

DFM Report

Mapping the African Great Lakes Dagua Value Chain: Women-Led Transcontinental Trade Networks

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1.0 Introduction

The African Great Lakes (AGL), Albert, Edward, Kivu, Malawi, Tanganyika, Turkana, and Victoria, are recognized as some of the most vital freshwater ecosystems globally. These lakes host over 1,419 freshwater fish species (FAO, Duke University, & WorldFish, 2023), accounting for half of all freshwater fish species in Africa and approximately 10% of all freshwater species globally (Chimatiro et al., 2021). They support the livelihoods of more than 287 million people across 10 countries, with fisheries employing over 5 million individuals, including 3 million in small-scale fisheries (SCF) within inland waters (FAO, Duke University, & WorldFish, 2023). Women play a central role in small-scale fisheries, particularly in post-harvest processing and trade, although their contributions are frequently undercounted in official statistics (Harper et al., 2013; Weeratunge et al., 2010; Kleiber et al., 2014; Pedroza-Gutiérrez & Hapke, 2022). Small fish species, particularly in their dried form, dominate market supplies, serving as an essential food source and economic driver for the region.

Dried fish is a primary form in which fish are traded and consumed globally. These products are typically cured, salted, preserved in brine, and/or smoked. According to Pradhan et al. (2022), dried fish accounts for approximately 12% of global fish production and consumption, making it a significant sub-sector of small-scale fisheries (SSF), which supports over 90% of the 120 million people involved in fisheries worldwide, rely heavily on dried fish as a core component of value chains, particularly, across Africa and Asia. In the African Great Lakes region, most fish landings are processed by drying, highlighting its critical role in sustaining livelihoods and ensuring food security in the region.

Despite the importance of these dried fish exports and imports, their complex socioeconomic value and environmental impacts remain understudied. Little is known about the dried fish export market out of Africa to the global North or about how the demand for imported dried fish interacts with domestic fish supplies. Although these trade links are mainly built and undertaken by women, little is known about how these women-led business networks operate, and whether there is a continuation of certain ways these

women engage in retail relationships that preserve African practices or whether these practices have been transformed in this transnational context.

This study investigated these women-led dried fish business export and import networks to Canada that extend beyond the transnational African networks of dagaa trade that exist in the African Great Lakes (AGL) region. The research examines the ecological impacts, the consumption patterns, and sustainability of both ends of the dried fish value chain. Taking a political ecology approach to value chain analysis, this project maps and analyzes these women-led export and import fish business networks. We examine the roles and connections of actors and flows of money and market information in the Great Lakes region of Africa and to Canada. We link empirical data from the two contexts with literature on global fish sustainability to examine the critical importance of AGL fisheries, focusing on their social, economic, and ecological dimensions. The research aims to deepen the understanding of the value chain of dried small fish species to promote sustainable development and gender equity in the region.

For readers interested in a visual representation of the fisheries, actors, and market environments discussed in this report, a companion photo essay produced through the *Dried Fish Matters* project provides additional visual documentation of the African Great Lakes dagaa value chain and offers complementary insights into the people, places, and practices examined in this study. Readers are encouraged to consult the companion photo essay for additional visual context and a richer appreciation of the fisheries systems discussed throughout this report (Namwira & Johnson, 2024).

Figure 1: Map of the AGL and the seven major lake basins, as well as coastlines.



Map of the AGLR and the seven major lake basins, as well as coastlines.

Source: Kolding et al., 2019

In response to the international community's emphasis on environmentally sustainable development, the study sought to contribute to reducing the environmental impacts of dried fish transnational trade activities. It aimed to provide insights that would inform further research on sustainable development approaches and interventions that address human well-being in relation to fisheries-based livelihoods. The findings from this study are intended to support policy recommendations, aligning development efforts with conservation goals. Theoretically, the study is situated within the framework of political ecology, employing wide-ranging social and natural science perspectives to explain the relative neglect of small-scale fisheries in development interventions, despite their significance in supporting millions of livelihoods.

This research is qualitative and interdisciplinary, with data mainly drawn from interviews, observation, and casual conversation, with the core groups of women, consumers and others involved in this transnational trade in dried fish value chain, both in Canada and in the Great Lakes region. Data collection was undertaken at several levels and locations using a cross-sectional approach combined with ethnographic elements. Also, secondary data from a wide range of secondary sources were used to contextualize and analyze the primary data collected for this study. The study seeks to contribute to debates on sustainable development by highlighting the social and economic dimensions of the transnational dried fish trade.

The findings of this study underline the central role of women in the dried small fish value chain, particularly in fish processing, trade, and informal retailing. These fish serve as an essential source of livelihood, food security, and cultural continuity for communities engaged across the value chain. However, the trade is predominantly informal and constrained by significant challenges, including inadequate infrastructure, erratic supply, price volatility, limited access to formal financial services, and inconsistent regulatory frameworks. Environmental concerns, such as changes in the wider lakes' ecology, declining fish stocks, ecosystem degradation, and insufficient conservation efforts, further strain the dried fish trade. Nevertheless, growing consumer demand, particularly among African diaspora communities in Canada, continues to sustain the trade, highlighting its ongoing economic significance and the pressing need for targeted policy interventions and institutional strengthening.

2.0 Background and context: Dagaa in African Great Lakes

2.1 Africa Great Lakes fisheries

More broadly, fish and fisheries hold substantial social and economic value globally. Across Africa, small-scale fisheries, especially in the African Great Lakes (AGL), have expanded considerably over the past three decades, becoming increasingly important for both food security and trade (Kolding et al., 2019). The African Great Lakes (AGL) are

among the world's most significant freshwater ecosystems, renowned for their exceptional aquatic biodiversity (Darwall & Vié, 2005).

This region, as noted in the introduction, is home to at least 1,419 freshwater fish species, over 10% of the world's freshwater species, and serves as a foundation for small-scale fisheries and trade networks (FAO, Duke University, & WorldFish, 2023). This rich biodiversity underpins extensive small-scale fisheries and trade networks across the region. Within these networks, small fish species, particularly in their dried form, dominate supply chains, serving as an affordable protein source for millions and forming the backbone of both local and transregional trade (Chimatiro et al., 2021).

Fisheries in the African Great Lakes (AGL) region are vital to the livelihoods of millions, providing both economic opportunities and essential nutrition to local communities (Allison et al., 2009; Béné et al., 2016; Basurto et al., 2025). Inland small-scale fisheries (SSF) alone employ around three million people, contributing to a broader fisheries workforce of over five million. Notably, women comprise 44% of those involved in SSF, with 88% of them engaged in fish processing and trading (FAO, Duke University, & WorldFish, 2023). This underscores the central role women play in sustaining and advancing the AGL fisheries value chain, particularly through the processing of small fish species into dried products for market distribution.

Therefore, the African Great Lakes exemplify the interconnectedness of ecological richness and human reliance. As a vital freshwater ecosystem, the lakes contribute to global biodiversity while underpinning the livelihoods and food security of millions. The dominance of small fish species in markets and the central role of women in SSF highlight the social and economic dynamics at play. Sustaining these resources is crucial, not only for the region but also for global freshwater conservation efforts.

Photo 1: Views of Lake Tanganyika fisheries in Kigoma, Tanzania



Source: Photographs by Deo Namwira during fieldwork, Kigoma, Tanzania, 2023.

2.2 Africa Great Lakes' small-scale fisheries and dried fish

Fish, in various preserved forms, are traded and consumed worldwide, playing an essential role in meeting global nutritional needs and sustaining livelihoods. Products such as cured, salted, brined, and smoked fish constitute approximately 12% of global fish production and consumption, underscoring their significance in both local and international food systems (FAO, 2022; Pradhan et al., 2022). . This processed fish sub-sector is particularly vital in small-scale fisheries (SSF), which support more than 90% of the 120 million people involved in fisheries globally (FAO, 2022).

Small-scale fisheries are the backbone of fish production and value chains across Africa and Asia. They represent an integral sub-sector within global fisheries, not only because of their scale but also due to their pivotal role in supporting livelihoods, food security, and regional economies (Béné et al., 2016; Basurto et al., 2025). In the African Great Lakes (AGL) region, SSF are critical to both local consumption and international trade. Fish landed in this region are predominantly processed using traditional methods such as drying, which preserves the product and extends its shelf life, enabling transport to distant markets.

Processing methods such as drying, salting, and brining play a core role in the fisheries value chain, particularly in regions where infrastructure for refrigeration and cold storage is limited. These methods not only prevent spoilage but also add value to the fish, making them more versatile for trade and consumption. This is especially true for small pelagic fish species harvested in the AGL, which are key components of regional and global supply chains. By transforming fresh fish into durable, preserved forms, these practices bridge the gap between local production and global consumption, ensuring broader accessibility to fish protein (Belton et al., 2022; Béné et al., 2016).

