are socially important (de Silva, 2011).

In examining COVID-19's impact on the fisheries sector through a value chain analysis and comparing a country that imposed a lockdown with one that did not, it is anticipated that some nodes will be more affected than others. At the same time, some might also have a bigger ripple effect on the overall value chain.

Figure 1. Fisheries sector value chain



Elaborated by the authors.

Methodology

Research approach and design

The study used a value chain analysis with a qualitative research approach and a comparative design to identify how the COVID-19 pandemic affected fishing communities. It compares a country that imposed a complete lockdown (Uganda) and one that did not (Tanzania). A qualitative approach was also used to identify the interventions employed to contain the pandemic and assess the utilisation of ICT tools during the lockdown in Uganda.

The value chain analysis tool allows for determining causal relationships between different nodes in the whole value chain and explains why and how these different nodes influence each other. This is the most valuable aspect of the value chain analysis approach—demonstrating that all decisions made at one node have consequences for other nodes. It allows the capture of a full range of activities associated with each node along the value chain. Since every economic and social activity was subject to impact, this approach allows for the capture of distortions in the secondary activities of each node. It helps explain how these distortions affect the primary activities of the different fisheries value chain nodes. More importantly, the process is helpful when looking at ways to increase the adaptive capacities of fishers and fishing households to reduce vulnerability (Jacinto & Pomeroy, 2011).

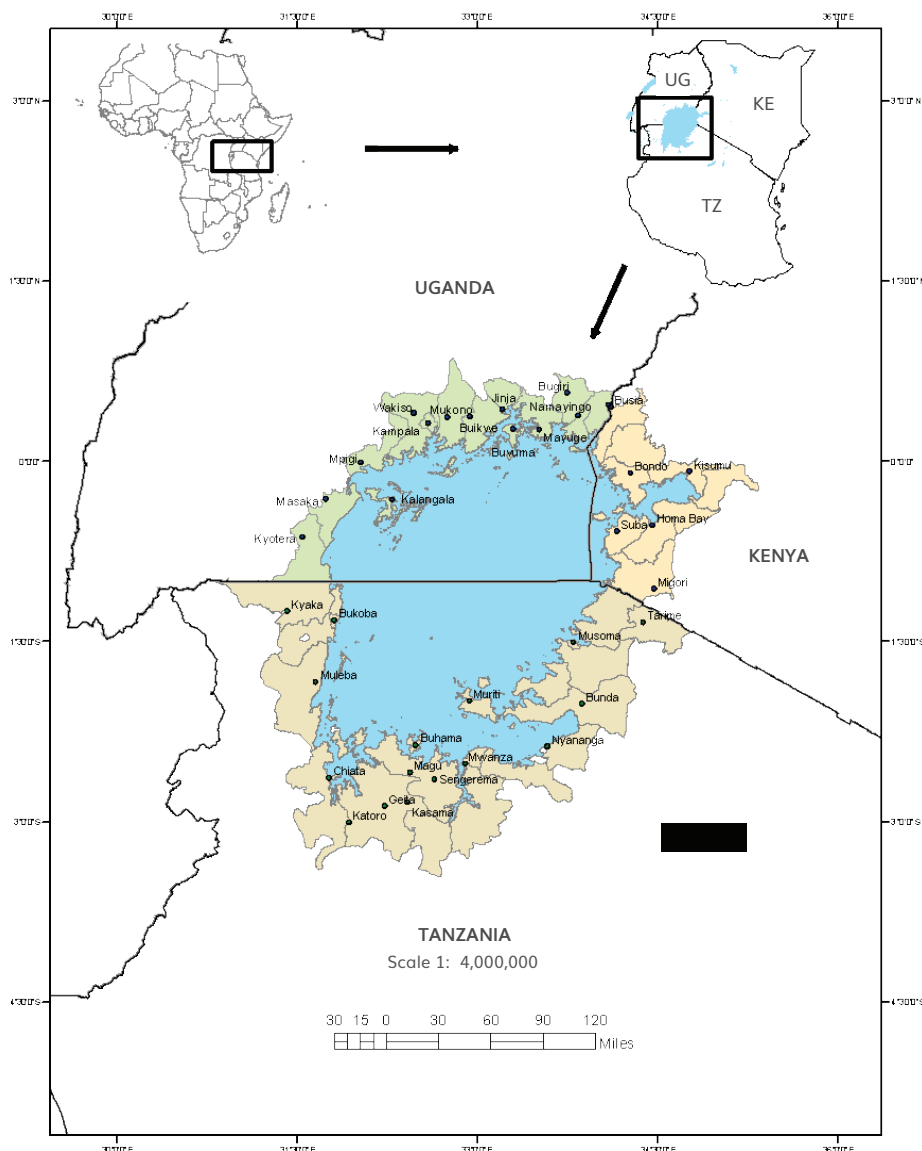
Study area and population

The study was conducted among fishing communities of the Lake Victoria region in Uganda and Tanzania. The Lake Victoria basin supports the livelihood of over 30 million people who are primarily involved in farming or fishing and is, therefore, one of the most important population centres in the African region (United Nations Environment Programme, 2006). As a country that did not impose a lockdown, Tanzania will be compared to Uganda, which underwent a complete lockdown. For Tanzania and Uganda, Lake Victoria is home to the inland fisheries sector. It is the second-largest lake in the world after Lake Superior in North America. It is a transboundary lake bordering three East African countries: The United Republic of Tanzania, Uganda and Kenya—respectively accounting for 51%, 43% and 6% of the shoreline (Figure 2).

