

A review of fish supply–demand in Tanzania

Authors

Jeffrey Peart, Nhuong Tran, Chin Yee Chan, Asiya Maskaeva, Amon Paul Shoko, Ismael Aaron Kimirei and Nazael Amos Madalla.

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Contact

WorldFish Communications and Marketing Department, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia. Email: worldfishcenter@cgiar.org

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List of abbreviations

EEZ	exclusive economic zone
LDC	least developed country
AFDP	Agriculture and Fisheries Development Program
MLF	Ministry of Livestock and Fisheries
FAO	Food and Agricultural Organization
t	metric ton
GDP	gross domestic product

Executive summary

As part of WorldFish's analysis of fisheries and aquaculture futures in Tanzania, this document serves as a preliminary review of the data and existing literature to help further develop a fish sector model for the country. We highlight factors influencing fish supply and demand in Tanzania and the need for further research, investment and sustainable management of aquatic food systems in the country. Total fishery output in Tanzania has been relatively stable since the mid-1990s. Although this trend has been seen in capture fisheries throughout the world, other countries have been able to make substantial increases in fish supply by advancing aquaculture. Recently, Tanzania has started to implement several initiatives aiming to promote aquaculture development.

Several factors are inhibiting the growth of the country's fish supply. Post-harvest infrastructure is insufficient, and coordination of fish supply chains is poor. Furthermore, there is a paucity of knowledge regarding fishstock dynamics that may lead to inefficient management. Above all, however, the current low production rate of the aquaculture subsector is limiting growth. Tanzania has also yet to design and implement an effective management strategy or conduct extensive industrial marine fishing operations in its exclusive economic zone (EEZ), and address issues of overexploitation of the fishery. Furthermore, post-harvest handling losses are significant, leading to an estimated 40% loss in fish yields.

Fish is a vital supplier of essential micronutrients for developing countries, but per capita consumption of 8.5 kg in Tanzania is well below the global average (20.5 kg), which may have negative effects on the development of healthy livelihoods and food security. This trend is not expected to subside in the near future given the anticipated high population growth, economic growth and changing consumer habits, which are the main driving forces behind increasing fish demand. Without substantial increases in fish availability, Tanzania can expect further decreases in per capita fish consumption in the future.

In the final section of this report, we outline steps that can be taken to address sustainable management and availability of aquatic resources in the future, including an in-depth fish sector analysis. We recommend foresight modeling of the different alternative scenarios that represent the most likely occurrences given the findings of this review. Through foresight analysis, projected costs and benefits of these scenarios can be considered to ensure that management decisions are made with the highest degree of certainty and efficiency. Governance and policy decisions that will be made soon are vital to the efficiency of aquatic food production in Tanzania and ensuring the economic, social and environmental contributions that they can provide.

Introduction

Foods that are captured or cultivated in freshwater or marine environments, known as aquatic foods, are a vital part of Tanzania's economy regarding nutrition, income and employment (USAID 2020). In 2017, fish accounted for about 20% of total per capita intake of animal protein for almost half of the world's population (FAO 2020). In addition, fish and fish products provide a rich source of vitamins and essential micronutrients, such as zinc and iron, for cognitive development and functioning (Thilsted et al. 2016). In Tanzania, the fishery sector directly provides jobs for about 200,000 people (Chan and Tran et al. 2021) while 4.5 million people (approximately 35% of rural employment) indirectly depend on fishery activities. The fish sector contributes about 1.75% to Tanzania's gross domestic product (GDP) (MLF 2021).



Figure 1. Location of Tanzania.

The role of aquatic food production in the Tanzanian economy has substantial room to grow as multiple indicators show that the fishery sector is underperforming. Population growth is outpacing the rate of growth in the aquatic food supply, which has led to an annual per capita fish consumption rate of roughly 8.5 kg (MLF 2021). For comparison the global average is 20.5 kg (FAO 2020). This is not due to the preferences of consumers in Tanzania as the demand gap for fish has been estimated at roughly 300,000 t (MLF 2020b), a substantial amount. Furthermore, the demand for aquatic foods worldwide is projected to double by 2050, with higher increases in areas where such foods will become more accessible (Naylor et al. 2021). To meet the supply shortage, imports of low-value fish have also risen steadily in recent years, closing the gap between import and export quantities. Most of the lack in fish supply can be attributed to lagging aquaculture growth in the region, which makes up only 4% of domestic fish supply.

Located in East Africa and within the African Great Lakes region, Tanzania has abundant fishery resources (MLF 2021). The total inland water bodies cover about 6.5% of the country's total land area. Inland water resources in Tanzania include Lake Victoria (35,088 km²), Lake Tanganyika (13,489 km²), Lake Nyasa (5760 km²), Lake Rukwa (3000 km²), Lake Eyasi (1000 km²), and about 1000 km² of other small lakes. On the marine side, Tanzania has a coastal line of 1424 km, a territorial sea of about 64,000 km², and the 200-nautical mile EEZ covering an area of 223,000 km². The estimated maximum sustainable yield of the country's aquatic resources is roughly 750,000 t, leaving approximately 300,000 t yet to be produced. Additionally, aquaculture development has the potential to drastically increase fish supply. However, multiple factors have held back the productivity of Tanzanian fisheries. These are discussed in sections 3-6.

This report provides a preliminary review of the data and existing literature on fish supply, demand, trade and prices in Tanzania to inform the development of a fish sector model to assess future scenarios of fish supply-demand and its implications on food and nutrition security. We identify various factors influencing fish supply and demand in Tanzania, highlighting the issues that have resulted in a lower supply of aquatic food relative to the rest of the world. We also examine historical trade and price trends within Tanzania, though data is quite limited. To solve these issues through effective governance and policy, further research is necessary, particularly foresight analysis of the fishery sector. This will help to analyze the effects that certain government policies or environmental changes will have on Tanzanian aquatic food systems. Informed decision-making and priority setting in developing aquatic food systems is critical in Tanzania to combat food insecurity and enhance livelihoods.