The trade and consumption of processed fish products highlight the interconnected nature of global fisheries and the essential role of small-scale fisheries. Through traditional preservation methods, regions like the African Great Lakes contribute significantly to global fish markets, supporting millions of livelihoods while ensuring food security. As a cornerstone of fisheries value chains across Africa and Asia, the sustainable management and development of this sub-sector remain crucial for future resilience and economic growth.

2.3 Small pelagic fish in African Great Lakes fisheries

Small fish species constitute approximately 75% of total catches from nearly all African Great Lakes, underscoring their central role in regional fisheries (FAO, 2022). These small fish, including dagaa and other small pelagic species, are critical for meeting the nutritional and economic needs of the growing populations in the region. Their affordability, ease of preparation, and accessibility make them highly popular among rural and urban communities, ensuring a steady demand that sustains both livelihoods and food security (Basurto et al., 2025; Kwarazuka & Béné, 2010).

Small fish provide a cost-effective source of high-quality protein and essential micronutrients, making them particularly important for vulnerable populations. Their smaller size not only makes them easier to process and cook but also ensures they are more affordable than larger fish species, broadening their accessibility. As populations in the African Great Lakes region continue to grow, the demand for small fish has driven an

increase in prices, with some species witnessing a price rise of 2-20% in 2021 (LVFO, 2021). This price shift reflects the escalating significance of small fish as a staple food source and an economic commodity.

Despite their critical role in food security and livelihoods, small fish species often receive less policy and investment attention compared to larger, more commercially valuable species. Larger fish are prioritized in fisheries governance due to their higher monetary value, leading to an imbalance in resource allocation and support. This disparity overlooks the broader societal benefits of small fish, including their role in combating malnutrition and providing sustainable incomes for small-scale fishers and traders, particularly women, who dominate the processing and marketing segments of the value chain (Harper et al., 2013; FAO, 2022).

Thus, small fish species are indispensable to the fisheries sector in the African Great Lakes, playing a vital role in sustaining the region's growing populations and providing economic opportunities. Addressing the existing policy and investment gaps requires a shift in focus to recognize and enhance the value of small fish, ensuring their sustainability and equitable integration into regional and global markets. Strategic investments in infrastructure, market access, and resource management can help amplify their contributions to food security and livelihoods.

2.4 Dagaa fisheries in Lakes Tanganyika and Victoria

Dagaa consists of small pelagic Clupeidae species whose Lake Tanganyika and Lake Victoria are among the leading producing inland lakes, serving as their major hubs for their fishing, processing, and trading. These species are locally named differently across regions, reflecting the linguistic and cultural diversity of the areas. For example, *Limnothrissa miodon* is known as dagaa in Tanzania and Kapenta in Zambia; in the Democratic Republic of Congo, *Stolothrissa tanganyicae* is called Ndakala; in Uganda, *Rastrineobola argentea* is referred to as Mukene; and in Kenya, the same species is known as Omena. These regional variations emphasize the importance of understanding local contexts in analyzing the dynamics of small-scale fisheries across Africa.

Dagaa accounts for over 60% of the catch in Lake Tanganyika (Kirema-Mukasa, 2012) and is the second most important species in Lake Victoria, following Nile perch (Wanink, 1999). It is primarily processed through sun-drying, often on raised racks, and is widely sold in local and regional markets (Waldorff, 2017).

Despite the availability of local fish, there are concerns that communities in the African Great Lakes region consume insufficient quantities due to high levels of fish exports (Luomba et al., 2013). Over recent years, international trade and exports of dagaa have steadily increased (Hebinck et al., 2014; Tumwebaze, 2018). This growth is partly driven by the rising international migration of Sub-Saharan Africans to countries in the Global North, including Canada, which has created increased demand for dagaa in these regions. Table 1 shows the distribution of main dagaa species between Lake Tanganyika and Lake Victoria.

Table 1: Main dagaa species found in Lake Tanganyika and Lake Victoria

Study Great Lakes	Coverage (km ²)	Sharing Countries	Main Species
Victoria	68,800km ²	Kenya, Tanzania & Uganda	<i>Lates niloticus</i> (Nile perch): 30% <i>Rastrineobola argentea</i> (dagaa): 60% <i>Oreochromis niloticus</i> (Tilapia): 7% Others – 3%
Tanganyika	32,900km ²	Burundi, DR Congo, Zambia, & Tanzania	<i>Stolothrissa tanganyicae</i> & <i>Limnothrissa miodon</i> (Kapenta): 60% <i>Lates stappersii</i> (Mukebuka/Mukeke): 30% Others – 10%

Source: FAO Country reports (Selected)

The shift towards a greater export orientation of dagaa has brought significant changes to the supply chain. Landing sites have seen increased shipping activities to meet the growing demand for international orders (Hebinck et al., 2014), alongside expanding marketing opportunities in countries of the Global North. Women play a vital role throughout the value chain, contributing significantly to its operations.

It is noteworthy that the international trade of dried fish, including dagaa, is legally sanctioned in the producing countries surrounding Lakes Tanganyika and Victoria (Kirema-Mukasa, 2012), as well as in the consuming countries of the Global North. However, despite the increasing importance of dried fish exports from the African Great Lakes, the complex socioeconomic value and environmental impacts of this trade remain largely understudied.

Gordon et al. (2011), in their study on smoked and dried fish in Ghana, highlighted limited opportunities for realizing higher value in national, regional, or extra-regional markets. While these channels appeared to offer potential for certain groups, they were unlikely to deliver significant livelihood improvements on a broader scale. Similarly, Shamsuddoha (2007) found that the profitability of marine dried fish in Bangladesh was reduced due to high transportation costs, which limited the added value in the supply chain.

In the UK, Ward (2003) studied the trade of smoked-dried fish and reported that eight tons of smoked catfish and tilapia were imported annually. However, despite the availability of these species, substitution was not feasible due to the strong preference of diaspora consumers for African-sourced fish. These findings underscore the challenges associated with maximizing the socioeconomic benefits of smoked and dried fish trade in various contexts. They also indicate a persistent trend that has not significantly reduced the pressure on African lakes, highlighting the need for further research to explore whether this pressure could be alleviated by developing fish supply chains within diaspora host countries in the Global North. At present, a gap exists in the literature regarding the value chain of dagaa products from the two African Great Lakes and their associated conservation prospects.

Furthermore, the gendered dimension of transnational dried fish market networks is a central focus of this study. Examining this aspect offers a fresh perspective on the sustainability of fish trade in central and eastern Africa, the dynamics of the supply chain, and the potential for establishing connections with Canadian suppliers. However, such efforts must also consider the social economy of the individuals and organizations involved (Ahmed, 2007), as these relationships are integral to understanding and addressing the broader implications of trade.

Photo 2: Fishing on Lake Victoria and drying racks by Lake Tanganyika



Source: Photographs by Deo Namwira during fieldwork, 2023

3.0 A brief literature review: Small fish, trade flow and women market networks

The production and trade of small dried fish, particularly dagaa, from the African Great Lakes, has attracted considerable scholarly attention due to its economic, ecological, and social significance. These small fish play a pivotal role in the global food system, offering affordable nutrition and serving as a vital source of income for millions engaged in their value chain. Within the African Great Lakes region, Lake Victoria and Lake Tanganyika stand out as primary hubs for small fish production, with their value chains extending to global markets, including Canada and other regions of the Global North. This section reviews briefly the literature regarding studies on dagaa, focusing on their production, trade flows, the crucial role of women in the value chain, and the ecological impacts of dagaa export market activities, while situating these dynamics within the broader context of the African Great Lakes and the global export market.

This section begins by reviewing the literature on small fish production, with a focus on its relevance to the African Great Lakes. It explores the socioeconomic benefits of small fish production, the challenges associated with processing due to limited infrastructure and technologies, and the regulatory trade barriers that hinder market expansion. Next, the section examines the trade flow of small dried fish in the export market, highlighting its role in fostering global connections. Following this, it provides an in-depth analysis of women as key actors in the small fish value chain, describing the nature and functions of their market networks within a transcontinental context. Finally, the section offers an overview of the ecological impacts of small fish production, with particular attention to the sustainability of global fish stocks. A brief conclusion is provided at the end to summarize the key insights discussed.