Lake Victoria serves as a source of food and water and as a climate modulator in the region. It also offers transport linkages for communities within the three countries,

enabling trade activities. The lake's catchment area is estimated to be about 194,200 km² (Hempel, 2010). This lake supports a big portion of the fisheries sector in Eastern Africa due to its strategic position, diversity of species, and economic value. Uganda dominates the sector with an estimated fish production of 100,000 tons, while Tanzania produces 13,530 tons. Since the peak production of Nile perch in the early 1990s, Lake Victoria has continued to maintain high levels of fish production (Lake Victoria Fisheries Organization, 2016).

Figure 2. Share of Lake Victoria by riparian countries



Note. Map reproduced and adapted by Authors.
 Source: National Fisheries Resources Research Institute (2021).

Sampling procedure

The purposive sampling technique was employed to select fishing communities, traders, and fish factories based on the type of species targeted: Nile perch, tilapia, and dagaa/mukene. The composition of the focus group discussions (FGDs) was guided by the respondent categories: fishers, processors, traders, and consumers. At least two respondents from each category were considered. Two industrial Nile perch processing factories in each country were also purposely selected. Other sampled respondents included beach management leaders at landing sites and consumers in different locations. For Uganda, where a total lockdown was implemented, staff from the Ministry of Agriculture, Animal Industry and Fisheries were considered for the key informant interviews (KIIs) to obtain information on their oversight of the implementation of SOPs and lockdown restrictions in the fisheries sub-sector.

Table 1. Summary of the sample of participants for KIIs and FGDs

| Participants | Uganda | Tanzania |
|--|---|--------------------------|
| Government officials | 3 males | 2 males |
| Landing site leaders | 2 males | 3 males |
| FGD for fishers (boat owners and crew) | 4 males and 2 females | 4 males and 2 females |
| FGD for artisanal fish processors and traders | 3 females and 3 males | 3 females and 3 males |
| Fish factories | 2 managers | 1 manager |
| Consumers of fish that are not based near landing sites | 4 females and 2 males | 3 females and 3 males |
| Restaurants | Restaurants were closed during the period considered for the study | 4 females |
| Civil society organisations | 1 male | 1 male |

Elaborated by the authors.

Data collection and analysis

Data collection was conducted between October and November 2020. Both secondary and primary data were collected during this period. Secondary data were obtained from journals, articles, and reports, among others. A checklist with parameters to guide the literature review was designed and reviewed by the research team prior to carrying out the exercise.

Primary data gathering involved using qualitative data collection methods such as focus group discussions and key informant interviews. Seven FGDs with four to six participants were held in each country. Eleven KIIs were conducted. The key informants were government officials, fish factory managers, fish market officials, and landing site leaders in Uganda and Tanzania. Specifically, data collection tools focused on capturing challenges posed by the pandemic to fisheries-related activities. The study also sought to examine interventions put in place and the use of ICT for fish marketing and enhancing access to information.

There were not many difficulties experienced with data collection in Tanzania. In Uganda, due to a strict lockdown policy, the FGDs and KIIs were conducted in compliance with SOPs as recommended by the World Health Organization (WHO). These included social distancing, wearing masks, handwashing, and sanitising. Some KIIs were held virtually. The information gathered was then subjected to content analysis.

Ethical considerations

The study adhered to ethical research considerations of confidentiality, anonymity, and informed consent. In order to effect the above, it was agreed prior to the conduct of the study that the names of fish factories, landing sites, and other study respondents would not be included in the report. Respondents were informed about the study's objectives and gave their consent before participating in the FGDs and KIIs.

Limitations of the study

Due to limited time and resources to collect robust primary data, the study was designed to rely on secondary sources and therefore depended on the availability of secondary data. Limitations in primary data collection revolved around COVID-19 prevention measures and observed SOPs, especially in Uganda. It took more time than usual to obtain necessary permits and to gather information for the study.

In some cases, the number of FGD participants had to be reduced to as little as three to allow for social distancing while maintaining a suitable environment for in-depth discussions. Some key informants did not honour the virtual interview appointments, while others did not respond to phone calls when contacted, indicating that they did not have time for an interview. The rest delayed sending back responses to interview questions that were emailed to them. In some instances, fewer respondents could be reached given time constraints; therefore, some information, especially on consumption, had to be deduced from fish market sales trends.

Findings

This section presents and discusses the impact of the COVID-19 pandemic on the different nodes of the fisheries value chain. The analysis differentiates between two country scenarios: Uganda with the presence of lockdowns and Tanzania without strict lockdowns. It identifies the COVID-19 interventions adopted and examines the role that ICT played in ensuring sustainable fisheries.

Production node


In some countries like Namibia, fishing stopped completely (Immanuel, 2020) during the COVID-19 outbreak and subsequent lockdowns. In contrast, fishing activities continued in Uganda and Tanzania, though Uganda imposed some restrictions. After introducing the lockdown and movement restrictions in Uganda, the Directorate for Fisheries Resources (DiFR) tailored these government SOPs to the fisheries sub-sector. The "Guidelines for prevention of the spread of COVID-19 among fishing communities" were released in March 2020, addressing the leadership at landing sites (Directorate for Fisheries Resources, 2020). The most strictly enforced guidelines were those on social distancing and a curfew that ran from 7:00 pm to 6:00 am daily.

Key aspects of the production node that were affected during the outbreak and subsequent lockdown are outlined in Table 2. In Uganda, FGD participants indicated that the number of crew members in some boats was reduced. The need to adhere to social distancing rules during landing time compelled fishers to assign all their catch to a few boats. This change came at the cost of losing their catch and under-declaring the prices and value of the catch, among others. Fishing communities also revealed that they were expected to buy and wear face masks and carry hand sanitisers in their boats while on the lake, which imposed additional operational costs. These SOPs, however, had low

compliance due to limited enforcement by authorities on the lake. In contrast, fishers in Tanzania did not face these challenges since there was no curfew and no stringent enforcement of World Health Organisation guidelines.

