



RSM2SNF

Research Supporting African MSMEs
To Provide Safe and Nutritious Food

Title: Challenges and Opportunities for MSMEs in the Fish Value Chain in Tanzania

Month and Year: August, 2024

Authors: Lydia Gaspare, Nassir Shabani Millao, Livinus Renatus Bitumbe and Nazael Amos Madalla

Authors

Lydia Gaspare., Lecturer (Fisheries Ecology). Department of Aquatic Sciences and Fisheries Technology. University of Dar es Salaam, Tanzania.

Nassir Shabani Millao., Tutorial and Research Assistant. Mwalimu Julius K. Nyerere University of Agriculture and Technology. P.O.Box 976, Mara, Tanzania.

Livinus Renatus Bitumbe., MSc. Fisheries and Aquaculture student, University of Dar es Salaam & Fisheries officer at Dar es Salaam City Council. P.O.Box 20950, Dar es Salaam, Tanzania.

Nazael Amos Madalla., Director of Aquaculture, Ministry of Livestock and Fisheries. Government city, Mtumba, Ulinzi street, P.O.Box 2847, DODOMA, Tanzania.

Acknowledgments

The authors thank all the fish value chain actors in Dar es Salaam, Pwani and Mwanza region, for their precious time, and for great information that they gave during interviews. We would like also to extend our thankfulness to RSM2SNF research team for their great comments that helped to construct the instrument that used for this study.

About Research Supporting African MSMEs to Provide Safe and Nutrition Food (RSM2SNF)

The Research Supporting African MSMEs to Provide Safe and Nutritious Food (RSM2SNF) is funded by the Bill and Melinda Gates Foundation. RSM2SNF dives deep into the wholesale, logistics, processing, and retail segments of the value chains of several products, such as fish, tomato, and green leafy vegetables. The goal is to understand the midstream of these food value chains with a focus on Micro, Small and Medium Enterprises (MSMEs), and to inform policies and interventions to support MSMEs in providing safe and nutritious foods at affordable prices. This five-year project (2022–2026) is led by Michigan State University (MSU) working with partners in Nigeria and Tanzania.

Contents

ACKNOWLEDGMENTS	III
ABOUT RESEARCH SUPPORTING AFRICAN MSMES TO PROVIDE SAFE AND NUTRITION FOOD (RSM2SNF)	III
CONTENTS	IV
ABSTRACT	1
LIST OF TABLES	2
LIST OF ACRONYMS.....	2
1. INTRODUCTION	3
2. DATA AND METHODS	3
2.1 Study sites	3
2.2 Data	4
3. RESULTS	5
3.1 Experiences of MSMEs Along the Fish Value Chain	5
3.1.1 Producers.....	<i>Error! Bookmark not defined.</i>
3.1.1 Fish Farmers in Dar es Salaam and Coast Regions.....	5
3.1.2 Fishers	6
3.2 Aquaculture input suppliers.....	6
3.3 Wholesalers (traders).....	7
3.4 Processors	8
3.5 Third-party logistics providers	9
3.5.1 Ice producers and traders.....	9
3.5.2 Transportation logistics.....	9
3.6 Retailers	9
4. CROSS-CUTTING THEMES: ENVIRONMENT, FOOD SAFETY, AND GENDER.....	10
4.1 Environment	10
4.2 Food Safety	10
4.3 Gender	11
4. CONCLUSIONS AND POLICY IMPLICATIONS.....	12
REFERENCES	13
TABLES AND FIGURES:.....	14

Abstract

This paper explored the challenges and opportunities for the MSMEs in the fish value chain in Tanzania. Moreover, the study identified ways to seize the vast existing opportunities in the fishery sector to increase its potential in contributing to the country's economy. This study took place in August 2023, in three regions of Tanzania, including Dar es Salaam, Pwani and Mwanza. A total of 100 key informants were reached out for the interviews, the informants were fishers, fish farmers, wholesalers, traders, transporters and input supplier. The findings revealed the significant increase in the number of fish farmers, as well as the shift towards sustainable aquaculture practices, which is largely contributed by increased market demand. The study also showed most of micro, small-scale actors face resource constraints and limited technology, that hinder their development in the fish value chain despite availability of interest free soft loan offered by the government. Additional findings showed gender gaps across the key actors of the fish value chain. Gender sensitive policies need to be in place to address the key challenges, likewise interventions that aimed at ensuring micro, and small-scale actors get access to key resources and technology is of great paramount.