3.1 Small fish production in the African Great Lakes

The African Great Lakes represent some of the most productive freshwater ecosystems globally, contributing significant quantities of small fish to both local and international markets. According to the FAO (2022), small fish species such as dagaa constitute a substantial portion of Africa's total fishery production, offering critical food security and economic benefits. Lake Victoria, for instance, alone accounts for approximately half of

Africa's freshwater fish production, making it a cornerstone of the region's fisheries. Despite this significant contribution, the sustainability of small fish production faces growing challenges. Overfishing, habitat degradation, and the impacts of climate change threaten the ecological balance of these ecosystems.

In response to these challenges, innovations in processing technology have emerged as vital interventions. For instance, the introduction of solar dryers in regions such as Lake Victoria and Tanzania has been reported to improve the efficiency of fish processing and significantly reduce postharvest losses, thereby enhancing product quality and marketability (Agrilinks, 2022; Feed the Future, 2023). However, they typically face uptake problems, particularly after external funding support ends. Such interventions nonetheless are a possible technological answer to some of the ecological and logistical challenges faced by the small fish industry.

The growing globalization of the dried fish trade has also introduced both opportunities and challenges. Belton et al. (2022) argue that dried fish contributes beyond mere food security by fostering cultural identity and economic resilience in developing regions. However, trade globalization necessitates a deeper understanding of the interplay between local practices and international market demands. Regulatory barriers, ecological pressures, and market variability complicate the trade dynamics, as highlighted by the LVFO. Despite these hurdles, dagaa remains a primary income source for fishing communities, reinforcing its economic significance within the broader food system.

As small fish production continues to expand, it underscores the interconnectedness of food systems, ecological management, and technological advancements. Efforts to promote sustainability, such as the adoption of solar drying technologies, provide potential pathways for addressing both local and global challenges. However, the variability in production, combined with ecological and market dynamics, necessitates ongoing research and innovation to ensure the sector's resilience and sustainability.

3.2 Trade flow of small dried fish, export markets and global connections

The trade of dried fish has historically played a critical role in ensuring food security and supporting livelihoods across Africa. While dried fish is a critical local source of affordable protein for rural and urban populations, its trade flow has expanded significantly to international markets in Europe, North America, and Asia. This global expansion is primarily driven by demand from diaspora communities, who value dried fish for its cultural and culinary significance rather than as a dietary staple (World Bank, 2012). Diaspora communities often act as both consumers and retailers, creating niche markets that bridge local producers with consumers abroad. This dynamic has helped solidify the importance of dried fish as a globally traded commodity, demonstrating its cultural and economic relevance in diverse contexts (Belton et al., 2022).

Dagaa from the African Great Lakes Region is one example of these dried fish whose economic significance of the local production and export trade is documented, with the World Bank (2012) highlighting the crucial yet often unrecorded contributions of small-scale fisheries through informal trade networks. These networks serve as vital conduits, connecting small-scale producers in the African Great Lakes region with international buyers, thereby creating significant economic opportunities for rural fishing communities within producing countries. According to the FAO (2022), small-scale fisheries such as those involved in dagaa production contribute not only to local livelihoods but also to global food security, underscoring their socioeconomic importance.

However, this dagaa trade is not without challenges. Inadequate infrastructure, high transportation costs, and fluctuating market prices continue to impede efficiency and profitability for small-scale producers and exporters. Additionally, regulatory barriers and inconsistent access to export markets further complicate the trade flow (Belton et al., 2022). These obstacles highlight the need for targeted interventions to improve trade logistics and market access while ensuring equitable benefits across the value chain.

The global export market for small dried fish, particularly to North America and Canada, is reported to have been experiencing steady growth, offering a significant opportunity for producers in the African Great Lakes region to diversify their markets, increase incomes and improve their livelihoods. This trade, driven in part by demand from diaspora

communities, underscores the economic potential of small-scale fisheries in connecting local production with global supply chains (Basurto et al., 2025). However, numerous challenges hinder the full realization of this potential. The World Bank (2012) identifies several critical obstacles, including stringent import regulations, complex certification requirements, and intense competition within international markets. These barriers disproportionately affect small-scale exporters who often lack the financial resources and technical expertise to navigate these regulatory frameworks.

Moreover, the sustainability of fish stocks remains a pressing concern. The FAO (2022) emphasizes the need for sustainable management practices to address the ecological impacts of intensified production and to preserve aquatic biodiversity. Overfishing, habitat degradation, and climate change further compound these challenges, necessitating a delicate balance between expanding export markets and ensuring the long-term viability of fish stocks. Addressing these issues will require coordinated efforts, including policy reforms, capacity building for small-scale fishers, and investments in sustainable practices to secure both economic and ecological benefits for producers and consumers alike.

While studies by the Lake Victoria Fisheries Organization (LVFO) and the Lake Tanganyika Authority (LTA) provide valuable insights into the production and local trade of dagaa, a significant gap remains in research on export market dynamics, particularly in North America. Existing studies primarily emphasize regional production trends, local consumption patterns, and intra-African trade flows. However, understanding how dagaa integrates into global supply chains, where demand is steadily expanding, remains an underexplored area of research, despite its growing economic and cultural significance in international markets, including Canada (Basurto et al., 2025; Béné et al., 2016).

This lack of research on export dynamics limits the ability to fully leverage the potential of dagaa in global markets. Export trade involves unique challenges such as meeting stringent international standards, navigating complex regulatory frameworks, and managing the logistical hurdles of transportation and storage. These issues disproportionately affect small-scale producers, who often lack the resources and expertise to meet export market demands effectively (World Bank, 2012).

To summarize, while the trade of dried fish like dagaa offers substantial opportunities for both local and global markets, it is constrained by infrastructural deficiencies, regulatory barriers, and environmental challenges. Addressing these issues requires targeted research to fill existing knowledge gaps and policy interventions to streamline export processes and ensure sustainability. Supporting the integration of Dagaa into global supply chains through improved infrastructure, capacity building for small-scale fishers, and sustainable practices will ensure mutual benefits for both local economies and international markets, fostering a resilient and inclusive value chain (Belton et al., 2022; FAO, 2022).

3.3 Women as key actors in the value chain

Women play a crucial role in the small fish value chain, particularly in processing and trading activities, where their contributions are indispensable. As fishery value chains have evolved, women have transitioned from informal roles as local processors and traders to becoming key players in export-oriented markets, a trend documented in the Lake Victoria region, where female traders now engage in drying and regional trade of dagaa in addition to local sales (Medard et al., 2023; Nunan & Cepić, 2021). Camlin et al. (2013) and related work show that women now travel between beaches and trading centers to procure, process, transport, and sell dagaa, reflecting their expanded roles. This shift has been particularly evident in regions with a growing demand for dagaa, a small pelagic fish critical to the economies of the African Great Lakes (Kolding et al., 2019). This evolution reflects women's adaptability and resilience in navigating complex market dynamics, often despite systemic barriers that hinder their full participation.

Among these challenges are limited access to credit, inadequate technological resources, and restricted opportunities for leadership within fisheries governance structures (Kleiber et al., 2014; Pedroza-Gutiérrez & Hapke, 2022; Weeratunge et al., 2010). These structural inequalities not only constrain women's economic potential but also limit the overall efficiency and sustainability of the fisheries sector. For instance, Harper et al. (2013) argue that women's centrality in postharvest activities, such as drying, salting, and

marketing, is critical to the value chain's functionality, yet these roles often go unrecognized in national fisheries policies.

Addressing these disparities is not only a matter of achieving gender equity but also critical for enhancing the sustainability and efficiency of fisheries. Integrating gender-sensitive approaches into fisheries governance, as advocated by Kleiber et al. (2014), can help dismantle systemic barriers and foster inclusive development. Successful examples from Southeast Asia and sub-Saharan Africa demonstrate that empowering women not only strengthens the resilience of the fisheries sector but also contributes to broader socioeconomic development goals (Béné et al., 2016; FAO, 2022).

Gender-sensitive policies and targeted interventions, such as capacity-building programs, improved access to credit, and the integration of women into decision-making platforms, can unlock their potential as key agents of change (Béné et al., 2016; Pedroza-Gutiérrez & Hapke, 2022; Weeratunge et al., 2010). Such measures would strengthen the resilience of fisheries, improve livelihoods in fishing communities, and contribute to broader goals of sustainable development within the fisheries sector.