The volume of fish catch per boat generally decreased during COVID-19 in Uganda and Tanzania. In Uganda, the reduction was attributed to adherence to curfew rules which forced some fishers to reduce time spent on the lake. Remaining on the lake during curfew hours was acceptable, provided fishers returned to land in the morning when curfew time had ended.

One respondent in Uganda reported that “a single Nile perch boat would harvest an average of 300 kg during the lockdown, as opposed to 1,000 kg on a weekly basis pre-COVID-19”. In Tanzania, one respondent also noted that “a boat with a capacity of 3 tonnes of fish during the pre-COVID-19 period caught less quantity during COVID-19”. Respondents further indicated that adhering to the curfew sometimes resulted in delays on the lake, which increased the chances of fish spoilage. This was further exacerbated by the relatively long time it took to offload fish from the boats (due to the need to comply with social distancing protocols) and for trading.



The volume of fish catch per boat decreased during COVID-19 in Uganda and Tanzania.

A reduction in fishing time as a result of COVID-19 preventive measures was foreseen by Aura et al. (2020), Bennett et al. (2020), Rosen (2020), and the Food and Agriculture Organization (2020b). They predicted that, in turn, this would contribute to fish stock recovery. Fishing community FGD participants reported that fishing grounds in Tanzania and Uganda did not significantly change despite limited fishing time due to the curfew in Uganda.

Primary data from both countries also revealed that some fishers changed the type of fish species targeted—mainly from table fish to silverfish—during the pandemic. Silverfish are usually dried and have a long shelf-life; as a result, making them easy to store for prolonged periods. Due to the increased number of silverfish harvesting, some Ugandan landing site leaders passed a resolution to regulate fishing days for each boat to accommodate the growing traffic. This measure led to low returns for fishers, with

one reporting that: "Because of the high number of silverfish boats, leaders here were forced to reduce the number of fishing days from six to three in a week". Notably, the number of fishing days for the Nile perch did not change since the number of fishers did not increase. Many fishers also moved away from export-oriented fishing to focus more on meeting supply needs for the local market. The change in targeted species resulted in additional costs of purchasing new boats and fish gear such as fishnets.

In general, lack of access to fish markets discouraged many from carrying out extensive fishing in Uganda and Tanzania. In addition, as a result of border closures with neighbouring countries, movement restrictions compounded the market challenges. Some traders in both countries were affected by these restrictions. They either went out of business or reduced the quantities traded and the number of fish trading days. The border closures also exacerbated post-harvest losses by fishers since traders were not available in time to collect their catch, in contrast to the pre-COVID-19 period. Most landing sites that would normally access ice through traders ran short of it, resulting in table fish post-harvest losses. In Uganda, the situation was worse. Transport services were limited, and the only available transportation inflated their prices. Sunny et al. (2021) indicated that these transportation challenges, along with the lack of buyers, caused an abnormal fall in prices of fisheries products during the COVID-19 outbreak and lockdowns. This study's findings confirmed this observation.

Restaurants closed in Uganda since they could not enforce social distancing regulations. This closure aggravated market challenges as they used to buy significant volumes of fish. In Tanzania, while restaurants remained open, there were fewer customers than usual. Some clients, who came from fishing communities, experienced low earnings and were consuming fish less often. The reduced consumer demand, particularly for restaurants, resulted in less fishing effort and catches. According to the World Bank (2012), 81% of fish catch is used for local consumption in the Lake Victoria region. In many countries, some fishers resorted to direct sales.

Nevertheless, these efforts were hampered in many places by stay-at-home orders to consumers (Clavelle, 2020; FAO, 2020b). The direct sales strategy was unsuccessful in many countries, including Indonesia (Sustainable Fisheries Partnership, 2020), Uganda, and Tanzania. It resulted in oversupply in places near the lake, leading to low prices. Mukiza (2020), however, projected that prices and demand should gradually pick up and return to pre-COVID-19 outbreak levels in the medium term. This projection applies to Uganda and Tanzania.

Table 2. A comparison of the COVID-19 effects on the key dimensions of the production node

| Key aspects | Uganda | Tanzania |
|------------------------------------|---|---|
| Target fish species | Some fishers changed the type of fish targeted, especially from table fish to silverfish. | Fish species targeted remained about the same, though some fishers changed to silverfish. |
| New fishers | New entrants into fisheries during the COVID-19 outbreak and lockdown after the closure of some business enterprises. | Entry into fisheries remained about the same. |
| Rescheduling of fishing activities | Some fishers changed their schedule on the lake in order to adhere to the curfew. | Time on the lake remained about the same. |
| Post-harvest losses | Fish post-harvest losses increased. | Fish post-harvest losses remained about the same. |
| Number of crew members on a boat | Reduced in order to adhere to social distancing SOP | Crew numbers remained about the same |
| Time spent fishing | The curfew forced some fishers to decrease their fishing hours. | Fishing hours remained about the same since there was no imposed curfew. |
| Demand for fish | Reduced due to multiple reasons. | Reduced mainly due to low purchasing power. |
| Investment and operational costs | New costs such as the purchase of sanitisers, masks, and gear (for those that changed targeted fish species, etc.). | Costs remained about the same. |

Elaborated by the authors.