List of Tables

TABLE 1 DISTRIBUTION OF THE INFORMANTS BY GENDER AND NODE.....	14
TABLE 2: NUMBER OF RESPONDENTS FROM DIFFERENT LEVELS OF MSMEs IN DAR ES SALAAM AND COAST REGIONS....	14
TABLE 3: NUMBER OF RESPONDENTS FROM DIFFERENT LEVELS OF MSMEs IN MWANZA.....	15

List of Acronyms

LVFO	Lake Victoria Fisheries Organization Secretariat
MSMEs	Micro Small and Medium Enterprises
MSU	Michigan State University
RSM2SNF	Research Supporting African MSMEs to Provide Safe and Nutritious Food
URT	United Republic of Tanzania

1. Introduction

Tanzania's fish value chain presents challenges and opportunities for Micro, Small, and Medium Enterprises (MSMEs). As a key sector in the country, the fish value chain significantly contributes to the economy by providing employment and enhancing food security. Despite its importance, MSMEs in this sector face numerous obstacles, yet they also have the potential to seize emerging opportunities. A comprehensive rapid reconnaissance survey explored these challenges and opportunities, shedding light on the factors influencing MSMEs in the fish value chain. These enterprises are involved in various stages, from fishing and aquaculture to processing, distribution, and marketing. However, they often struggle with issues such as inadequate infrastructure, limited access to capital, and regulatory constraints. At the same time, substantial growth opportunities are driven by rising domestic and international demand for fish products, advancements in sustainable fishing practices, and supportive initiatives from governmental and non-governmental organizations. This study aims to investigate the specific challenges MSMEs face and identify ways to leverage opportunities to enhance their contributions to the fishery sector and the broader economy.

The report begins with an introduction highlighting the importance of the fish value chain in Tanzania, focusing on Mwanza, Dar es Salaam and the Coast. It then delves into specific thematic areas, including gender dynamics, food safety, and environmental impacts, dedicating individual sections to each. The report uncovers the nuances and challenges within the fish value chain through thorough qualitative and quantitative data analysis. It concludes with key findings and proposes areas for further research and intervention to provide a holistic understanding of this crucial sector and facilitate informed decision-making.

The study specifically focused on:

- i. To understand the structure of the fish and fishery products value chain and the interrelation of actors at different nodes.
- ii. To understand the primary challenges and opportunities perceived by stakeholders in the fish subsector and to grasp the specific challenges actors face at each stage.
- iii. To understand how patterns vary according to the scale of the enterprise.
- iv. To develop insights to inform the design of a micro-level survey instrument for a stacked fish and fishery product chain survey.
- v. To develop partnerships with stakeholders.

2. Data and Methods

2.1 Study sites

The study took place in Mwanza, Dar es Salaam, and the Coast regions to evaluate the fish value chain. These regions are strategically located and have abundant aquatic resources vital to the country's fishing industry. Mwanza, situated on the shores of Lake Victoria, and Dar es Salaam and the Coast, along the Indian Ocean, are hubs for fishing and related activities. These locations were chosen to address fish production and distribution issues due to their significant population sizes and status as business cities. Dar es Salaam covers a total surface area of 1,400 km², with an estimated population of 5,147,070 (NBS 2022). In 2020, the city contributed 25,273.7 billion TZS to the national GDP. It is divided into five (5) Municipal Councils: Temeke, Kinondoni, Ilala, Ubungu, and Kigamboni. The Coast region is located on

the eastern part of Tanzania's Mainland along the Indian Ocean, covering a total surface area of 32,500 km² with a population of 1,265,504 inhabitants (NBS, 2022), and it contributed 2,984.8 billion TZS to the national GDP in 2020. The region comprises nine (9) districts: Bagamoyo, Chalinze, Kibaha, Kibaha Urban, Kibiti, Kisarawe, Mafia, Mkuranga, and Rufiji.