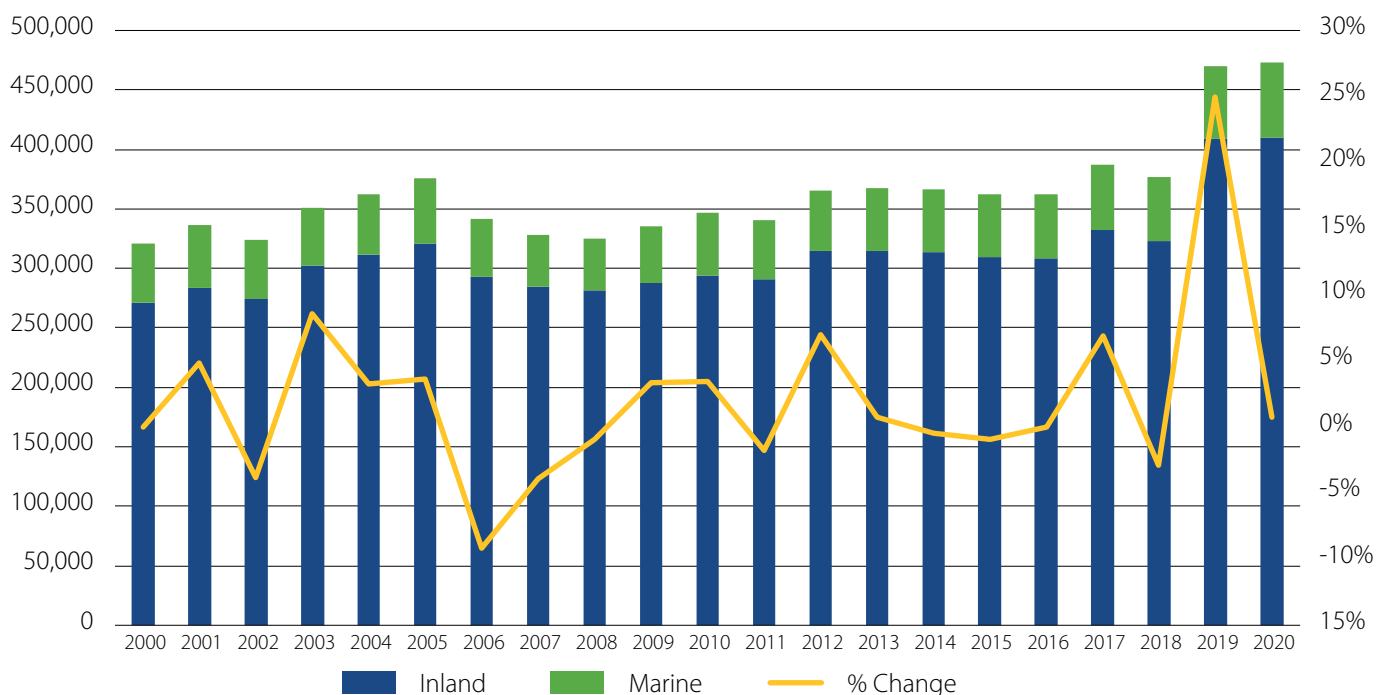
1. Fish supply in Tanzania

1.1. Capture fisheries

As shown in Figure 2, capture fisheries in Tanzania are responsible for the majority of aquatic food production in Tanzania, averaging 364,351 t per year between 2000 and 2019 and making up roughly 96% of total fishery production in 2019 (FAO 2020). Most production comes from inland fisheries, accounting for about 85% of total capture fishery production annually (MLF 2020b). Marine fisheries make up the remaining 15% of production. With the maximum allowable catch estimated at about 750,000 t for Tanzania (excluding the EEZ), there is room for growth in the sector (PMO 2020). Tanzania's EEZ remains underused by domestic fishing operations, a key issue that the country's government has been actively solving. Industrial and semi-industrial fishing operations remain largely absent from Tanzania, as 95% of fishery catch is attributed to small-scale artisanal fisheries (Jiddawi and Öhman 2002). In line with global trends, capture fisheries in Tanzania have not experienced substantial growth since the start of the 21st century, remaining relatively stable, aside from a recent spike in yields due to efforts

to minimize illegal fishing (Figure 2). This has led to levels of per capita fish consumption that are much lower than international averages as production has not kept up with population growth (MLF 2020b; FAO 2020).

The problems endemic to Tanzania's capture fisheries include insufficient knowledge of the resource base, open-access problems (e.g. tragedy of the commons), inadequate post-harvest infrastructure and subsequent high post-harvest losses, and the predominance of artisanal fisheries (MLF 2020b). In addition, the lack of a clear exploitation plan for the EEZ remains an issue that threatens the sustainability of the marine resources and requires substantial investment and research to solve. Along with management and infrastructure issues, Tanzanian fisheries face the effects of climate change, which, given the low levels of historical data, are especially uncertain (Sekadende et al. 2020). Climate change is predicted to have a more severe impact on freshwater systems because of increased levels of warming on continental land masses relative to the open ocean (Tigchelaar et al. 2021). As a result, Tanzania may be especially vulnerable.



Source: MLF 2021.

Figure 2. Capture fish yield and growth rate.

To address these problems, the government has outlined several measures, one of which being the Agriculture and Fisheries Development Program (AFDP) (PMO 2020). To increase the productivity of artisanal fisheries the plan lends support to fishers for accessing suitable sustainable fishing gear, ice for cold fish storage, implementation of fish aggregating devices (FADs) and improvements in post-harvest processing techniques. The AFDP also promises to buy eight marine fishing vessels with a capacity of 30–45 t each, build three cold fish processing plants and implement a range of supply chain management strategies to effectively use Tanzania’s EEZ, focusing on tuna and tuna-like species (PMO 2020). In addition to these infrastructure advancements the Ministry of Livestock and Fisheries (MLF) also released its National Fisheries and Aquaculture Research Agenda for 2020–2025. It includes a comprehensive stock assessment and valuation of all water bodies, analysis of fish migration patterns, and identification of endangered and threatened species (MLF 2020b). Implementing this rigorous research agenda will require substantial investments and collaboration with international research organizations but will allow for sustainable and efficient management of Tanzania’s capture fisheries. To effectively manage the EEZ, the Tanzanian government has also recently released the Deep-Sea Fisheries Management and Development Act, which lays out a management framework implemented by the Deep Sea Fishing Authority. This further defines the licensing framework for foreign vessels in Tanzanian waters and will hopefully deter illegal fishing in the area.

1.2. Aquaculture

In Tanzania, the contribution of the aquaculture sector is currently low, at about 4% of total fish production (MLF 2021). Globally, however, aquaculture accounted for 46% of total fish production in 2018, up from 12.7% in 2000. However, it has shown considerable growth in recent years increasing by 563% from 3517.70 t in 2011 to 18,716.56 t in 2021. Aquaculture in Tanzania is primarily conducted in freshwater with Nile tilapia being the dominant farmed fish, making up more than 90% of total aquaculture production. Freshwater production is characterized by approximately 27,979 predominantly subsistence earthen ponds, 431

“Aquaculture will continue to be the driving force behind the growth in global fish production, extending a decades-old trend.”
– FAO 2020

cages and one recirculating aquaculture system (MLF 2020a). Although still not well developed, mariculture is also practiced in Tanzania’s coastal areas. Mariculture currently produces a variety of marine species including marine shrimp, molluscs, sea cucumber, crabs and seaweed.