Processing node

The processing node is vital to increase the shelf life of fish and fish products. This includes both industrial and artisanal processing. The latter is done at the landing site, using rudimentary technologies. Industrial processing is done in factories and mainly targets the export market. Fish processing operations include traditional drying (either on the ground or on racks), smoking, salting, and the use of chilled and frozen fish technologies. Compliance with COVID-19 SOPs, lockdown restrictions, and border closures affected processors at all scales of operation. It included small-scale operations in local markets, medium-scale operations in local and regional markets, and large-scale industrial operations serving international markets. Table 3 compares how fish processors were affected in each country.

Focus Group Discussion participants who work as artisanal fish processors indicated that silverfish was the major fish species processed in Uganda during the period under study. In Tanzania, the three major commercial species (silverfish, Nile perch, and tilapia) remained about the same. While the volume of fish handled in Uganda decreased during the period under study, Tanzanian respondents reported that the number of fish processed remained about the same. This was particularly due to the fact that processing in Tanzania continued with minimal interruptions under the SOPs, unlike in Uganda, where both SOPs and lockdown restrictions were observed. At one of the landing sites visited in Tanzania, respondents indicated that the quantity handled still depended mainly on the processor's operational investment capital, the size of the processing facility, and the technologies they owned. In Uganda, however, a respondent at one of the landing sites revealed that "before the lockdown, an artisanal fish processor that would handle an average of 30 kg of silverfish (dagaa) daily would handle about 5 kg during the lockdown.

Industrial fish processors in both countries experienced a decline in the volume of fish handled. It was mainly due to limited import demand from international fish markets and limited fish supplies in the case of Uganda. One of the factories sampled in Uganda indicated that Nile perch handled decreased from 15 to 10 tonnes in a month. Another factory reported that the volume of fish handled declined by about 70%. Reporting on the decline in fish exports and earnings, one of the factory managers interviewed indicated that monthly quantities exported to the European Union (EU) had decreased from about 150 tonnes to 60–80 tonnes.

According to FGD participants in Uganda, the decline in the volume of fish handled came from the supply side, mainly the production node. Some fishers were forced to reduce their fishing time to adhere to the curfew, which usually resulted in less fish available for processors. Limited access to fish markets due to lockdown restrictions also

discouraged many from processing high volumes of fish. The need to adhere to the curfew guidelines and the SOPs also stopped many fish processors from sourcing fish from other landing sites, which some did before the COVID-19 outbreak and subsequent lockdowns. As a result of limited fish supplies, factory agents/trucks and other processors took more time (an extra amount of days at most) to accumulate reasonable fish quantities for processing compared to the pre-COVID-19 period.

FGD participants (artisanal fish processors) in Uganda also reported that they experienced high fish post-harvest losses during the period under study. They attributed these losses to the time lags before they could access fish supplies and the longer time taken to process the fish compared to the pre-COVID-19 period. Additionally, the situation created by lockdown restrictions resulted in low demand, which meant that even processed fish was stored for a prolonged period compared to the pre-COVID-19 period.

Industrial processing factories in Uganda reported significant changes caused by the enforcement of stringent COVID-19 guidelines. The changes included extra costs related to residential staff (beddings, food, utility bills, etc.), operating at excess capacity, and employee redundancy. Meanwhile, Tanzanian fish factories continued operating without incurring the above-mentioned extra costs. Studies like the one carried out by Oloktum (2020) indicated that during the lockdown, the sampled fish factories incurred a daily average extra cost of USD 135 (500,000 Ugandan Shillings) on utilities and feeding, among others, as a result of accommodating 30% of their workforce while some of the workers were laid off.

Table 3. A comparison of the COVID-19 effects on the key dimensions of the processing node

| Key aspects | Tanzania | Uganda |
|-----------------------|---|--|
| Targeted fish species | Silverfish/dagaa, Nile perch, and tilapia | Mainly dagaa and less of Nile perch and tilapia |
| Fish factory labour | Fish factories retained most of their staff and did not provide accommodations for them | Fish factories retained 30–70% of their critical staff and provided accommodation for them |

| | | |
|------------------------------------|---|---|
| Operational costs | Operational costs remained about the same | Operational costs overly increased due to staff-related food, utilities, and accommodation costs, etc. |
| Volume of fish handled | Volumes for artisanal fishers remained about the same while that for industrial fish processors decreased | Considerable reduction in the volume of fish handled by both artisanal and industrial fish processors |
| Fish purchase and selling time lag | Relatively longer time and delays due to adherence to less stringent SOPs during the buying and selling process | Longer time and delays due to adherence to the SOPs and lockdown restrictions during the buying and selling process |

Elaborated by the authors.

Market and trade node

According to the KIIs, fish products from Lake Victoria could reach different market segments at the domestic, regional, and global levels. Domestic markets remained important due to an increasing consumer base. Tanzania and Uganda have estimated populations of 50 million and 43 million, growing at an average rate of 2.9% and 3% per year, respectively (National Bureau of Statistics, 2013; World Bank, 2020a). This signals an expanding local market for fish and its by-products.

At the regional markets, fish and fish products from Lake Victoria are mostly exported to other regional blocs such as the Southern Africa Development Community (SADC) and the East African Community (EAC)¹. Fish species such as dagaa/mukene and tilapia mainly serve domestic and regional markets, while the Nile perch is mainly for global export (Bagumire, Muyanja, & Kiboneka, 2018; Lake Victoria Fisheries Organization, 2016; Ministry of Agriculture, Livestock, and Fisheries, 2016; Uganda Bureau of Statistics, 2020). The export value of Nile perch products from Lake Victoria generally ranges between USD 250 million to USD 310 million per annum, with the EU being the top export market (accounting for about 60–80% of total exports), followed by Japan and the Middle East (Food and Agriculture Organization, 2015).