The Mwanza region is situated on the southern shores of Lake Victoria in Northwest Tanzania, spanning an area of 256.45 km². Of this, 184.90 km² (72%) is land, and 71.55 km² (28%) is water from Lake Victoria. According to NBS (2022), the region has a total population of 3,699,872 people, making it the second most populated region after Dar es Salaam (5,383,728). Mwanza region is abundant in water resources, which support various economic activities such as fishing and transportation. Approximately 2.5 per cent of the population in Mwanza is engaged in fishing, hunting, and livestock keeping, among other activities (URT, 2017). Fishing contributes 8.2% of cash income in Mwanza (URT, 2007). Apart from fishing, there are also fish farming activities in ponds (URT, 2007) and, more recently, cage fish culture. Various fish are caught from the lake, including haplochromines, tilapia, Nile perch, and sardines (dagaa). Sardines account for the highest catch percentage, with 55.4% of Lake Victoria's annual catch 2014 (LVFO, 2016).

2.2 Data

A total of 50 respondents (25 from each region) were obtained using snowball sampling. Data collection in the field utilized a mixed-methods approach. Qualitative data was gathered through semi-structured interviews with purposively selected participants, allowing in-depth exploration of their experiences and perspectives. Additionally, participant observations were conducted to provide contextual insights. For quantitative data, a survey instrument was designed and administered to capture the respondents' assets, their current and past input procurement and sales strategies, and their current and past production activities. This approach facilitated a comprehensive understanding of the research phenomenon by combining rich qualitative insights with descriptive quantitative data. Ethical considerations were carefully observed, with informed consent obtained from all participants before data collection.

Mwanza

We collected qualitative data from participants in the fish and fish products industry. We interviewed them using a set of questions about their assets, input purchasing behaviour, and sales and recorded their responses. The participants were selected through snowball sampling, where the research team choose the first participant, and each participant led the interviewer to another participant. We selected respondents from two regional fish markets, one landing site, and cage fish farms based on the nature of the responses we were seeking. The information we collected was used to identify themes that emerged from the content of the information provided. We used thematic analysis to describe the themes identified during the rapid reconnaissance survey.

3. Results

3.1 Experiences of MSMEs Along the Fish Value Chain

3.1.1 Fish Farmers in Dar es Salaam and Coast Regions

Traditional aquaculture methods, such as pond cultivation and reliance on local fish species for fingerlings, are prevalent. Micro-scale farmers often face resource constraints, smaller farm sizes, and limited access to modern technology. They rely on leftover food for fish feed and operate with minimal capital. In contrast, medium-scale farmers have access to advanced technologies like generators and large aquariums, and they may produce fish feeds using machines. Both scales sell fish directly to consumers or through delivery, with some leveraging social media platforms for marketing and exports. Over time, there has been a noticeable shift towards sustainable aquaculture practices driven by market demands for quality and environmental considerations. However, the pace of adoption varies significantly, with small-scale farmers facing persistent challenges such as limited access to training, capital, and markets, hindering their ability to embrace sustainable practices fully. The inability to access credit due to lack of collateral, ignorance, and reluctance to take out loans further exacerbate these challenges.

Key challenges for fish farmers include limited access to quality fish feed and fingerlings, import taxes for fingerlings, inadequate water quality management, fluctuating market demand and prices, and the prevalence of fish diseases. These issues are more acute for micro-scale farmers with less access to resources and technology. Over time, while there has been increased awareness of sustainable practices and the need for improved infrastructure, smaller-scale farmers still struggle to access the necessary support and financing to implement these changes effectively. This hampers their ability to compete favourably in the evolving fish value chain, with a significant need for training and supportive policies from the government to improve their operations sustainably.

In Mwanza, the story is not different from that of Dar es Salaam. Traditional aquaculture methods, reliance on local fish species, and direct consumer sales are prevalent. Micro-scale farmers often use homemade feeds and struggle with limited resources, while medium-scale farmers have better access to advanced technologies and stable market access, allowing for larger, more efficient operations. Over time, the number of fish farmers has increased due to government policies promoting aquaculture and educational campaigns, leading to a positive shift in consumer perceptions and adoption of sustainable practices. However, key challenges persist, such as limited access to quality feed and fingerlings, high costs of inputs and dependency on imports, limited ability for fish disease management, fluctuating market demand, and threats from vandalism and predators. While medium-scale farmers can somewhat mitigate these issues with better resources, smaller-scale farmers face acute difficulties due to limited capital and financing, hindering their ability to expand and adopt advanced technologies. Government through Tanzania Agricultural Bank is offering interest free soft loans in terms of cages, fingerlings and feeds existing and potential cage fish farmers. Despite these advancements, significant barriers remain, particularly for micro-scale operators, who continue to face severe challenges in accessing resources and support.