Despite significant progress in recognizing women's roles in fisheries, existing research often fails to capture the diversity of their experiences, frequently treating women as a homogenous group. Factors such as age, socioeconomic status, ethnicity, and education significantly influence their participation and the challenges they face within the value chain (Harper et al., 2013). By recognizing the heterogeneity among women in the fisheries sector, policies and interventions can be better tailored to address the unique needs of diverse groups. For example, younger women might benefit from mentorship programs, while women from marginalized backgrounds could gain from targeted financial support and access to technology. Studies by Kleiber et al. (2014) emphasize the importance of such differentiated approaches, advocating for inclusive governance frameworks that empower women across various demographic and socioeconomic categories.

Successful initiatives in sub-Saharan Africa and Southeast Asia underscore the transformative potential of investing in women-specific programs that demonstrated that

when women are supported with resources and opportunities, they not only contribute to the economic resilience of their communities but also play a crucial role in promoting ecological sustainability. Expanding such programs more globally could bridge gaps in participation and unlock the full potential of women as key actors in the fisheries sector.

3.4 Ecological impacts of fisheries and global fish sustainability

The ecological impacts of fisheries are central to understanding the sustainability of global fish stocks, particularly under pressures from overfishing, habitat degradation, and climate change. Overfishing, where fish are harvested faster than they can replenish, disrupts biodiversity and destabilizes aquatic ecosystems. According to the FAO (2022), nearly one-third of global fish stocks are exploited beyond biologically sustainable levels. Unsustainable practices, including high bycatch and discard rates, exacerbate ecological strain by wasting non-target species and damaging habitats (Kelleher, 2005).

In the African Great Lakes, particularly Lakes Victoria and Tanganyika, small pelagic fisheries like dagaa constitute a significant portion of regional fish production, yet these fisheries face sustainability challenges from overexploitation and environmental changes (LVFO, 2021). Beyond overfishing, other ecological challenges in the African Great Lakes region include postharvest inefficiencies and pollution. Spoiled fish dumping, caused by inadequate storage and processing facilities, introduces organic waste into lakes, leading to oxygen depletion and biodiversity loss (Njiru et al., 2012).

Additionally, human activities such as bathing and toileting directly in lakes increase nutrient loading, promoting eutrophication and harmful algal blooms (LVFO, 2021). These activities degrade water quality, threatening fish habitats and the broader aquatic ecosystem. Addressing these issues requires investments in infrastructure, waste management, and community-led sanitation solutions to protect water quality while supporting fishing livelihoods. Transportation emissions from long-distance trade of dried fish further impact the environment. While such trade fosters economic opportunities, it relies on fuel-intensive transport methods that contribute to greenhouse gas emissions. For instance, fish products exported from the Great Lakes region to international markets

such as North America increase the carbon footprint of this value chain (World Bank, 2012). Reducing these emissions involves promoting efficient transport systems and localizing value chains.

Community-driven innovations, like solar dryers, also demonstrate the potential for minimizing postharvest losses and environmental degradation (Agrilinks, 2022). International collaboration and climate-resilient investments remain essential to ensure the sustainability of global fisheries, including small pelagic fisheries in the African Great Lakes. Additionally, Marine Protected Areas (MPAs) have proven effective in rebuilding fish stocks and preserving biodiversity when properly managed (Edgar et al., 2014). These areas serve as conservation tools, offering ecological benefits by protecting critical habitats and fostering the recovery of overexploited fish populations.

However, their implementation can also have significant social and economic ramifications. Scholars such as Mills et al. (2011) suggest that the sources and intensities of vulnerability affecting households depend on their primary livelihood activities. Marine protected areas, for instance, can restrict access to previously used fishing grounds and thereby affect local livelihoods (Chaigneau & Brown, 2016). A case in point is the Mnazi Bay–Ruvuma Estuary Marine Park in Tanzania, a large multi-use protected area that has reshaped how coastal communities engage with marine resources and adapt their fishing practices. Such restrictions may compel fishers to operate further from shore, with potential implications for both livelihood security and ecological dynamics in adjacent unprotected areas. This underscores the importance of balancing conservation objectives with the socioeconomic needs of resource-dependent communities.

This forced fishers to fish further from shore, which potentially alters the ecological balance of adjacent unprotected areas. This example underscores the importance of balancing conservation goals with the socioeconomic needs of communities reliant on natural resources.

To conclude, it can be said that the small fish value chain, particularly in the African Great Lakes, is a vital component of local and global food systems. Women are central to this chain, driving much of the processing and trade, yet they face systemic challenges that

limit their potential. The growing export market to the Global North, including Canada, offers significant opportunities but requires addressing barriers such as infrastructure and regulatory challenges. Future research should focus on closing these gaps, ensuring that small fish production and trade remain sustainable and equitable.

4.0 Purpose and scope

4.1 Project goals and objectives

This study examines the environmental and socioeconomic impacts of the African-sourced dried fish trade, particularly dagaa, and its growing ties to Canadian markets. It aims to document the supply chain within women-led networks in the African Great Lakes region and to explore retail practices in Canada. The research also investigates connections between African immigrant traders and Canadian fisheries, assessing the potential for local dagaa-like alternatives. By analyzing market dynamics, consumer preferences, and value chain relationships, the study explores how this transnational trade could promote sustainability and generate shared benefits for both African and Canadian communities.

Motivated by concerns over the sustainability of this trade, the study is guided by the following goals and objectives:

1. Document the Dried Fish Supply Chain :Provide a detailed description of the supply chain within women-led dried fish market networks in the African Great Lakes region and its connections to Canada.
2. Analyze Retail Practices in Canada: Examine how African-sourced dried fish is retailed across various locations in Canada, highlighting distribution channels and market dynamics.
3. Assess Links to Canadian Fisheries: Identify the extent of connections between African immigrant dried fish traders and retailers, local fisheries in Canada, and immigrant communities from other regions of the world.
4. Evaluate Sustainability Implications: Explore the sustainability implications of the growing trade and market linkages between Africa and Canada, considering both environmental and socioeconomic dimensions.

4.2 Focus of the study

This research focused on examining the environmental impact of the dagaa trade from the African Great Lakes region and assessing whether ecological impacts could be mitigated by developing local sources of fish supply (dagaa-like species) in Canada to meet the demand of the growing African diaspora. These pursuits represented a novel area of study, as the mechanics of this transnational trade have received little attention in scholarly fisheries research. The lack of focus on the dagaa market in Canada suggests a missed opportunity for Canadian fish producers to cater to diaspora consumers. If such a market opportunity exists, it could benefit Canadian producers, African-origin Canadian immigrant traders, retailers, and consumers, while contributing to sustainability and improved nutrition in the African Great Lakes region. Thus, this research explored these potential synergies and their broader implications.

4.3 Research questions

The following questions guide the research:

1. How is the market in imported dried fish from Africa organized?
 - i. What are specific environmental impacts associated with the export/import activities of dagaa on African Great Lakes?
 - ii. How are they currently exported to Canada, and how do their market networks operate in Canada?
 - iii. What is the nature of the relationships in the value chain involving dried fish women traders in the transnational context?
 - iv. What challenges do they face and how do they carry out their activities, and why?
2. Who consumes dagaa in Canada?
 - i. What are the desirable sensory qualities and cultural values of dagaa?
 - ii. What particular opportunities do women fish traders have in importing dagaa to Canada?
 - iii. How do they benefit from these opportunities? (e) How do these opportunities differ from those that Canadian-sourced dried fish could offer?

3. Is there a possible dagaa-like fishery in Canada that might be overlooked or underutilized?
 - i. To what degree could Canadian-sourced fish be acceptable to African immigrant consumers?
 - ii. What processing adaptations would be required in Canada?
 - iii. How could African and other diaspora groups be encouraged to eat Canadian fish?
 - iv. Could Canadian fish represent a viable market opportunity for Canadian producers and socioeconomic development for local fishing communities?
 - v. What would the estimated economic and environmental sustainability outcomes be of the substitution of Canadian fish for African fish?

5.0 Methodology

5.1 Research approach

Questions of this nature are best addressed through interdisciplinary approaches, which provide a comprehensive understanding of the complex dynamics involved. The methods employed in this research built upon the expertise developed during earlier doctoral fieldwork, primarily relying on qualitative methodologies. Data collection was designed to include in-depth structured interviews, narrative life stories, and informal meetings with participants to explore and address questions related to transnational dried fish trade activities in both Canada and the Great Lakes region.

The research design involved a multi-level data collection strategy, employing a cross-sectional approach combined with ethnographic methods. This integrated approach was particularly well-suited for analyzing the complex social, economic, and cultural interactions that define fisheries systems. By positioning the study within the broader socio-ecological framework of fisheries, the methodology facilitated the detailed capture of nuanced interactions among diverse actors.

This includes theoretical explanations grounded in local knowledge, providing a rich and detailed analysis of the interconnected factors influencing this trade.