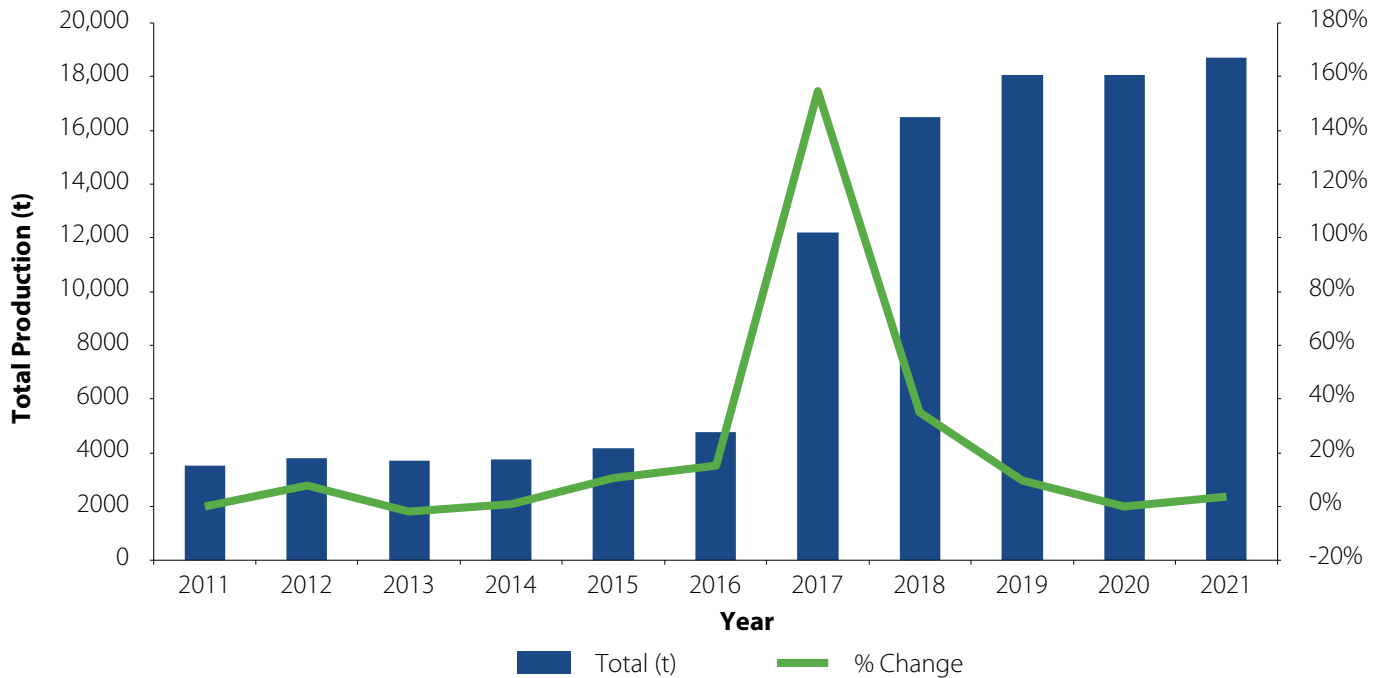
Many of the problems plaguing aquaculture are related to the supply of the inputs needed. These include fingerlings and fish feed, both of which are facing supply deficits. In 2019, private and public hatcheries produced a combined 21 million fingerlings. The MLF outlines the causes of these problems facing aquaculture as the following:

- inadequate institutional, policy and legal framework for the aquaculture industry
- limited supply of key aquaculture inputs, especially fingerlings and feeds
- limited adoption of best management practices and technologies for aquaculture
- predominance of subsistence aquaculture due to low commercial investment
- limited value addition and marketing for aquaculture products
- limited knowledge generation and transfer of technologies and innovations.

The AFDP will be implementing several measures to help expand the aquaculture industry. They include developing additional hatcheries, fish feed production facilities and other necessary aquaculture supplies, providing hands-on training and education of best management practices, expanding the aquaculture supply chain and expanding the market of farmed fish using cold chain facilities. The greater availability of aquaculture inputs alone will drastically improve the situation for Tanzanian fish farmers, allowing easier access and lower barriers to entry into the industry. In addition to the advancements being made in freshwater aquaculture, the Tanzanian government is also planning to increase

mariculture activities. This will increase the production of high-value species such as marine shrimp, milkfish and oysters, as well as create new jobs in coastal communities. Implementing these solutions will get Tanzania back on track

with the rest of world in regard to aquaculture production, which in turn will enhance livelihoods, and help boost domestic fish consumption to recommended levels.



Source: MLF 2021.

Figure 3. Aquaculture production and annual growth since 2011.

Box 1. Factors influencing fish supply.



Insufficient post-harvest infrastructure is limiting processing efficiency and marketing ability of both capture fisheries and aquaculture.



Lack of knowledge regarding resource base and aquaculture best management practices is undermining the sustainable management and efficiency of fisheries.



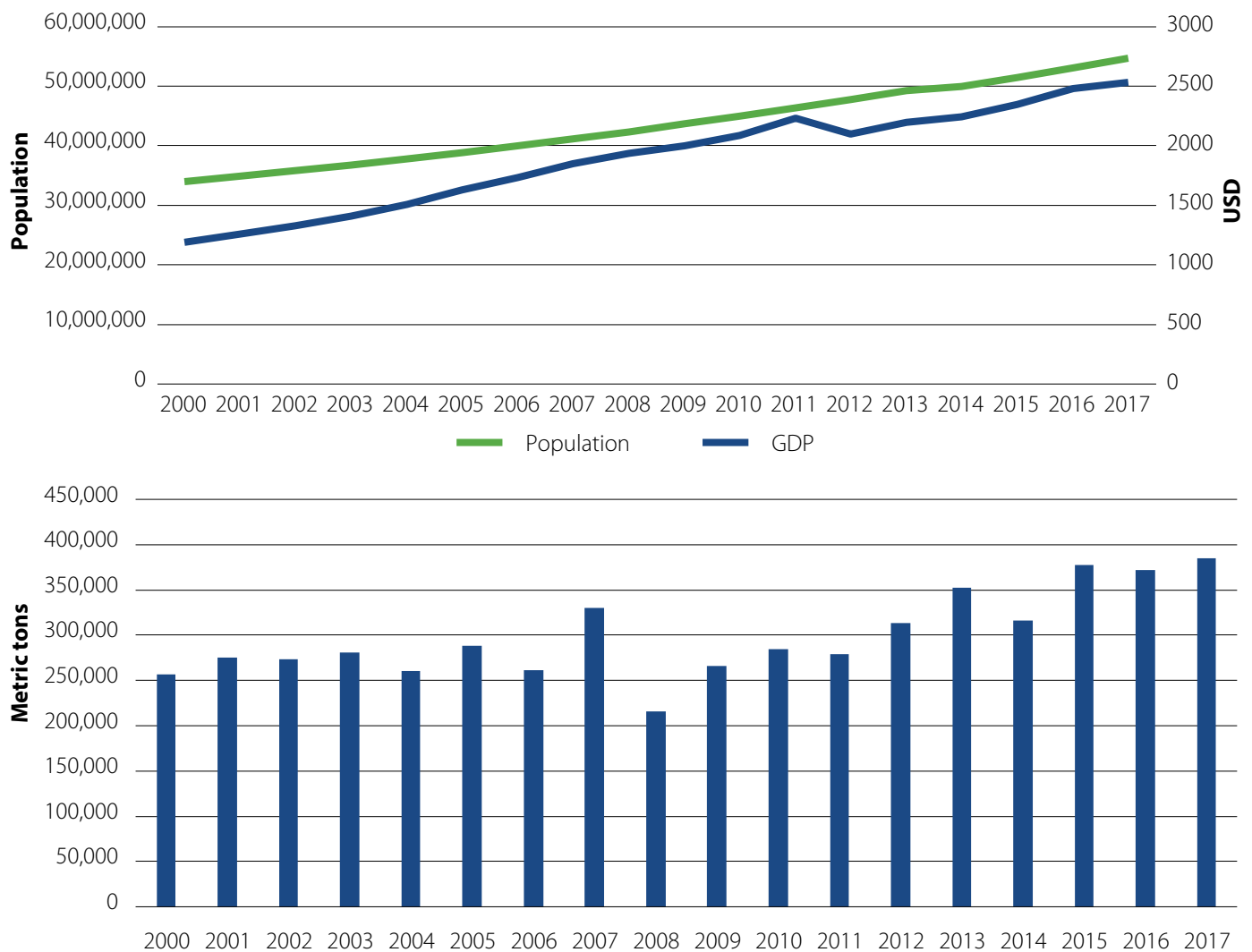
Inadequate institutional framework and input supply surrounding aquaculture has led to the predominance of subsistence-based fish farms instead of commercial farms.