3.1.2 Fishers

Fishers in Dar es Salaam and Coast regions operate in two sessions, day and night, to ensure a constant supply of fish. The value of the catch is often dictated by boat ownership, with non-owners receiving a smaller share after costs. Fishing assets range from traditional wooden vessels to fiber motorized boats and advanced gear, with medium-scale fishers having better access to these resources. Sales channels include direct sales at landing sites, auctions, local markets, and through collectors, with some fishers adding value through processing activities. Over time, improvements such as using GPS technology have been adopted, particularly by medium-scale fishers, although small-scale fishers often rely on borrowed equipment. Key challenges faced by fishers include declining fish stocks due to overfishing and environmental degradation, limited access to modern fishing resources and gear, fluctuating market prices, and inadequate infrastructure for fish handling and storage. These challenges are more acute for nano and micro-scale fishers who lack the capital to invest in modern technology and face severe resource constraints. Despite an increased awareness of sustainability issues and the gradual adoption of modern techniques, the pace of change has been slow, with smaller-scale fishers requiring targeted support and incentives to improve their resilience and competitiveness in the evolving fish value chain. It is in that context that the Government through Tanzania Agricultural Bank is offering interest free soft loans of modern fishing boats to fishers.

In Mwanza, fishers have noticed a significant decrease in the wild catches of Nile perch and tilapia. This has led to changes such as reducing the number of vessels to cope with the high production costs and decreasing catch volumes. Despite the decline, fishers are still using their remaining vessels for fishing. Over time, many have switched from traditional paddled boats to motorized vessels with outboard engines, allowing them to explore deeper waters and catch larger fish. Initially using basic gear like hooks and lines, fishers gradually upgraded to fishing nets as they saved money, improving catch efficiency. Sales practices have also changed, shifting from selling fish at landing sites to wholesaling to fish collectors, reflecting improved capabilities and market demands. However, persistent challenges include increasing production costs, aggravated by theft of fishing nets and illegal fishing practices such as beach seining, which threaten fish populations and industry sustainability. These challenges vary in intensity across different scales of operation, with smaller-scale fishers being particularly vulnerable due to limited resources and reliance on natural fish populations. Despite these obstacles, fishers continue to adapt, highlighting the need for targeted interventions and sustainable practices to protect the long-term viability of the fishing industry in Mwanza.

3.2 Aquaculture input suppliers

In Dar es Salaam and Coast regions, most suppliers remain at their established locations, focusing on providing essential inputs like fish feed, equipment, and medications, often distributed by larger companies, or imported. Small-scale suppliers offer deliveries, while nano and small-scale ones rely on customers coming to the shop. Additionally, many suppliers diversify their offerings to include inputs for other domestic animals sold on a cash basis. Assets like furniture and refrigeration for medication storage are observed among nano, micro, and small-scale suppliers, with larger-scale ones being more advanced and equipped with vehicles for deliveries and generators. Over time, there has been a shift towards more structured supply chains and increased awareness of quality control and sustainability, driven by market demands

and regulations. However, smaller-scale suppliers face challenges such as inconsistent demand, limited access to financing, and competition from informal sources, necessitating external support to adapt. Other challenges include inconsistent demand, limited financing, difficulty reaching remote farms, and competition from informal sources. These challenges affect businesses of different sizes, from micro to medium-scale input suppliers. Smaller suppliers face more significant constraints due to limited capital and distribution capabilities. Some have purchased vehicles to facilitate delivery, but access to credit remains challenging, mainly due to a lack of collateral. Competition is also a significant challenge, driven by population growth and increased economic activities. Smaller-scale suppliers may require external support to adapt to evolving industry standards and meet customer expectations despite a gradual shift towards structured supply chains and increased quality control.