The empirical data collected in this study was crucial in generating generalized insights into the market opportunities for dried fish in Canada and the challenges linked to the unsustainable transnational trade of dried fish in Sub-Saharan Africa. Field notes, which documented observations, reflections, and insights, played an essential role in contextualizing, interpreting, and understanding the primary data. Additionally, these notes facilitated triangulation, thereby enhancing the credibility and validity of the empirical findings, as recommended by Saunders (2016).

In addition to primary data, secondary data sourced from a diverse array of credible materials was utilized to complement and compare with the collected data during the analysis phase. This integration of primary and secondary data contributed to a robust methodological framework, allowing for a comprehensive examination of the phenomenon under study.

The qualitative data collected through this approach offered rich and detailed insights into the nature of retail relationships within the value chain of this women-led, transnational dried fish business network. By examining these dynamics, the study aimed to provide a nuanced analysis of the sustainability of the African-sourced dried fish trade, including its potential environmental impacts and its broader socio-economic and ecological implications. This analysis was designed to contribute meaningfully to the discourse on sustainable trade practices and gender-focused economic empowerment in global markets.

5.2 Model and framework of the study

Employing the Structure-Conduct-Performance (SCP) model alongside the Political Ecology framework, the study offered profound insights into the intricate dynamics of small-scale fisheries in the African Great Lakes (AGL) region. The SCP model facilitated an analysis of the structural elements of the dagaa value chain, including the organization of fisheries, the behavior of market participants, and the economic outcomes of the trade. This approach highlighted the reliance on informal networks, limited infrastructure, and the regulatory challenges that shape the production and trade of dagaa.

The Political Ecology framework further contextualized these findings by examining the socio-environmental pressures shaping AGL fisheries. It highlighted the vulnerabilities of small-scale fishers confronting overfishing, climate variability, and habitat degradation, all of which threaten the sustainability of fish stocks (FAO, 2022; Allison et al., 2009). These environmental pressures, coupled with limited access to institutional support, create a precarious foundation for the dagaa trade, which sustains both local communities in the AGL region and diaspora populations in Canada.

Thus, as part of the analysis, data were systematically collected and organized into thematic categories to build a body of evidence through the identification of patterns, relationships, and outcomes characterizing the integration of SCP and Political Ecology. These are reflected in the adapted framework presented in Table 2, which supports both analytical and empirical interpretation. The themes align with the interview guides used to capture informant responses to key research questions. Within the framework, these themes and their presumed relationships with SCP and Political Ecology are mapped across the different segments of the value chain.

Table 2: Analysis framework themes

Segments	STRUCTURE	CONDUCT	PERFORMANCE
	Structure of the Supply Chain	Conduct of the export dagaa market	Performance of dagaa trade
Production	Resource base (lakes); actors and access rules; products	Fishing and drying practices; power and gender dynamics	Trends in profits and volume; ecological and socio-economic impacts
Distribution	Actors; export channels; policies; market structures	Trade relations; market networks; retail practices	Trends in costs/profits; socio-economic and environmental impacts; volume
Consumption	Actors; end markets; socio-economic factors; environmental considerations	Consumer preferences; cultural factors	Trends in acquisition and consumption; food quality; nutrition outcomes

5.3 Fieldwork and sites selection

Three landing sites were strategically selected in each country to ensure geographical and contextual diversity. At each site, five participants were selected using stratified sampling techniques to enhance representativeness across key demographic and professional variables. These variables included age, marital status, years of experience in the trade, and volume of activity within the fish trade. This stratified approach ensured that the sample captured the heterogeneity of individuals engaged in the dried fish value chain, providing a comprehensive understanding of the diverse perspectives and experiences present within the sector.

Key informants will be individuals deeply embedded in the fish value chain, with a particular focus on women, who play a central role in trading and retailing activities. These informants will be identified in both the Great Lakes region of Africa and Canada, reflecting the transnational scope of the research. By selecting informants with varying roles and responsibilities within the value chain, the study aims to capture the complexity

of their contributions and challenges, from sourcing and processing to distribution and retail.

This methodological approach is designed to provide robust, contextually rich data, allowing for in-depth analyses of the dynamics and sustainability of the transnational dried fish trade. It also facilitates the identification of opportunities and barriers faced by women, who are often the backbone of these economic activities, contributing valuable insights into gendered economic participation and empowerment within global trade networks. A tentative breakdown of targeted participants was used as a basis for identifying actual participants during the fieldwork, as shown below.

Table 3: Research participants

African Great Lakes	Fisheries Sites	No. of key informants	No. of Interviews (Individual & group)	Life stories	Observation visits
DR Congo	4	33	29	3	7
Tanzania	4	41	32	4	8
Uganda	3	26	22	4	6
Kenya	3	20	18	2	6
S/Total	14	120	101	13	27
Canadian context	Cities Site	No. of key informants	No. of Interviews (Individuals)	Life stories	Observation visits
Alberta	3	10	10	0	6
Manitoba	3	10	10	0	10
Ontario	3	13	13	0	10
Quebec	3	17	17	0	8
S/Total	12	50	50	0	34
Grand Total	26	170	151	13	61

5.4 Fieldwork preparation and travels

Upon the approval of project funding by Mitacs in March 2022, efforts were promptly directed toward detailed preparations for fieldwork. These preparations encompassed establishing collaborations with local institutions that endorsed the research, including the Centre for Hydrobiological Research (CHR) in Uvira, DR Congo; the Tanzanian Fisheries Research Institute (TAFIRI) in Kigoma; the Kenyan Marine and Fisheries Research Institute (KMFRRI); and the Lake Victoria Fisheries Organization (LVFO) in Uganda. These institutions were instrumental in facilitating the necessary formalities required for conducting research within their respective jurisdictions.

Additionally, these partnerships supported the recruitment of qualified Research Assistants (RAs), whose expertise was vital for fieldwork data collection. The RAs were carefully selected to ensure they possessed the relevant skills and local knowledge needed to navigate the socio-cultural and logistical contexts of the research sites. Their roles included conducting interviews, observations, and other data collection activities, ensuring methodological rigor and reliability in gathering empirical evidence. This collaborative undertaking not only expedited the research process but also strengthened institutional relationships, thereby enhancing the overall feasibility and credibility of the fieldwork activities.

In Tanzania, obtaining research clearance from the Commission for Science and Technology (CoSTech) was a prerequisite for conducting the study. This process ensured compliance with national research regulations and facilitated formal approval for the planned fieldwork. However, for the other three countries, Kenya, Uganda, and the DR Congo, research permits were not required. This was due to the unique operational mandates of the local endorsing institutions, which routinely conduct research activities in collaboration with their internal and external partners.

For these countries, the documentation provided by the respective local institutions endorsing and collaborating on the research was deemed sufficient to grant us access to all selected fieldwork sites. These endorsements underscored the institutional commitment to supporting the research and enabled seamless navigation of logistical and

administrative processes. The partnership with these institutions proved invaluable, not only in facilitating access to the sites but also in fostering a collaborative framework for data collection and knowledge sharing throughout the research process.

5.5 Data collection

During this period, preparations were undertaken to finalize the fieldwork research plan, data collection guides, project information sheets, and consent forms. These documents were carefully drafted, reviewed, and subsequently approved by my supervisor, Professor Derek Johnson, ensuring alignment with the study's objectives and ethical standards.

The data collection guides were specifically designed to facilitate in-depth, semi-structured interviews with individual and official informants. These guides provided a structured yet flexible framework to elicit detailed insights while allowing for the exploration of emergent themes during interviews. Additionally, the guides incorporated protocols for deliberate observational visits, aimed at capturing contextual and behavioral data to complement the interview findings.

The research plan also anticipated the collection of secondary data where available, recognizing its potential to enrich the primary data by providing contextual and comparative insights. These preparatory steps ensured that the fieldwork was systematically organized and ethically sound, thereby laying a strong foundation for robust data collection and subsequent analysis.

Before embarking on the fieldwork, ethical approval from the University of Manitoba's Research Ethics Board was required, as the research involved human participants. The research was approved under protocol HE-2022-0296.

5.6 Data analysis

The analysis of collected data was conducted using Atlas.ti, a qualitative data analysis software that facilitates the organization, coding, and interpretation of qualitative data. A combined inductive and deductive approach was employed to ensure a comprehensive

examination of the research material. This dual approach allowed for both the emergence of new themes from the data (inductive) and the application of pre-existing theoretical constructs (deductive), ensuring that the analysis was both grounded in the data and aligned with the study's conceptual framework.