2. Fish demand in Tanzania

2.1. Fish consumption trends

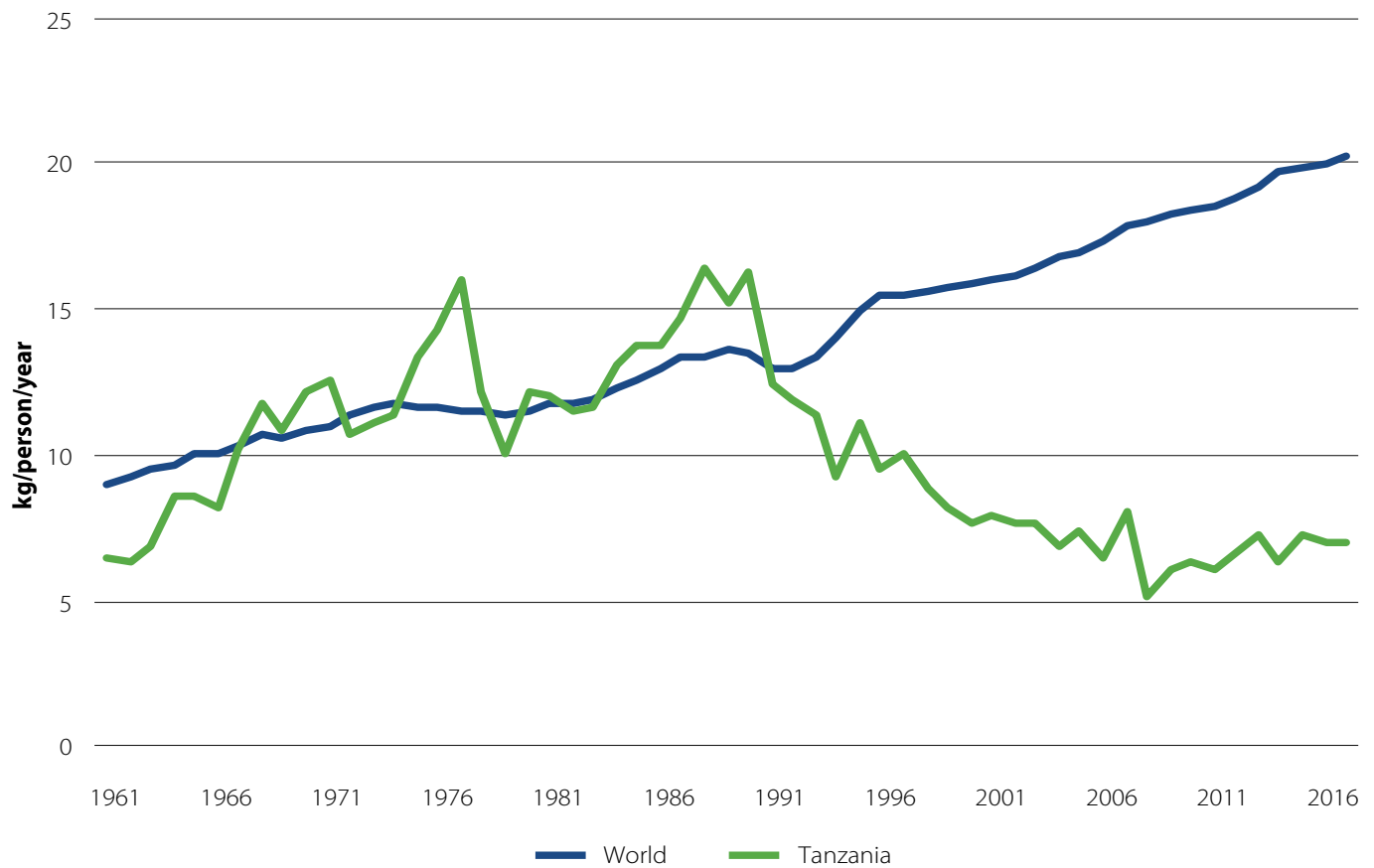
Per capita consumption of fish in Tanzania, equal to total production plus imports and minus exports, has decreased from 1990 levels. According to statistics from the Food and Agriculture Organization (FAO), Tanzania had a per capita consumption level of 16.4 kg/year in 1990. By 2017, however, that same statistic was just 7 kg/year. Annual per capita fish consumption rate increased to 8.5 kg in 2020 (MLF 2021). Low per-capita consumption was mainly due to the supply of fish, which has stayed relatively steady around 300,000 t per year since 1990 while the population has more than doubled in that same timespan. Figure 4 shows how the aquatic food supply declined and then stagnated during the early 2000s until

2012. There have been some gains in supply since 2012, due in part to increased fish imports; however, demand for fish consumption is still outpacing supply, causing an estimated demand gap of approximately 300,000 t. Comparatively, as shown in Figure 5, fish consumption globally increased by 3.1% per year on average between 1961 and 2017 (FAO 2020). Globally, per capita fish consumption increased from an annual average of 9 kg in 1961 to 20.5 kg in 2016, significantly higher than Tanzania's fish consumption. As global capture fishery production has been relatively stagnant for roughly 30 years, the global trend of increasing fish consumption can be attributed mostly to the proliferation of aquaculture, which is not the case for Tanzania, where aquaculture production is still low.



Sources: World Bank 2021 and Eurostat-OECD 2021 (top); FAO 2021 (bottom).

Figure 4. Population and GDP growth (top) and food supply (bottom).



Sources: FAO 2020b.

Figure 5. Per capita fish consumption: Tanzania vs. the world.