3.3 Wholesalers (traders)

Fish traders and wholesalers play a critical role in the seafood supply chain by sourcing fish from various places and distributing them to markets and retailers in Dar es Salaam and Coast regions. In these areas, most of these businesses are owned by men, but women are employed in departments like finance and marketing. They commonly rely on informal networks for sourcing and distribution, transportation vehicles, storage facilities, and processing equipment. The scale and location of the businesses determine the level of infrastructure investment, with medium-scale wholesalers having advanced infrastructure like cold rooms and generators, while small-scale traders rely on simpler storage methods. There's a trend towards adopting modern practices, such as cold storage facilities, to meet quality standards and enhance product preservation, driven by market demands.

Fish traders and wholesalers face challenges such as seasonality, price volatility, transportation difficulties, and competition, which affect businesses of different scales. Smaller traders rely on personal relationships and local market knowledge, while medium-scale wholesalers have a greater capacity for bulk handling and broader market reach. Efforts to modernize involve investments in cold storage facilities, the use of social media for advertising and digital payments, and engagement with formal market channels. However, smaller-scale wholesalers may face barriers to modernization, limiting their competitiveness. Key challenges also include erratic fish supply, transportation costs, price fluctuations, and competition. Larger wholesalers have more resources to invest in infrastructure, giving them a competitive advantage. There's a slow shift towards more structured supply chains and increased awareness of quality and hygiene standards over time, but smaller-scale wholesalers may still face barriers to adopting these improvements, particularly in accessing financing and technology.

In Mwanza, the common patterns among fish traders and wholesalers include the establishment of relationships with fishers for a regular supply of fish, often built on trust over time. Some wholesalers own fishing vessels and provide material loans to fishers, obligating them to sell their catch to the lender until the loan is repaid. Most wholesalers operate on a small scale, with few permanent employees, while some medium-scale wholesalers own boats and have both permanent and part-time workers. Over time, there has been a trend of wholesalers aiming to improve transportation and storage facilities, with challenges arising from reliance on public transport, limited cold storage capacity, and high production costs during peak seasons.

Key challenges fish traders and wholesalers face include transportation and storage difficulties, especially for those relying on public transport and lacking sufficient cold storage facilities. The decline in wild fish catch poses a significant challenge, leading to business interruptions during scarcity. However, the rise of cage-cultured fish, particularly tilapia, has helped mitigate this decline by increasing market availability. Wholesalers also encounter challenges from dishonest customers who delay payments or fail to settle debts, impacting their cash flow and profitability. These challenges persist across different scales of operation, although larger wholesalers may have more resources to invest in mitigating them.

3.4 Processors

Common patterns among fish processors include traditional processing methods such as frying, drying, and salting, relying on locally available fish species. While both males and females are involved in fish processing, most processors are female (92%). Processors may offer frying services to customers who bring their fish, or they may fry fish for sale. Assets commonly owned by processors across different scales include frying pans, buckets, tables, chairs, and kitchen utensils. Some processors have adopted improved processing techniques over time, driven by increasing awareness of quality and hygiene standards, including using gas stoves, sunflower oil for frying, and modern packaging methods.

Key challenges faced by fish processors include limited access to modern processing equipment and facilities, variations in fish supply, and inconsistent product quality due to reliance on traditional processing methods. Competition from other processors and limited resources compound the challenges, particularly for nano and micro-scale processors. Transportation issues, including high transport costs and restrictions on carrying raw fish, pose challenges. Access to financing is a significant obstacle for many processors, particularly those lacking collateral to secure loans, hindering their ability to invest in improved facilities and techniques. These challenges persist across different scales of operation, with medium-scale processors generally having more resources to address them than smaller-scale processors.

In Mwanza, fish frying is common among processors who offer a service of frying fish brought to them by customers. However, they often face fuel availability and cost challenges, mainly relying on firewood, which, if not well-dried, can burn quickly, increasing cooking oil consumption. Additionally, processors sun-drying small fish encounter weather-related challenges, especially during the rainy season when drying becomes impractical due to wet conditions, impacting product availability. Over time, the number of small fish processors has increased, intensifying competition for fish stocks and decreasing availability compared to previous years. Despite these challenges, processors typically operate small-scale enterprises, owning processing plants, storage facilities, and essential equipment. However, micro and nano-scale processors may struggle with accessing modern equipment and facilities, facing transportation issues and limited access to financing. Conversely, medium-scale processors may have more resources available for investment, giving them a competitive edge in the market.