The data, primarily interview transcripts, was systematically organized and coded to identify recurring themes, geographic locations, and participant categories (Kuckartz, 2019). Codes were applied to meaningful segments of text, categorizing them into predefined themes while allowing flexibility for additional codes to emerge. These themes included key aspects of the structure, conduct, and performance (SCP) model, as well as environmental and socio-political factors associated with the Political Ecology framework. Each category was further disaggregated based on research sites and participant demographics, such as gender, age, and occupation, enabling nuanced insights into the interactions between ecological, economic, and social dimensions.

The coding process generated a structured body of evidence, which was analyzed to uncover patterns, relationships, and outcomes that characterize the central research themes. For instance, the results highlighted connections between the economic dynamics of small-scale fisheries in the African Great Lakes (AGL) region and the cultural significance of dagaa in export markets like Canada. Findings were also mapped against the specific contexts of geographic sites and stakeholder roles, providing a detailed understanding of localized practices and global trade flows. Visual tools within Atlas.ti, such as network views and thematic maps, were used to present these findings.

One of the key features of ATLAS.ti employed in this qualitative analysis was its capacity to generate transcript summaries for each of the four countries in the African Great Lakes Region (GLR) and the four Canadian provinces included in the study. This was achieved by integrating Conversational AI tools within the software to produce concise, structured overviews of lengthy interview transcripts. Building on these summaries, ChatGPT was subsequently utilized to extract and highlight salient quotes that were most relevant to the study's research questions. These quotes were then thematically aligned with the analytical framework underpinning the study. To ensure participant anonymity while enabling meaningful analytical connections, an anonymous coding system was

developed. This system assigned unique identifiers consisting of a two-digit numerical code and a location marker, allowing for nuanced cross-regional comparisons while maintaining ethical standards of confidentiality. This combined methodological approach enhanced both the rigor and efficiency of the qualitative data analysis process.

The results are interpreted and discussed using the research's analytical framework, which integrates the Structure-Conduct-Performance (SCP) model and the Political Ecology framework. The SCP model provided a lens to evaluate the organization of small-scale fisheries, the behavior of market actors, and the performance outcomes in terms of sustainability and equity (Porter, 1985). Concurrently, the Political Ecology framework contextualized the ecological and socio-political dimensions, such as resource governance, environmental impacts, and power dynamics within the fisheries value chain (Robbins, 2012). This dual-framework approach allowed for a holistic analysis of the systemic and localized factors affecting small fish production, trade flows, and sustainability.

By integrating these frameworks, the study results analysis provides a comprehensive understanding of the ecological impacts, sustainability of global fish stocks, and socioeconomic outcomes of the women-led market networks in the transcontinental trade of dried small fish. It addressed key research questions and their associated implications for policies and practices. The findings highlighted the need for strategies that balance local livelihoods, global market demands, and environmental conservation. Suggestions for future research and policy interventions, emphasizing the importance of investments in infrastructure, gender-sensitive policies, and sustainable resource management to enhance equity and long-term viability in the fisheries sector, are also offered.

6.0 Results

This section presents the findings from the qualitative data collected to investigate the socioeconomic and ecological impacts of transcontinental, women-led market networks in the small, dried fish trade from the African Great Lakes region to Canada. The study analyzes data from 161 participants, including 58 officials and 103 individuals involved in different nodes of the export market value chain, interacting with relevant actors linked to

Lake Victoria (fished from Kenya and Uganda) and Lake Tanganyika (fished sourced from Tanzania and the DR Congo).

On the Canadian end of the value chain, additional participants included six officials and 43 individuals, primarily retailers and consumers from African diaspora communities in four provinces: Alberta, Manitoba, Quebec, and Ontario, who provided their insights into their retail practices, consumption patterns, their levels of satisfaction with the small fish market, their awareness of any Canadian small fish similar to dagaa, and whether these alternatives could serve as substitutes for the Dagaa they consume. This section highlights key thematic threads and subthemes derived from the dataset, guided by the research objectives and questions, capturing participants' experiences and perceptions both within and outside the small fish export market value chain.

6.1 General information and characteristics of participants

6.1.1 Officials

In the African Great Lakes region, the officials who participated in the research were individuals connected to or engaged with the aforementioned actors and their livelihoods associated with Lake Tanganyika and Lake Victoria. These participants were affiliated with local institutions, including Research staff from local institutions; Fisheries management committees; Fishers' cooperatives and grassroots organizations; Fisheries researchers, practitioners, and other stakeholders. For Canada, the participating officials were adult professionals and key figures familiar with the dried fish economy and connected to fisheries and related markets through respective. Table 4 groups these officials based on their general information and characteristics.

As illustrated in Table 4, the majority of officials interviewed across the African Great Lakes countries were male (71%), highlighting a pronounced gender imbalance within public and societal service sectors. This disparity is not necessarily a matter of selection bias but rather a reflection of broader sociocultural and institutional realities, even if deliberate efforts had been made to increase female representation among respondents. In contrast, the participation of Canadian officials was notably lower, both in overall

numbers and female representation, primarily due to their limited availability, as repeated attempts to recruit them for interviews were largely unsuccessful.

Table 4: General information and characteristics of participant officials

General information and characteristics of official participants		Frequency N=58	Percent %=100
Gender	African Great Lakes Region		
	Male	41	71
	Female	11	19
	Canadian Context		
	Male	5	9
	Female	1	2
Location	African Great Lakes Region		
	Kenya	10	17
	Uganda	11	19
	Tanzania	15	26
	DR Congo	16	28
	Canadian Context		
	Alberta	0	0
	Ontario	1	2
	Quebec	1	2
	Manitoba	4	7
Position	African Great Lakes Region		
	Administrator, Director, Manager, or Inspector	13	22
	Fisheries Officers (Junior & Senior Levels)	9	16
	Traditional, Community, or Religious Leader	11	19
	University Professor or Researcher	19	33
	Canadian Context		
	Administrator, Director, Manager, or Inspector	1	2
	Fisheries Officers (Junior & Senior Levels)	0	0
	Traditional, Community, or Religious Leader	2	3
	University Professor or Researcher	3	5
General information and characteristics of official participants		Frequency N=58	Percent %=100
Experience	African Great Lakes Region		
	1 - 10 years	23	40

General information and characteristics of official participants		Frequency N=58	Percent %=100
	11 -20 years	15	26
	21 + years	12	21
	N/A	2	3
	Canadian Context	4	7
	1 - 10 years	4	7
	11 -20 years	2	3
	21 + years	0	0
	N/A	0	0

6.1.2 Individuals

Individual participants in the African Great Lakes region primarily consisted of women over the age of 18 who were engaged in various activities within the dried fish value chains linked to Lake Tanganyika and Lake Victoria. These participants included fishers, crew members, processors, traders, export shippers, and transporters. Since individual participants operate in multiple locations on the lakes, interviews were conducted during the day at landing sites and/or fish markets where they were encountered. In the Canadian context, individual participants were people within African diaspora groups whose living activities include retailing or consuming these dried fish linked to Lake Tanganyika and Lake Victoria, and of at least 18 years of age. Their characteristics are presented in Table 5.

Table 5 shows that the majority of interviewees in the individual category were women (75%, including 44% from the African Great Lakes and 31% from Canada), aligning with the study's focus on women-led market networks operating at local, regional, and international levels. This sample composition reflects the strong presence of women in various roles within fisheries-related activities, particularly in the dried small fish value chain, highlighting their substantial participation and influence across its different stages. Moreover, the table confirms that the study effectively captured both ends of the value chain, from production and consumption.