2.2. Drivers of fish consumption

Negative attitudes toward fish are not the reason for the low levels of fish consumption in Tanzania. Nor is it low demand, with the demand gap for fish estimated at around 300,000 t (MLF 2020b). Growth in fish demand is primarily fueled by four factors: (1) population growth, (2) economic growth, (3) evolving consumer preferences and (4) relative prices (Chan and Prager et al. 2021; Naylor et al. 2021; Wang et al. 2021). According to FAO data, the Tanzanian population grew at an average rate of 2.83 % per year from 2000 to 2017. Demand for fish will likely grow in a linear fashion in relation to population, which translates into a possible 43% increase in fish demand by 2030. Furthermore, demand has been seen to be a normal good, meaning it increases as income increases. This positive relationship has been analyzed by Abdulai and Aubert (2004), they estimate elasticities between income and animal protein in Tanzania (e.g. fish) at 1.04. This indicates that fish demand may increase at a slightly higher rate than GDP. With Tanzania's GDP having increased at an average of 4.6% per year between 2000 and 2017, fish demand will

continue to rise by at least that rate. Taking this all into account, upward pressure from population and economic growth should more than double the quantity of fish demanded by 2030.

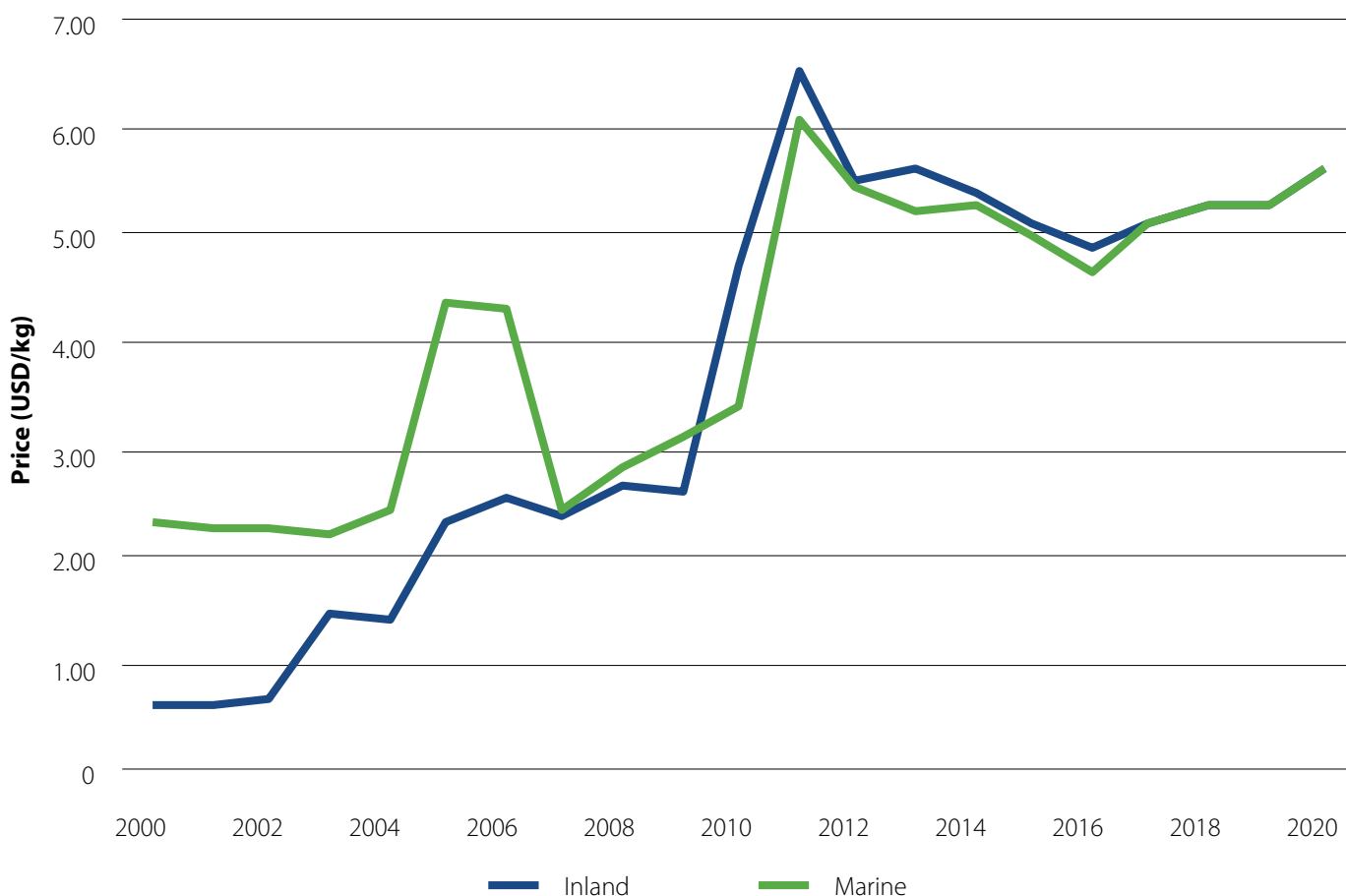
In addition to these influences, consumers' attitudes and cultural change also play a large part in determining fish demand. In an article analyzing consumer preference in Tanzania, 95% of respondents showed a strong willingness to consume fish because of its health benefits (Wenaty et al. 2018). Recent publications concerning healthy livelihoods and diets have underlined the importance of fish consumption for multiple health benefits. For example, Ahern et al. (2021) find that fish consumption has the potential to reduce the risk of multiple serious health issues and promote childhood development. As consumers become aware of the health benefits of fish consumption, demand may subsequently increase. Other determinants of demand for fish and other aquatic and terrestrial sourced animal foods include years of schooling for women, household size, accessibility and convenience (Abdulai and Aubert 2004; Wenaty et al. 2018).

3. Fish prices

3.1. Capture

As shown in Figure 6, fish prices from capture fisheries in Tanzania have been trending upward since 2000 (MLF 2021). This is most likely a result of the rising demand for fish, which has outpaced the slow-to-moderate growth of domestic fish supply described in sections 2–4. Further breakdown of fish prices by species or group within capture fisheries is challenging because data is limited; however, the literature provides some sparse examples that follow similar trends to the aggregated data shown in Figure 6. In Lake Victoria, where most inland fish are landed in Tanzania, Nile perch was worth about USD 1000 t in 2005 and around USD 2100 t in 2014. Additionally, between 2012 and 2014 the total value of the Dagaa fishery in Lake Victoria more

than doubled even though there was a decrease in total catch (LVFO 2016). A similar trend has been seen for the prices of high-value species from the pelagic fishery, such as tuna and king mackerel. For example, the price of tuna has increased approximately 48% from USD 1863 t in 2011 to USD 2763 t in 2019 (Igulu et al. 2013; Maskaveva et al. 2019). The drastic rise in the price of fish reflects growing scarcity and stagnation of supply against a growing population with an increasing appetite for fish. This trend in prices is negatively affecting livelihoods in Tanzania, as high prices are forcing many Tanzanians to forgo eating fish even though there is a strong demand and willingness to include it in their diet (Wenaty et al. 2018).