3.5 Third-party logistics providers

3.5.1 Ice producers and traders

In Mwanza, third-party logistics providers, especially ice suppliers, play a vital role in preserving the freshness of fish. Initially, large fish factories dominated ice production and supplied their trucks. As time passed, small-scale sellers emerged, purchasing leftover ice. The introduction of ice plants enabled these small-scale retailers to sell ice to fish traders. Smaller retailers, lacking cold storage, use makeshift methods to prevent melting, while larger wholesalers and ice plants utilize cold rooms and large freezers. Challenges include environmental factors such as wind and frequent power blackouts affecting ice preservation. Despite increased competition and financial constraints for smaller logistics providers, larger producers have modernized facilities, highlighting resource disparities but improving overall supply chain efficiency.

3.5.2 Transportation logistics

In Mwanza, third-party logistics providers such as transporters and storage facilities play a crucial role in the fish supply chain. Over time, common patterns include using varied transportation methods based on the scale of operations. Nano enterprises rely on motorcycles and public transport, while small enterprises, particularly wholesalers, hire vehicles. Fresh fish transporters may own vehicles or use those provided by fish factories, with factory vehicles limiting their market options but ensuring a steady supply. The growing use of hired and private transport highlights the importance of efficient logistics in the fish trade. Key challenges for these providers include environmental factors, high fuel costs, and frequent inspections. Small-scale transporters face limitations due to the lack of cold storage facilities, leading to reliance on makeshift methods to preserve fish. Additionally, fixed pricing and limited buyer options constrain those using factory-provided vehicles. Conversely, private vehicle owners must bear the high costs of ice and fuel, significantly impacting their profitability. Despite these challenges, advancements in logistics have improved overall supply chain efficiency, although resource disparities between small and larger providers persist.

3.6 Retailers

In Dar es Salaam and Coast, fish retailers, mostly young males, connect consumers with products primarily from Lake Victoria. They operate in local markets and informal stalls, using assets like fridges, freezers, weighing machines, and pangas. Small and medium retailers often own generators and vehicles, while smaller retailers use motorcycles. Over time, there's been a shift towards better hygiene and packaging due to consumer preferences and government regulations, although this change has been slower among nano and micro-scale retailers. Fish retailers face limited fresh fish availability due to high transport costs, unreliable infrastructure, and fluctuating fuel prices. Nano and micro retailers, lacking cold storage, rely on ice and frequently restock to prevent spoilage. They also face intense competition and price volatility. Smaller retailers struggle more with investing in necessary infrastructure, impacting their ability to maintain product quality and compete with larger-scale operators.

In Mwanza, Fish retailers buy bulk stock from wholesalers, fishers, or fish farmers and sell smaller quantities to customers. Initially, retailers were few and mobile, selling daily without ice. With easier access to ice, they now purchase larger stocks that stay fresh for up to four days. They repurpose broken freezers as cool boxes with ice to maintain fish freshness. Retailers now

sell at market places instead of moving around. Dried small fish retailers transport fish from landing sites to their homes using bicycles, hired motorcycles, or by carrying buckets on their heads. Challenges include increased competition among retailers, a decline in wild catch, and reduced stock availability from fishers and wholesalers. While the rise of cultured fish has mitigated some of these issues, it doesn't fully address shortages for non-cultured species like Nile perch.

4. Cross-Cutting Themes: Environment, Food Safety, and Gender

4.1 Environment

Common environmental patterns in the fish value chain in Dar es Salaam and Pwani include overfishing, habitat degradation, and waste disposal issues. MSMEs in this sector can both negatively and positively affect the environment. In the capture fisheries industry, overfishing and destructive practices, such as illegal fishing gears and methods, can harm aquatic ecosystems, while inadequate waste management can lead to pollution. Although the environmental impacts are more controlled in aquaculture, challenges like water quality management and sourcing of fish feed still pose problems. MSMEs are also affected by environmental changes. Climate-related shifts in fish populations or water quality can impact their catch or production levels. Some MSMEs have adopted innovations to address these challenges, such as using GPS to locate fishing grounds, reducing illegal fishing practices, and responding to government interventions to prevent pollution from nearby agricultural land. The differences between aquaculture and the capture fisheries industry are notable. The capture fisheries industry faces more direct overfishing and habitat destruction issues, while aquaculture deals more with managing water quality and sustainable feed sourcing. Sustainability practices are crucial in both sectors to mitigate negative environmental effects and ensure long-term viability.