Table 5: General information and characteristics of research participants

General information and characteristics of Individual participants			Frequency N=103	Percent %=100
Gender	African Great Lakes Region	Male	15	15
		Female	45	44
	Canadian Context	Male	11	11
		Female	32	31
Location	African Great Lakes Region	Kenya	13	13
		Uganda	10	10
		Tanzania	16	16
		DR Congo	21	20
	Canadian Context	Alberta	10	10
		Ontario	12	12
		Quebec	15	15
		Manitoba	6	6
Age category	African Great Lakes Region	15 to 25 years	3	3
		26 - 35 years	14	14
		36 - 45 Years	18	17
		46 + years	21	20
		Not Applicable or No answer	4	4
	Canadian Context	15 to 25 years	0	0
		26 - 35 years	10	10
		36 - 45 Years	5	5
		46 + years	25	24
		Not Applicable/ No answer	3	3
Marital Status	African Great Lakes Region	Married	31	30
		Single	13	13
		Divorced	4	4
		Widowed	7	7
		Not Applicable or No answer	5	5
	Canadian Context	Married	35	34
		Single	7	7
		Divorced	0	0
		Widowed	1	1
		Not Applicable or No answer	0	0

General information and characteristics of Individual participants			Frequency N=103	Percent %=100
Self-identified Income status	African Great Lakes Region	Poor	18	17
		Middle	29	28
		Rich	1	1
		Not Applicable or No answer	12	12
	Canadian Context	Low	2	2
		Middle	36	35
		Rich	4	4
		Not Applicable or No answer	1	1
Experience	African Great Lakes Region	1 - 10 years	52	50
		11 -20 years	28	27
		21 - 30 years	18	17
		31 + Years	4	4
		N/A	1	1
	Canadian Context - Not applicable			
Connection with Dagaa	African Great Lakes Region	Fish exporter	7	7
		Fish processor - Trader	5	5
		Fish trader	38	37
		Fish shipper	1	1
		Fisher (Boat owner)	5	5
		Fisher (Boat Crew member)	4	4
	Canadian Context	Fish Consumer	28	27
		Fish Consumer & Retailer	15	15

Data collection spanned four provinces in Canada and four countries within the African Great Lakes region, ensuring a comprehensive geographic representation of the study's scope.

Additionally, the highest number of interviewed individuals in the African Great Lakes region were from the DR Congo (21 out of 60, or 20%) and Tanzania (16 out of 60, or 16%). This concentration is primarily attributed to the inclusion of Mwanza, Tanzania, and Kalemie, DR Congo, both of which serve as key hubs for dagaa production and trade. In

contrast, the lowest number of interviewed individuals was recorded in Manitoba, Canada (6%), primarily due to limited availability, which restricted participation.

In terms of individual participant involvement in dagaa fisheries-related activities, the largest proportion (37%) comprised individuals engaged exclusively in fish trade, whereas the smallest group (1%) consisted of fish shippers. Notably, a significant portion of participants in Canada (42%) reported having consumed dagaa since childhood and having continued to do so after migrating to Canada. Regarding the duration of engagement in fisheries-related activities, Table 2 highlights a significant trend: the largest segment (50%) of participants had between 1 to 10 years of experience within the value chain. This finding aligns with existing literature and participant accounts indicating a recent increase in new entrants into small-scale fisheries, often reflecting their role as a livelihood of last resort and the growing economic importance of small pelagic species (Allison & Ellis, 2001; FAO, 2022; Basurto et al., 2025).

6.2 Identifying key components in the dagaa production and supply chain

This section analyzes the structure of dagaa production in the African Great Lakes region, focusing on the supply chain that connects fish producers to the export market and consumers in Canada. It aims to provide a detailed overview of the dried fish supply chain within women-led market networks operating in both Africa and Canada (Objective 1). To achieve this, the section examines data from 146 semi-structured interviews, 2 informal conversations, and 13 narrative life stories, collected in 13 fishing communities and six cities in the study's selected countries: Uganda, Kenya, Tanzania, and the DR Congo. The analysis draws from the first section of the interview guide and the SCP (Structure-Conduct-Performance) framework, to facilitate the interpretation of participants' perspectives on the organization and dynamics of the dried fish supply chain. Four broad categories of factors emerged from individual and focus group interviews, highlighting the key drivers of livelihood changes that increase vulnerability. The findings are presented by identifying critical factors, key actors, and contextual elements relevant to the research questions.

6.2.1 Production context and product demands

As previously stated, dagaa, a small pelagic fish species, is a vital component of the fisheries sector in Uganda, Kenya, Tanzania, and the DR Congo. Their names vary by location: dagaa in Tanzania for *Limnothrissa miodon*, Ndakala in DR Congo for *Stolothrissa tanganicae*, or Mukene in Uganda and Omena in Kenya for *Rastrineobola argentea* (Silver cyprinid). A common perspective among producers is that dagaa has the potential to be highly profitable, provided the market operates efficiently. This view is consistent with academic research that points to the importance of well-structured market systems to maximize the economic benefits of fish as one of the most extensively traded global commodities (Bellmann et al., 2016).

Informants highlighted the widespread consumption of dagaa at local, regional, and international levels, emphasizing its role as an affordable and essential source of protein for low-income households (553:20-UG; 575:56-KE). This study focuses on dagaa primarily harvested from Lake Victoria and Lake Tanganyika, where, according to most informants, seasonal fluctuations significantly impact production levels and market supply, mirroring trends observed in other water bodies within the African Great Lakes region. The seasonal fluctuations were linked to the price fluctuations reported by informants as a major obstacle in dagaa production. These fluctuations, which were said to be primarily driven by unpredictable seasonal weather patterns, and supply chain inefficiencies, creating earnings instability for both traders and fishers (602:130-TZ). Inconsistent supply leads to periods of market oversaturation, where prices drop sharply, followed by shortages that drive up costs, making it challenging for actors to plan effectively or maintain stable incomes.

Recorded interview data from the four countries indicate that dagaa production is a labor-intensive process, involving fishers, traders, and processors, with women playing a central role in drying and selling the fish (574:57-UG; 441:147-CD). From what informants reported, regional variations were evident in drying techniques, influencing fish quality and preservation methods. In some areas, raised racks are used to enhance quality and

reduce contamination, while in others, fish are dried directly on the ground, raising concerns about hygiene and overall market value (556:116-UG; 603:12-TZ).

This labor intensity extends well beyond the immediate tasks of fishing and drying. As described by some informants (569:147-UG; 623:214-TZ), a single dagaa fishing trip can generate employment for at least nine additional categories of workers. They elaborated further, mentioning individuals who sort the catch, unload boats, transport fish to drying areas, spread and turn the fish during drying, pack them for transport, and drive the trucks to market. In addition, less visible but equally important contributors, such as net and boat makers, repairers, food vendors, and women who prepare meals for fishing crews, also play crucial roles at the landing sites. Altogether, this complex web of labor demonstrates the significant economic and social importance of small fish fisheries in sustaining the livelihoods of fishing communities.

When describing the challenges faced in dagaa production, several fish traders highlighted post-harvest losses as a major issue, attributing them to inadequate drying facilities, poor storage infrastructure, and fluctuating weather conditions (603:127-TZ; 555:156-UG). One example of these post-harvest losses occurs when unexpected rainfall coincides with dagaa landing. Without access to cold storage, fishers are forced to sell the catch quickly at low prices (578:183-KE). Whatever remains unsold is often left on the ground, with no chance of recovery, resulting in significant losses. Other instances of post-harvest losses, as mentioned by one informant (553:29-UG), were linked to quality deterioration during the drying process, often caused by unfavorable weather conditions such as high humidity or limited sunshine. These conditions were reported to compromise the appearance, texture, and shelf life of the dried fish, resulting in lower market prices and reduced revenues that sometimes fail to cover the operational costs of fishing, ultimately leading to financial strain for both fishers and processors.

Additionally, informants noted that regulatory policies were often outdated or inconsistently enforced, which has contributed to illegal fishing practices and broader sustainability concerns (452:143-CD; 575:77-UG). These factors collectively reduce the efficiency and threaten the long-term viability of the dagaa supply chain.

6.2.2 Dagaa trading dynamics and market networks

An analysis of responses regarding the structure of the dagaa trade reveals a shared recognition of its economic significance among respondents. However, they unanimously described the trade as highly informal and fragmented, with distribution primarily dependent on personal networks, informal agreements, and intermediaries rather than structured market systems (555:149-UG). Despite these limitations, the trade remains a critical economic activity, with primary domestic and regional markets identified as the DR Congo, Kenya, Uganda, Tanzania, Rwanda, Burundi, and Zambia (603:120-TZ; 452:117-CD). Strengthening institutional frameworks and improving trade infrastructure could enhance market efficiency and expand access to higher-value markets.

The significant influence of intermediaries in the dagaa trade, as reported by respondents, warrants attention. These intermediaries, described as wholesale traders, individuals with exclusive connections to distant buyers, or informal lenders who provide credit, play a central role in price setting and distribution, often exerting considerable control over market dynamics. One respondent noted that intermediaries frequently earn higher profits than both fishers and local fish traders, who remain at the lower end of the value chain with limited bargaining power (555:152-UG). Such findings point to the structural imbalances that characterize this largely informal dagaa market, where fishers and small-scale traders face major barriers to negotiating fair prices and accessing more profitable markets. The dominance of intermediaries in the distribution of dagaa highlights an apparent imbalance in overall market structure that results in inequitable distribution of profits across the value chain.