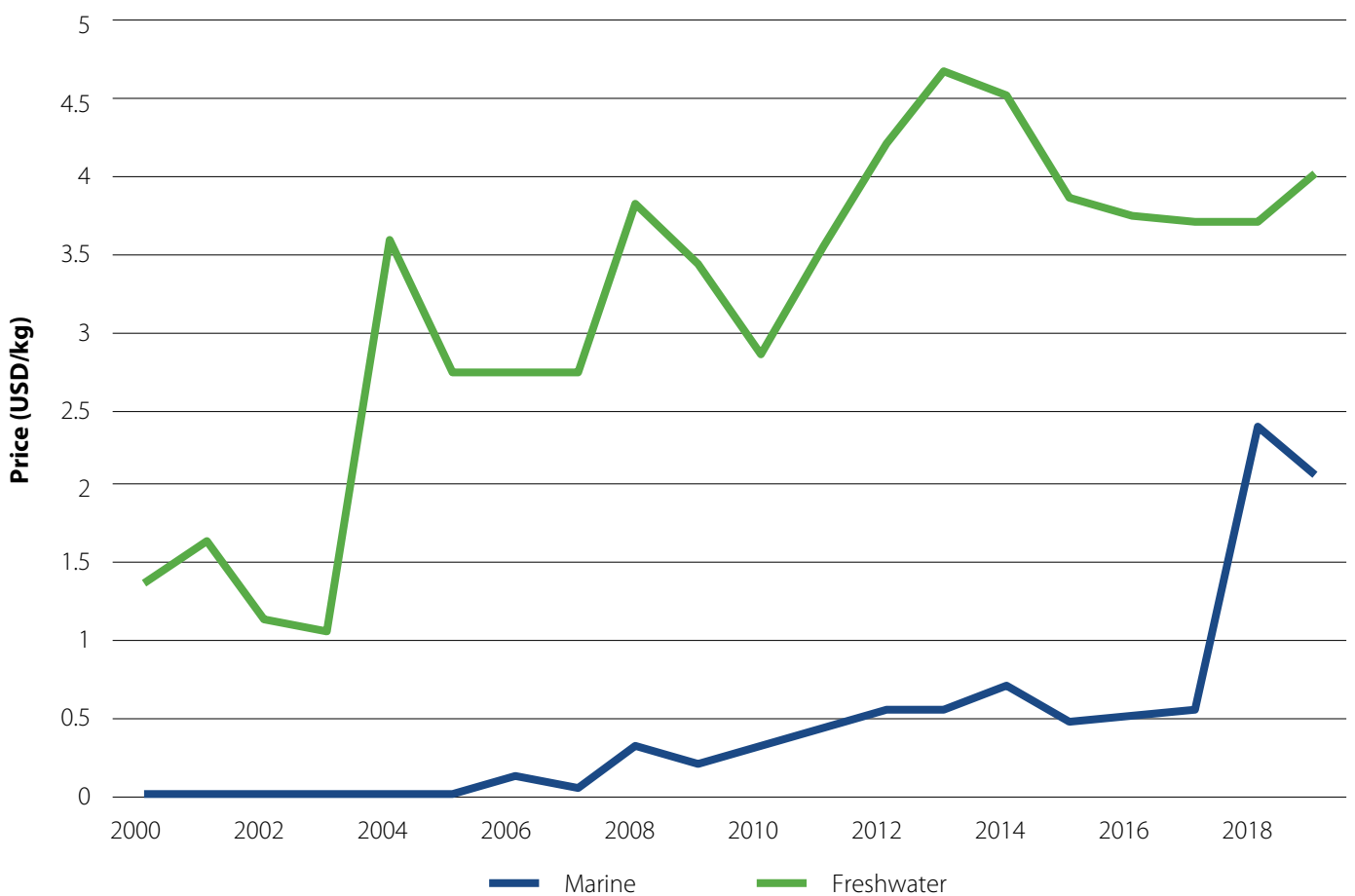
Source: MLF 2021.

Figure 6. Aggregate capture fishery prices.

3.2. Aquaculture

Prices of farmed fish are on a similar trend to capture fisheries in Tanzania, as shown in Figure 7. Price data for aquaculture is comparatively more readily available than for capture fisheries and can be accessed through FAO. Although aquaculture prices have increased since 2005, they have not seen the drastic increases that capture fishery prices have. These species are however quite different than the species described section 3.1 which may justify their relatively inflated price. Aggregate prices of aquaculture products seem relatively similar to that of the capture fisheries. However, disaggregated data

on the value of wild-caught species is currently unavailable to us. Further comparison of farmgate prices from aquaculture and capture fishery landing prices may provide some insight into any price discrepancies that exist. There are some differences when comparing the value of marine aquaculture and marine capture fish; however, this is most likely due to variability of the species being produced and quantity differences. Furthermore, reliability of fisheries specific data has been questioned in the developing world. Price discrepancies may be generated from varying reported yields and values. Yields in the African region have been reported to underestimate catch by as much as 30% (Jacquet et al. 2010).



Source: FAO 2021.

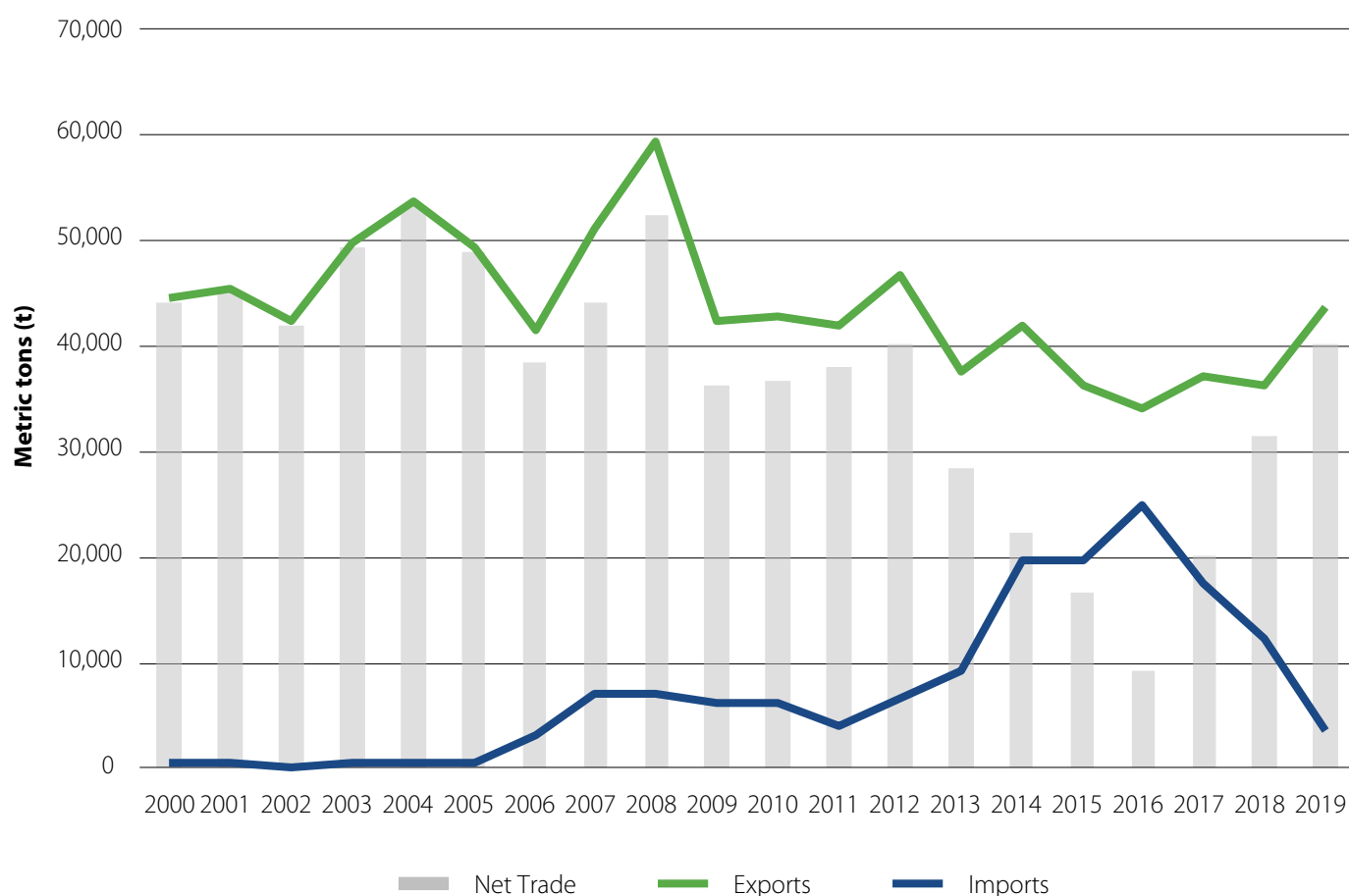
Figure 7. Aquaculture prices by species.