¹ These regions include the Democratic Republic of Congo (DRC), Burundi, Zambia, South Sudan, Kenya, Rwanda, and Malawi.

Studies show an increase in the volume of fish exports in recent years. In Tanzania, they increased from USD 182 million (407 billion Tanzanian shillings) in 2017 to USD 240 million (547 billion Tanzanian shillings) in 2018 (Ministry of Finance and Planning of the United Republic of Tanzania, 2019). Uganda recorded fish exports worth USD 171 million in 2018, the highest export revenue the country has earned in the last ten years—due to immature and illegal fishing methods, which depleted the water resources (Nakaweesi, 2019).

Challenges have been reported in fish marketing activities due to the pandemic and the enforcement of intervention measures. The fisheries supply system has been disrupted, resulting in a drop in fish stock, demand as well as prices. The Food and Agriculture Organization (2020a) indicated a fall in demand and associated income as a result of the enforcement of physical distancing and curfews at the fish markets. Table 4 presents a comparison of the COVID-19 effects on the key dimensions of the marketing node in the two countries.

Table 4. A comparison of the COVID-19 effects on the key dimensions of the market and trade node

| Key aspects | Tanzania | Uganda |
|-------------------------|--|---|
| Demand for fish | A slight reduction due to decreased number of local customers. | A significant decline due to the decreased number of local customers. |
| Volume of fish traded | Slight changes in volume. | Significant reduction in volume. |
| Logistics and transport | Not much effect on logistics and transportation within the country. | Limited transport due to strict ban of different transportation modes, and enforcement of curfew. |
| Storage | Not much effect on storage and fish preservation technologies and infrastructure (e.g. icing). | Availability and accessibility of fresh fish as well as ice were limited, which inhibited fish marketing to places far from the lake. |
| Price | Slight changes. | Significant changes. |

Elaborated by the authors.

Interview data from Tanzania revealed a slight decrease in the number of local customers in the market. However, ICT tools were increasingly used in transactions to reduce possible physical contact. Mobile phones were used to place orders for fish as well as to make payments. Part of the arrangement between customers and artisanal fish processors was that the latter would pack and ensure the safe transport of fish to the customers. Uganda faced a more difficult situation, as the lockdown restricted any public transport. This included motorcycles, which have always been a means for delivering goods. A study by Odongkara et al. (2014) pointed out the significance of public transport in fish marketing. The study indicated that 28% used hired trucks, 24% made use of public vehicles, 19% used motorcycles, while 3% used their personal vehicles for fish deliveries. With common fish transportation means restricted, the cost of hiring the available ones—such as private cars and the three-wheeled auto-rickshaws—increased. This resulted in a reduction in orders and traders coming to the landing sites.

Fish prices also changed due to the pandemic. At one of the sampled landing sites in Tanzania, a 1.5 kg Nile perch that used to be bought at around USD 2.20 was sold at less than USD 1.80. At another landing site, 3 kg of dagaa, bought at around USD 2.20 during the pre-COVID-19 period, was sold at USD 1.30. Respondents attributed the price change to reduced fish demand from traders. At some point, processing factories also refrained from buying fish from landing sites. According to the survey at one of the sites in Tanzania, processing factories such as those processing the Nile perch used to buy significant volumes of fish. They would even camp at landing sites for about three to four days until the quantity needed was reached. But during the pandemic, no processing factory was present at the landing site to collect fish.

In Uganda, fish factories reported a decline in fish prices from USD 0.80 before COVID-19 to USD 0.50 for a kilogram of sold fish. An interviewed fish factory worker indicated that the price per kg decreased from USD 5 to USD 3 for fresh fish and from USD 4 to USD 2.80 for frozen fish. The drop in price was attributed to the closure of borders, mainly with the DRC, which imports a significant quantity of fish from Tanzania and Uganda.

The closure of borders generally challenged fish exports. For example, a factory in Uganda reported that it would send about 15 tonnes of fillets per week by air to the EU market instead of the 20 tonnes that it used to send before the lockdown. For sea cargo, only 26 tonnes per month were shipped as compared to about 75 tonnes before the pandemic. This trend has also been felt in marketplaces elsewhere.

According to the Uganda Fish Processors and Exporters Association, global fish exports fell by 70% in the first month of the lockdown. Uganda exported 2,000 tonnes of

fish in January, a figure which dropped to 611 tonnes by April 2020. In a media interview, the association's chairperson was quoted saying: "Uganda's major fish markets are in China and Europe, and it has become hard for us to transport fish from the airport to the markets since there's a lockdown in those countries". They also reported that their export volume had dropped from 300 to 100 tonnes of fish per week (Muganga, Ssenkibirwa & Ssemugenyi, 2020).

In Tanzania, although there are no available figures, fish export was also affected. The government facilitated an arrangement with RwandAir and Ethiopian Airlines for the export of fish. This is something that fish processing factories expressed appreciation for during the FGD.

Consumption node

From 1961 to 2017, the average global annual growth rate of total food fish consumption increased by 3.1%, outpacing the annual population growth rate of 1.6%. Per capita fish consumption rose from "9.0 kg (live weight equivalent) to 20.3 kg in the same period" (Food and Agriculture Organization, 2020c, p. 3). The expansion in consumption has been driven not only by increases in production but also by a combination of many other factors. They include technological developments, rising incomes worldwide, reductions in loss and waste, and increased awareness of the health benefits of fish (FAO, 2020c).