Retailers at the fish markets in Mwanza had basins below their damaged freezers to collect melted water from the frozen fish. This helped reduce water waste. Most boats fishers use are equipped with outboard engines that run on petrol, which is efficient and emits fewer greenhouse gases. However, fish processors still rely on firewood, which may contribute to deforestation as the wood is obtained from trees. The smoke from the cooking stoves also adds to greenhouse gas emissions, as the firewood is not efficiently combusted within the stoves. In aquaculture, poor siting of fish cages, fish biomass beyond carrying capacity and excessive feeding increases nutrient load in the water causing pollution of the lake.

4.2 Food Safety

In Dar es Salaam and Coast, food safety issues in the fish value chain include inadequate handling practices, poor storage conditions, and limited hygiene standards awareness. Micro, small, and medium enterprises (MSMEs) are critical in protecting or endangering food safety. Some MSMEs implement good hygiene practices, like handwashing facilities and regular equipment cleaning, which help maintain food safety standards and avoid fines. However, others operate in unsanitary conditions, risking contamination due to inadequate resources and awareness. For instance, fish processors may use ocean water for washing, posing health risks. In the capture fisheries industry, improper handling and inadequate refrigeration during transportation can lead to contamination. Conversely, aquaculture offers more controlled

conditions but both sectors struggle with consistent adherence to food safety standards, necessitating ongoing improvement and education.

In Mwanza, the market's fish handling practices were good. The fish were kept in clean freezers and handled in buckets and basins. Leaking water from the melted ice in damaged freezers was collected in basins, keeping the market areas clean and dry. Fish processing tables were regularly cleaned during and after use. Most markets are under the authority of specific area authorities, who ensure that the markets are cleaned daily. Traders of sundried fish dry their fish on canvas sheets during sunny seasons, and during the rainy season, small fish are dried on rocks and left there until dry. Food safety considerations here are minimal, as the drying rocks are left unattended and are far from the processors' homesteads. In aquaculture, no fish handling practices were observed during the survey, as fish were not harvested. However, the fish from aquaculture observed in the market were in good condition, indicating that they were well-handled hygienically before being sold.

4.3 Gender

In the fish value chain in Dar es Salaam and Coast, men mainly hold roles such as fishers, boat operators, and transporters, with better access to resources and decision-making power, especially in the fish capture industry. On the other hand, women are more involved in post-harvest activities like fish processing and retailing. While men usually oversee pond operations and fish breeding in aquaculture, they may still face challenges in accessing capital and technology, similar to women in small-scale enterprises. Both genders face challenges such as lack of collateral for loans and limited capital, but women often experience them more severely, which hinders business expansion and technology adoption. These gender disparities emphasize the need for gender-sensitive interventions to empower women and promote equal opportunities, ultimately enhancing the sustainability of the fish value chain.

In Mwanza, Common patterns and themes associated with gender in the fish value chain reveal distinct experiences, responsibilities, choices, and outcomes for women and men. Men predominantly occupy roles in fish production, wholesale, and transport logistics, such as fishers, cage fish farmers, wholesalers, and transporters. Conversely, women are more prevalent in retail, particularly in selling fish at markets, with some involvement in net mending at landing sites. However, women often face challenges accessing resources and may choose retail sales due to lower capital requirements and familial support needs. Despite these differences, both genders encounter similar obstacles in accessing fish and resources. Regarding employment, most retailers, wholesalers, and processors hire male assistants, citing perceived advantages in handling strenuous work and higher retention rates than female assistants. This gendered division of labour and hiring practices persist across the fish value chain, with women occupying certain roles while facing barriers to others. These dynamics may differ slightly between aquaculture and the capture fisheries industry, with men predominantly involved in production activities in both sectors but more prevalent in cage fish farming in aquaculture.