4. Fish trade

4.1. Quantity

Import and export data for Tanzania from FAO is displayed in Figure 8. It should be noted that the data provided by FAO regarding trade may not include some instances of unreported trade occurring across neighboring countries within Africa. While fish exports from Tanzania have remained relatively constant since the year 2000, possibly showing a slight negative trend, fish imports increased steadily from less than 400 t in 2000 to a peak of about 25,000 t in 2016 (Figure 8). This was most likely due to an increasing domestic supply shortage of fish until 2016, after which domestic production increased slightly and helped reduce the number of fish imported. In 2016, net exports were only 9000 t. However, Tanzania is still a net exporter of fish with a yearly

average of 40,000 t of exports between 2010 and 2017. This quantity is predicted to grow as the international market becomes more accessible for Tanzanian fishers. With the introduction of more modern capture and aquaculture practices and infrastructure, such as cold storage and processing facilities, meeting international fish processing and storage regulations will allow more fishers to enter the international market. Being a net exporter indicates two things: (1) a domestic supply surplus allowing large exports, or (2) high international prices relative to domestic prices are such that they incentivize selling abroad rather than domestically. Overall in Tanzania, we are seeing stable exports while imports increased until 2016 and then decreased dramatically, due to food supply increases.



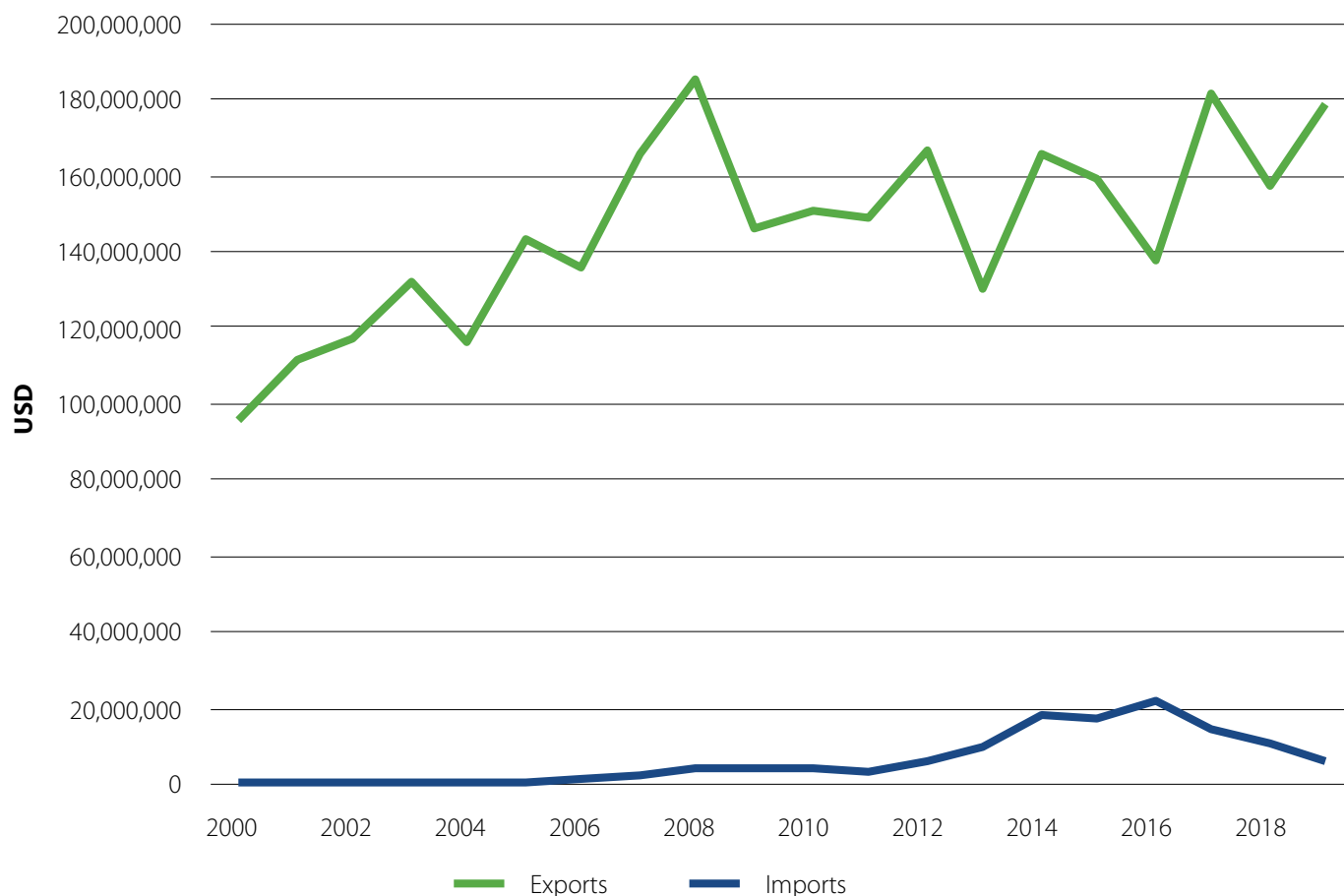
Source: FAO 2021b.

Figure 8. Fish exports and imports for Tanzania.