Africa experienced the lowest per capita fish consumption, which reached 10.5 kg in 2014 before decreasing to 9.9 kg in 2017 (FAO, 2020a). According to FAO, a number of factors could explain this, particularly in sub-Saharan Africa. Reasons include the disproportion between fish production and rapid population growth and inefficient aquaculture sector development.

In the East African region that Tanzania and Uganda are part of, average per capita fish consumption is estimated at 5.3 kg annually (Obiero et al., 2019), which is lower than the African average and far below the global average. Per capita fish consumption in the region is likely to decline further due to the pandemic. As mentioned, the crisis has disrupted fishing activities, employment, and transportation to places far from the lakes due to imposed restrictions. The Daily Monitor (Uganda) reported on May 5, 2020, that the COVID-19 pandemic and subsequent lockdown in the country had affected people's eating schedules. Some people in Uganda had resorted to eating any available type of food or food combination to avoid starvation. Non-perishable products were preferred; therefore, silverfish was consumed more than fresh fish, even by those who earlier despised it as a "poor man's sauce" (Daily Monitor, May 5, 2020). The advantage

of silverfish like dagaa/mukene is that it is usually sold dried and in quantities that are relatively affordable to all income groups (Akumu et al., 2020).

It was evident in the FGDs that fish consumption in Uganda and Tanzania declined significantly. In Tanzania, respondents indicated that fish was always available since fisheries-related activities were neither stopped nor largely altered. Consumption was thus mainly limited by the willingness and income levels of individuals, as exhibited by a FGD participant's statement that:

"During COVID-19, consumers got their varieties of species as usual although catches varied over the period. All the species [tilapia, Nile perch and dagaa] were captured, so the consumers' choice of fish was determined by their willingness and backed up by income".

In Uganda, lower fish consumption was due to reduced income levels and reduced availability of fish for consumption, especially in places far from the fish landing sites. As elaborated earlier in this study, the enforcement of a curfew and the restriction on taxi and private car operations, which were common means of transport for fish traders, were among the factors that led to the reduced availability of fish. Motorcycle transporters, who were critical transporters of fish to places far from landing sites, were initially not allowed to operate beyond 2:00 pm. This was later extended to 5:00 pm. Weekly markets where fish are sold were also closed during the lockdown periods.

Rising transport costs resulted in reduced fish trading activities. It led to low fish supplies in markets, which in turn resulted in high fish prices that were no longer affordable for some consumers. As silverfish is less perishable than other artisanal-processed fish, it remained the main fish available in places far from the lake. One FGD participant shared that: "Some people consume silverfish for almost all days of the week compared to once a week in the pre-lockdown period". However, in the two countries, respondents indicated that the quantities and number of days on which fish was consumed declined for most households due to pandemic-related disruptions. On this note, it would be interesting to have a more comprehensive study that includes more consumers in the sample to establish the extent of the pandemic's impact on fish consumption.

Interventions to combat COVID-19

In Uganda and Tanzania, the SOPs were immediately imposed at the beginning of the COVID-19 outbreak, though implemented more extensively in Uganda. While the Ugandan government's interventions prioritised health measures to prevent the spread of the virus, the Tanzanian government focused more on interventions to combat the

economic impacts of the pandemic. The interventions in Tanzania included the reduction of the discount rate, lowering of the minimum reserve requirement ratio, and incentivising the restructuring of loans for severely affected borrowers.

Tanzania encouraged non-cash payments and relaxed limits on mobile money users in order to reduce the need to visit bank branches and mobile money kiosks. Domestic payment arrears and value-added tax refunds were also expedited by the Ministry of Finance and Planning, with specific priority given to the small and medium enterprises (SME) sector. About USD 395 million (916 billion Tanzanian shillings) of verified domestic debts were paid in March 2020 (Masubo, 2020).

In Tanzania, the SOP interventions referred to 46 of the public health regulations (sanitary and hygiene practices of 2012), while there were 34 COVID-19 containment measures in Uganda, in addition to the WHO recommended SOPs. The DiFR in Uganda also customised the government SOPs and tailored them to fit the fisheries subsector, releasing the guidelines in March 2020 (Directorate for Fisheries Resources, 2020).

Some SOPs applied in both countries included: restrictions on large gatherings, public health campaigns to encourage social distancing, regular hand washing, use of sanitisers, dissuade handshaking and physical contact, suspension of international travel with the imposition of 14-days mandatory isolation for incoming travellers. The private sector also engaged in facemask, personal protective equipment (PPE), and sanitiser production to meet their growing demand. When a rapid community spread of the virus and an increasing number of confirmed cases was reported, the government isolated the infected individuals, and tracked their 'contacts'. Public awareness campaigns were put in place to educate people on how to avoid contracting the COVID-19 virus.

Civil society organisations were also engaged. The Katosi Women Development Trust in Uganda prepared COVID-19 prevention guidelines and translated them into Luganda, a local language understood by the majority of the population. During a FGD, participants said that the main government and private sector interventions were: the provision of masks to some landing site communities and fish factories, establishment of handwashing facilities, provision of some food items, distribution of posters on the prevention of the spread of the virus, and sensitisation sessions. However, not everybody at the landing sites benefited, due to limited resources and shortage of supplies.