4.4 Conclusions and policy implications

The fish value chain in Tanzania, particularly in regions like Mwanza, Dar es Salaam, and Coast, reveals a complex mix of challenges and opportunities for micro, small, and medium-scale enterprises (MSMEs). While strategic locations and rich aquatic resources offer significant potential, MSMEs face hurdles such as inadequate infrastructure, limited access to capital, and regulatory constraints. Understanding the structure of the value chain and the roles of various actors, including gender dynamics, food safety, and environmental impacts, is crucial for informed decision-making and targeted interventions. Key findings suggest gender disparities across different sectors of the value chain, with men dominating roles in fish production, wholesale, and transport logistics, while women are more prevalent in retail. Women often face challenges accessing resources and may opt for retail sales due to lower capital requirements. Despite similarities in obstacles faced by both genders, hiring practices often favour men, contributing to a gendered division of labour.

Food safety concerns persist, particularly regarding inadequate handling practices and storage conditions. While some MSMEs implement good hygiene practices, others operate in unsanitary conditions, risking contamination. Environmental issues such as overfishing and habitat degradation pose significant challenges, necessitating sustainable practices across the value chain. In aquaculture, traditional methods prevail, with micro-scale farmers facing resource constraints and limited access to modern technology. Fishers encounter challenges like declining fish stocks and inadequate infrastructure, requiring targeted support for resilience and competitiveness. Logistics providers play a crucial role in preserving fish freshness, but challenges like environmental factors and high fuel costs impact their efficiency. Retailers face issues with fresh fish availability and infrastructure investment, particularly for smaller enterprises. Addressing these challenges will require gender-sensitive interventions, improved food safety practices, and sustainable environmental management. Furthermore, targeted support for MSMEs, particularly in accessing resources and technology, is essential for their growth and competitiveness in the evolving fish value chain. A more comprehensive, micro-level survey can further explore these themes and identify specific interventions to enhance the sector's sustainability and resilience.

References

Ministry of Finance and Planning, National Bureau of Statistics(NBS) and President's Office – Finance and Planning, Office of the Chief Government Statistician, Zanzibar. The 2022 Population and Housing Census: Initial Results. Dodoma, Tanzania. October 2022

Lake Victoria Fisheries Organization Secretariat (LVFO), The Convention for the Establishment of the Lake Victoria Fisheries Organization(2016). Mwanza, Tanzania.

URT, (2007). National Fishery Sector Overview, Food and Agriculture Organization of The United Nations

URT, (2017) Mwanza City Council Strategic Plan 2016/2017-2020/2021

Tables and Figures:

Table 1 Distribution of the informants by gender and node

Value chain Nodes	Male	Femal e	Total	(%)
Input Supplier	4	1	5	10
Fish Farmers	2	1	3	6
Wholesalers	3	0	3	6
Processors	1	11	12	24
Retailers	14	1	15	30
Transporters	1	0	1	2
Fisher	11	0	11	22
Total	36	14	50	
Percentage	72	28		100

Table 2: Number of respondents from different levels of MSMEs in Dar es Salaam and Coast Regions

Regions		Nano	Micro	Small	Medium	Total
Dar es salaam	Input Suppliers		2	2		4
	Fish Farmers		1		1	2
	Wholesalers			2	1	3
	Fishers		3	1	2	6
	Processors	1	2	1	1	5
	Retailers		1	1	2	4
	Transporter				1	1
Coast	Input Suppliers	1				1
	Fish Farmers		1			1
	Wholesalers					
	Fisher	1		3	1	5
	Processors	5	2			7
	Retailers	3	7	1		11
	One-Stop Shops					

Table 3: Number of respondents from different levels of MSMEs in Mwanza

Value chain Nodes	Nano	Micro	Small	Medium	Total
Input Suppliers	0	2	2	0	4
Fish Farmers	0	1	0	2	3
Wholesalers	0	5	2	2	9
Third-Party Logistics and transporters	0	3	2	3	8
Processors	2	1	2	0	5
Retailers	1	2	4	1	8
One-Stop Shops	0	0	0	0	0