4.2. Trade value

Although the reported quantity of fish exported by Tanzania has not seen any sustained growth since 2000, the value of those exports has substantially increased. Overall, fishery exports provide an important source of income for fishers and boost GDP. As shown in Figure 9, Tanzania exported approximately 45,000 t of fish products in 2000 for almost USD 100 million. For comparison, in 2019 Tanzania exported 43,000 t of fish

with a reported value of USD 186 million, almost double the value of exports in 2000 even though a lesser quantity of fish was exported. The per t value of imports on the other hand have remained relatively stable, following a similar trend to the quantity of imports. Importing relatively low-cost fish into Tanzania reflects an effort to curb domestic demand for cheap fish, and not an increasing demand for high-priced exotic species of fish.



Source: FAO 2021b.

Figure 9. Value of Tanzania's fish exports and imports.

Discussion

After reviewing current trends in Tanzania's fisheries sector and related literature, it can be concluded that future research and analysis are needed to fully understand the drivers of demand and supply in the country, as well as evaluate the effects of likely future scenarios. Data gaps need to be closed, especially on domestic prices of capture fish species, and assurances that data is accurately collected are needed to conduct effective economic analysis. Furthermore, foresight analysis of the Tanzanian fisheries sector will help relevant stakeholders allocate sufficient funds to buy appropriate equipment and build needed infrastructure. The design of the foresight model will be based upon likely policy and environmental developments. Based on the findings of this review, we recommend the following scenarios be modelled and analyzed.

1. Rising fish demand fueled by demographic change, economic growth and dietary shift

Given the findings of our review, further increases in fish demand are almost certain to occur due to increases in the country's population and economic growth, and changes in consumer preferences. If current trends persist, population and economic growth alone could increase the demand for fish by more than 100% by 2030. Changes in consumer preferences, such as a switch to a more healthy and nutritious diet, will also increase demand; however, the degree to which this will increase demand is more challenging to estimate. Other factors, such as educational improvements and family composition, have also been predicted to affect fish demand.

2. Expansion of aquaculture and supply capacity of aquaculture inputs

Given the trends of global fish production, an increase in aquaculture production is one of the most logical and effective ways of increasing fish supply. Currently, the contribution of aquaculture in Tanzania to the overall supply of fish is low (4%), despite the potential. Furthermore, the global trend of stagnating capture fisheries is also seen in

Tanzania, indicating that expanding aquaculture could be one of the only options to substantially increase the supply of fish. Plans from the Tanzanian government to improve aquaculture knowledge, infrastructure and supply chains are in place. Therefore, there is hope for aquaculture expansion soon if sufficient investments and appropriate policies are in place.

3. Reduction in wild catch due to climate change and/or regulations

Although reported capture fishery yields have been relatively steady since the mid-1990s, Tanzania must face the possibility that regulatory restrictions adopting sustainable fishing practices may reduce yields. Tanzanian aquatic resources, like all fisheries throughout the world, face the uncertain effects of climate change, which may have negative effects. Furthermore, under-reported catches and data limitations invite the possibility of further ecological damage due to mismanagement and overexploitation of fish species. Current regulations may be relying on data that misrepresents total catch statistics, a common occurrence in developing countries, leading to the overprescription of fishing licenses or other management mistakes. For the above reasons, stringent regulation on capture fisheries that places a limit on allowable yields may be needed to ensure the future sustainable management of fisheries resources. The economic impacts of regulations on Tanzania will be needed to understand the future benefits or costs of such actions.

4. Effects of taxes or subsidies on domestic supply and trade

As discussed in section 6, Tanzania is a net exporter of fish, exporting an annual average of 40,000 t since 2010. The effect of being a net exporter of fish in a developing country struggling with food and nutrition security has competing opinions. The first being that fish exports are beneficial for domestic income and lead to development and increased living standards. A second train of thought argues that

high exports are because of high international prices relative to domestic prices, which reduces the quantity and quality of fish supplied within the country. As fish products are an important source of protein and micronutrients in developing countries, unavailability of fish because of exports can threaten food security.

Either or both viewpoints may be the reality in Tanzania. Taxes and/or subsidies can be used to influence international trade in order to limit export quantities to sustain domestic supply. Foresight analysis is needed to understand the effectiveness and future benefits of these economic instruments on domestic food security.



Photo credit: Immanuel E. Edward, Sallale/Tanzania Fisheries Research Institute

Conclusion

Throughout this review we have presented a summary of supply, demand, trade and prices pertaining to the Tanzanian fisheries sector. Serving as a preliminary review for the fish sector analysis in Tanzania, we have identified the factors influencing fish supply, the drivers behind fish consumption, and the historical trends in international trade and prices. On the supply side, Tanzania's capture fisheries and aquaculture face several challenges regarding to infrastructure, management, attitudes and environmental change. Capture fisheries require additional investment for marine fishing operations in the EEZ, increased cold chain facilities to mitigate post-harvest losses and further research into fishstock assessment and dynamics. Growth in aquaculture, a key proponent in international fish supply, is negatively influenced in Tanzania by the predominantly subsistence practices, lacking supply chain facilities and market access, and a generally negative attitude surrounding it. On the demand side, there is a substantial demand gap due to increasing demand for fish paired with slow growth on the supply side. Per capita fish consumption in Tanzania is well below the FAO recommended level of 20.5 kg per year as well as the global and most regional averages. Increasing demand for fish is fueled by the combination of a growing population, increasing income, and changing consumer preferences. Because of these factors, prices of fish have seen substantial increases since the year 2000 both domestically and internationally. Finally, Tanzania remains a net exporter of fish, though this trend may have both negative and positive domestic implications.

Given all of the factors influencing the Tanzanian fisheries sector, we recommend further, extensive fisheries sector analysis and modeling, including foresight analysis. The results of this review provide motivation for specific future scenarios to be investigated. Tentative scenarios for further analysis include (1) impacts of increasing fish demand, (2) impacts of accelerating aquaculture growth, (3) reduction in capture fishery yields, and (4) effects of trade regulations on food security. Further research along these themes will allow the Tanzanian government to understand the future economic benefits and costs of the most likely sequence of events for the fisheries sector. Understanding the scenarios listed in section 7 is imperative to help guide policy development within Tanzania. Effective policies will maximize the accrued benefits while minimizing negative effects, improving Tanzanian livelihoods and setting the country on a path toward a sustainable and profitable future.

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About WorldFish

WorldFish is a nonprofit research and innovation institution that creates, advances and translates scientific research on aquatic food systems into scalable solutions with transformational impact on human well-being and the environment. Our research data, evidence and insights shape better practices, policies and investment decisions for sustainable development in low- and middle-income countries.

We have a global presence across 20 countries in Asia, Africa and the Pacific with 460 staff of 30 nationalities deployed where the greatest sustainable development challenges can be addressed through holistic aquatic food systems solutions.

Our research and innovation work spans climate change, food security and nutrition, sustainable fisheries and aquaculture, the blue economy and ocean governance, One Health, genetics and AgriTech, and it integrates evidence and perspectives on gender, youth and social inclusion. Our approach empowers people for change over the long term: research excellence and engagement with national and international partners are at the heart of our efforts to set new agendas, build capacities and support better decision-making on the critical issues of our times.

WorldFish is part of One CGIAR, the world's largest agricultural innovation network.