The Ugandan government also gave special attention to landing sites that were located at border points with other countries, such as the DRC and Tanzania. For instance, it carried out mass testing at Kansesero on Lake Victoria, and conducted sensitisation sessions for the communities, aiming to change attitudes towards the

pandemic. Kasesero is an important landing site, as it has fishers who are in contact with Tanzanian fishers while on the lake (World Health Organization, 2020a). In addition, security and community leaders helped in reaching out to almost every household to create awareness. Community radio was used to sensitise and remind the community to follow the Presidential Directives and guidelines from the Ministry of Health. It greatly contributed to compliance, and an eventual reduction in the number of confirmed cases (World Health Organization, 2020a). On Lake Edward, the army intensified its patrols, which ran from 2:00–7:00 am (World Health Organization, 2020b), to ensure that the community strictly followed the SOPs.



The fisheries supply system has been disrupted, resulting in a drop in fish stock, demand as well as prices.

Reflecting on its decision, the Tanzanian government emphasised the importance of not putting the country under lockdown. The authorities also resolved to keep up its production and supply of food to neighbouring countries that faced lockdowns. To further reinforce this, the government mobilised flights with RwandAir to export fish in the region. This measure helped neighbouring countries and minimised the impact of COVID-19 on the Tanzanian fisheries sector.

In Uganda, respondents attributed the limited spread of the COVID-19 virus to the imposition of and adherence to the SOPs. They also indicated that the implementation of SOPs led to improved hygiene in communities. This, in turn, reduced incidence of other diseases, such as diarrhoea and common flu. They indicated, however, that in the long run, adhering to the SOPs strains their already reduced earnings. They suggested that, in addition to enforcing the SOPs, the government and other actors adopt livelihood enhancement interventions to boost people's earnings and welfare. The respondents suggested the following steps:

- Provision of financial support, in the form of soft loans, at low-interest rates, to refurbish businesses.
- Negotiations between the government and lending institutions, for the provision of low-interest loans to fisheries-related actors.
- Mediation between the government and lending institutions for the deferral of loan repayment periods, and reduced interest on loans that were acquired pre-COVID-19.

- Review of government policy towards reducing taxes or giving tax holidays for fisheries-related activities at least for the recovery phase.
- Measures to lower taxes on fuel to reduce transport costs.
- Issuance of COVID-19 testing equipment, sanitisers, and handwashing facilities, which should be installed at every landing site.
- Deployment of a well-trained officer, preferably a member of the Village Health Team, to check the temperature of fishers and visitors upon arrival at landing sites before entry.
- Establishment of a quarantine centre at every landing site for the isolation of individuals suspected to have contracted COVID-19.

The role of ICT

This study revealed no profound changes in the use of technology in Tanzania and Uganda, compared to the pre-COVID-19 period. Despite the overall growth in the use of ICT in both countries, the fisheries sector has been slow to adapt to advanced technologies, particularly those that make use of internet connectivity. While there has been minimal progress in upgrading ICT infrastructure in fishing communities in both countries, technology usage has increased. The fishing communities, processors, marketers, and consumers have neither learned how to use new applications nor have they purchased new ICT equipment. Instead, they have used the same tools—radio, television, and mobile phones—as prior to the pandemic. This finding is supported by a study by Bernard et al. (2018) that pointed out that the type of ICT tools preferred by fish farmers, processors, and marketers to share agricultural information were mobile phones, radio, and television. The internet was the least used technology.

Radio and television were used as sources of general information via broadcasted announcements and presidential addresses. Mobile phones were used for sharing information via short message alerts and for carrying out financial transactions through mobile money services. These were the preferred means because they are easily accessible, available, and cheap, and facilitate two-way communications with instant responses. Most importantly, phones solved issues of transportation coordination, especially during the enforcement of the SOPs and lockdowns. A study by the World Bank (2020b) confirmed the importance of ICT for new cash transfer schemes, compatible with procedures like social distancing.

Notably, basic mobile phones were preferred over smartphones. They retain battery power longer and are better suited while fishing on the lake. The bridging of knowledge flow from advanced ICT tools to simpler ICT tools was made possible through the replication of content from internet-based sources to radio and television. Web content

was repackaged, rendered in local languages and formats, and distributed on mass media channels. High rates of taxes were mentioned by respondents as an obstacle to full usage of technology-based services, specifically the OTT (over-the-top media service tax, popularly known as social media tax) in Uganda. This tax is applied to data packages in addition to the already existing value-added tax. High costs of mobile money services, internet bundles and ICT gadgets, such as smartphones, hamper fishing communities and businesses access to ICT.

Conclusions and implications

The fisheries sectors of Uganda and Tanzania experienced many similar challenges due to the COVID-19 pandemic. However, these challenges were experienced at different magnitudes owing to the differences in the two countries' responses to the pandemic, specifically the imposition of lockdowns. Interventions, such as the enforcement of curfews, which led to limited fishing times, as well as import and export challenges, impacted the value chain of both artisanal and industrial fisheries. The pandemic affected fisheries communities' livelihoods and income gains visibly more in Uganda than in Tanzania.

While fish harvesting continued in Tanzania, the pandemic disrupted day to day activities in Uganda. Social distancing measures implemented to address congestion in landing sites resulted in increased post-harvest losses (fish spoilage), as very few people were allowed to offload the product from boats. The prolonged time that fish stayed on boats reportedly affected its quality, as well as the revenue of retailers. Table fish harvesters recounted that they were able to collect all their catch and assign an individual responsible for delivering it to the landing sites, while also complying with social distancing measures. However, the arrangement sometimes caused misallocations in the quantity of fish catches per individual fishers. This led to conflict and income loss. Some fishers who changed target species—like those that changed from Nile perch to dried fish like dagaa/mukene—incurred additional input costs.

With demand and logistical challenges in the export market, fishing shifted towards species that were locally consumed (tilapia and dagaa/mukene) and away from species that are mainly for the export market (Nile perch). This led new players to join the silverfish market, enabled by the open-access nature of fisheries resources. Some have since continued to seek silverfish, as they can generate income with it. However, the increased number of silverfish harvesting added pressure on fisheries resources, resulting in reduced catch volumes per boat.

Furthermore, the impact of the pandemic and its response measures led to the closure and eventual collapse of other businesses. The fishing industry, however, continued to operate with some restrictions and attracted new entrants from other industries. The increasing competition put more pressure on fisheries resources and contributed to drastically reduced earnings of fishers.

Effective responses to emergencies that affect the fisheries sector require an understanding of the specific features of the sector's activities and the people who work and depend on it. It is especially important in the fishing/production node, and the wide range of services that support these activities (Cattermoul, Brown, & Poulain, 2014). Understanding this is key to ensuring accessibility and availability of fisheries resources, the profitability of their businesses, and the sustained livelihood of the communities.

In both countries, the processing and marketing nodes of the fisheries sector are closely linked. Border closures affected factories that cater to the export market, impacting the overall sustainability of their operations.

The COVID-19 pandemic affected trade worldwide, regardless of lockdown policies, and Tanzania and Uganda were no exception. In Tanzania, the local fish market continued operating with a minimal negative effect, but the export market was distorted due to lockdowns in importing countries (mainly Western countries).

The pandemic also led to lower fish consumption in both countries, but more so in Uganda. Reduced fish consumption in Tanzania was mainly due to a decline in consumer earnings. In Uganda, decreased earnings were further compounded by the absence of fresh fish or locally preferred species, especially in areas far from the lake. Lack of appropriate preservation technologies, especially for table fish, hindered access and availability in said areas. Non-perishable fish products also had more demand in both Uganda and Tanzania. Dried fish was purchased even by those who usually despised it as a "poor man's sauce". But even with increased consumption of dried fish, total consumption was lower compared to pre-COVID-19 levels. Limited operational hours for motorcycle transportation—commonly used for long-distance deliveries—and the resulting high transportation costs led to a further reduction in fish volume consumption in Uganda. This decline inhibits the achievement of the targeted per capita fish intake for East Africa and Africa, in general.

The use of ICT tools and systems increased during the pandemic. In addition to technology as a tool for promoting public health awareness on COVID-19, it played an important role in local fish trading. Even though no new or advanced technologies were introduced, traditional ICT tools, like radio, television, and mobile phones, were

progressively used for advertising and delivering fish products to local consumers. These tools also aided activities in other nodes of the fisheries sector value chain. Indeed, ICT presented an opportunity to ensure sustainable fisheries continuity amidst the pandemic. Access to social media platforms and mobile money services in Uganda, however, was partly limited by the high tax rates on internet bundles and mobile money transaction fees.

The experience with lockdowns in low-income countries, such as Uganda, requires rethinking. In countries like these, most communities depend heavily on the informal sector for their livelihood. An intermediate solution, involving innovation to comply with health preventive measures, while ensuring the sustainability of fisheries businesses, is paramount. This study offers recommendations to reduce the impact of the pandemic on fisheries-dependent communities and on the sector as a whole in both Tanzania and Uganda.

Recommendations

The recommendations are as follows:

Legislative recommendations

- Government policies and responses for reducing the impact of the COVID-19 pandemic should strike a balance between health measures and economic interventions that support the livelihood and needs of fisheries-dependent communities.
- Both countries should coordinate and develop a strong procurement and distribution facility for fish and fisheries products to sustain fish trade and consumption, while social distancing measures and border closures are in effect. This is applicable to national and regional markets.

Regulatory recommendations

- Governments should consider reducing import taxes of ICT devices, taxes on internet use and mobile money charges during the pandemic to promote information sharing on production and businesses, including those involving fisheries value chain activities.

Practical recommendations

- Given that most landing sites are in remote locations, governments should invest in infrastructure, such as an upgraded energy grid, to support the operation and growth of the sector. This will not only aid better fish preservation but will also power other activities across the value chain nodes. This includes production, value addition, marketing and export. Improved infrastructure will help support better technology uptake to improve fisheries business operations.
- Investments in energy and transport infrastructure would improve accessibility to ice and other fish processing technologies. This would enable better fish preservation, decrease spoilage, and ensure smooth road network connectivity for deliveries over long distances and periods of time.
- Train fish traders on social media and technology adoption, specifically on modern marketing strategies, so that they can better utilise available platforms to build and maintain customer relationships. Such training opportunities can be mobilised at the municipal level or at landing site management units.

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Appendices

Appendix 1. FGD checklist

1. Describe the effects/challenges posed by the outbreak of COVID-19 and its subsequent lockdown on the following aspects:

- Fish stocks
- Volume of fish handled
- Fish prices
- Fish species targeted
- Fish post-harvest losses
- Number of people targeting the different fish species
- Fish processing
- Fish marketing
- Fish exports
- Earnings from fisheries activities
- Fish consumption (any changes in type, patterns, frequency, quantity consumed, etc.)

2. Describe any interventions made towards the fisheries and the fishing communities as well as their benefits. What kind of interventions did/do you require?

3. Have ICT tools (mobile phone, radio, TV, internet) been useful in your fisheries-related activities during the COVID-19 era? If yes, how were they useful? What are the limitations and what are the recommendations to improve usability?

Appendix 2. KIIs checklist

1. What Covid-19 measures do you think negatively affected the fisheries sector?

2. For those provided, how do you think these affected the fisheries sector?

3. What would you recommend as best practices for fisheries sustainability amidst the COVID-19 lockdowns in Uganda?

4. Give recommendations that can help the sector recover from the above-mentioned effects



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