Additionally, taxation rates were reported to vary significantly across countries, further impacting the profitability and sustainability of the dagaa trade. The vast majority of respondents reported that in some cases, high tax rates and compliance costs significantly increase the overall cost of doing business, making it challenging for small-scale traders to remain competitive (609:183-TZ). Respondents also noted that excessive taxation, coupled with bureaucratic hurdles, have discouraged many existing actors in the sector, creating financial strain and reducing profitability. However,

interestingly, these challenges do not appear to limit the sector's expansion, as there remains a steady influx of new entrants into the trade. This suggests that despite regulatory and financial barriers, the high demand and potential profitability of dagaa continue to attract new participants.

Not surprisingly, informants consistently identified the perception of dagaa as a low-value product as a significant challenge in the trade, particularly in domestic markets, where it is often regarded as "food for the poor" (554:53-UG). This social stigma not only influences consumer preferences and demand but also affects market pricing and profitability, making it difficult for traders to position dagaa as a high-value commodity despite its nutritional and economic importance.

Furthermore, financial constraints were reported to significantly limit market access and the business operations of those involved in the dagaa trade, particularly small-scale traders who lack access to formal banking services. Many traders and fishers indicated that they rely on self-help groups as their primary source of informal credit to sustain their activities (575:73-UG; 555:144-UG). While such arrangements offer flexibility and immediate financial relief, they are often accompanied by repayment difficulties, which can deepen financial insecurity and erode trust among actors in the dagaa trade.

In addition to self-help groups, informal money lenders were frequently cited as key sources of credit. These lenders, who often maintained close ties with fish traders, acting as their clients and are sometimes considered patrons of boat owners, provide loans or fuel in exchange for repayment in fish, often at below-market prices. Through this arrangement, informal credit providers function as powerful intermediaries who leverage their financial support to exert control over the market and concentrate profits in their own hands following sales in the market. This informal credit dependency reinforces structural inequities within the value chain and limits the ability of small-scale actors to operate independently or access fairer market opportunities.

6.2.3 The export market structure and destinations

Emerging from the interview data, most respondents expressed the view that dagaa exports remain largely informal, with varying degrees of market structure across countries. While Tanzania, Kenya, and Uganda exhibit relatively more developed institutional arrangements to facilitate export operations, the Democratic Republic of Congo appeared to lag behind, with limited regulatory structure and inadequate infrastructure. This uneven institutional landscape results in inconsistent management of trade operations and disparities in market efficiency (457:131-CD). While there is evidence of exports to Canada, the USA, Belgium, Sweden, France, and Brazil, the trade is characterized by fragmented distribution networks, weak regulatory oversight, and inconsistent supply chains (555:138-UG; 603:120-TZ). Table 6 and Figure 6.1 show responses provided by individual participants to the question of whether they exported dagaa and if Canada was among the destination.

Table 6: Traders' responses if they export dagaa and if Canada is a destination

Do you Export fish	DR Congo	Kenya	Tanzania	Uganda	No of Counts	%
No	13	9	9	6	37	62
Yes	2	1	10	7	20	33
Not directly	1	0	2	0	3	5
Total	16	10	21	13	60	100
Is Canada one of Destinations	DR Congo	Kenya	Tanzania	Uganda	No of Counts	%
No	2	0	3	7	12	20
Yes	2	1	10	3	16	27
Don't know	12	9	8	3	32	53
Total	16	10	21	13	60	100

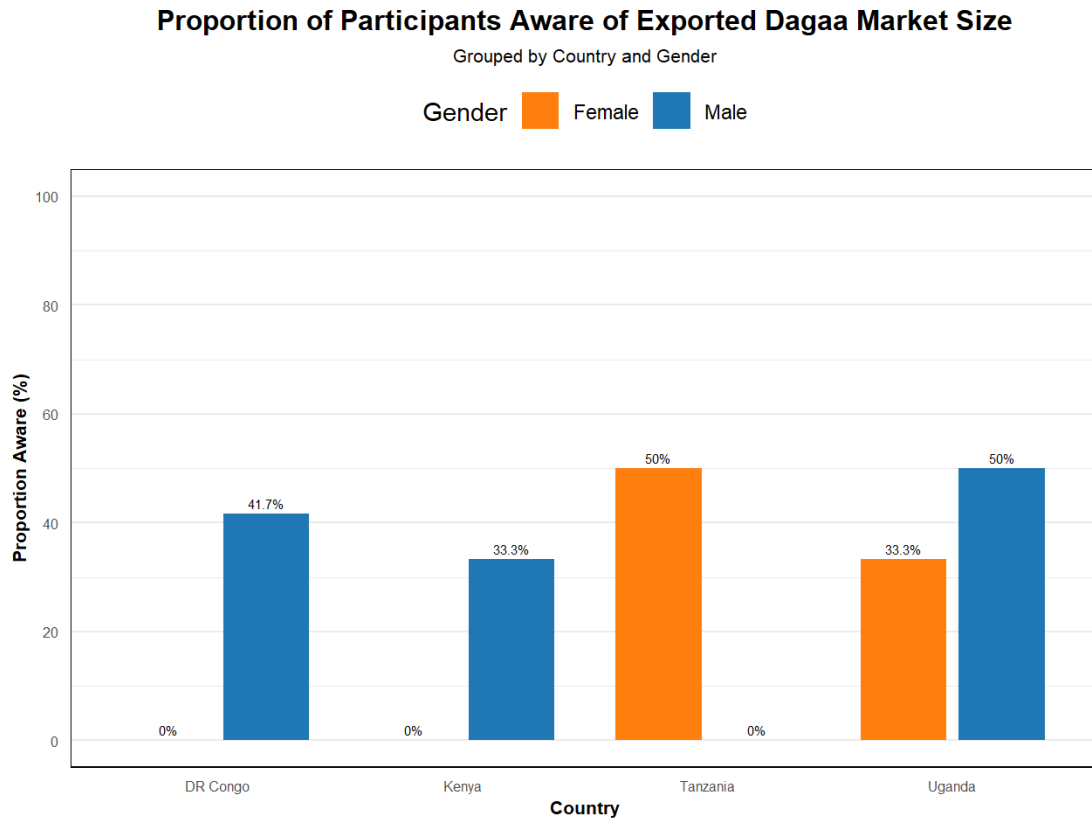
Table 6 and Figure 2 present individual participants' responses on their involvement in the dagaa export trade and whether Canada is among their export destinations. It includes insights from four Great Lakes region countries (DR Congo, Kenya, Tanzania, and Uganda), offering an overview of export participation and market linkages.

Regarding the question of whether they export dagaa, the findings indicate that a majority (62%) of informants do not export dagaa, suggesting that most respondents are engaged in local or regional trade rather than international markets. In contrast, both Table 6 and Figure 2, also show clearly that 33% reported exporting dagaa, with Tanzania (10 respondents) and Uganda (7 respondents) having the highest number of exporters. Additionally, a small percentage (5%) indicated they do not export directly, which suggests that some traders may be involved in indirect export channels, possibly through intermediaries.

In addition, Figure 2 below reveals significant disparities in awareness of the exported dagaa market size across countries and between genders, with an overall awareness rate of 31.8%. This measure is based on responses to interview questions such as: "Are dagaa from this lake sold in overseas export markets, and to which countries?", "How is the dagaa export market organized and who are the key actors?", and "What is the size of dagaa exported from this lake, and has it changed over time?" (for officials), as well as "Do you export to international buyers?", "To which countries do you export dagaa?", and "Is Canada one of those countries?" (for individual actors). In this context, "market size" refers to participants' perceived understanding of export volume and demand rather than verified quantitative data. Secondary data on export volumes were limited and not systematically comparable across countries; therefore, the analysis focuses on perceived knowledge of market scale rather than direct comparison with official statistics.

Gender-based differences are particularly pronounced. In Tanzania, where female participants report higher awareness than males, while the opposite is true in DR Congo and Kenya. In Uganda, both genders exhibit moderate awareness levels, with 33.3% of females and 50% of males reporting some awareness of the market size.

Figure 2: Proportion of participants aware of exported dagaa market size



All conditions being equal, these findings suggest that Tanzania and Uganda have more active individual exporters compared to DR Congo and Kenya. The high percentage (62%) of non-exporters points to barriers to direct export participation, possibly due to market access limitations, regulatory hurdles, or logistical constraints. This indicates the likelihood that some traders may rely on transiting through more accommodating neighboring countries to facilitate their exports, as noted by some informants.

As to the question of whether Canada was among the destinations for dagaa exports, the findings show that only 27% confirmed exporting to Canada, with Tanzania (10 respondents) having the highest proportion of exporters to Canada. However, as shown in Table 6 and Figure 2, 20% explicitly stated that Canada is not a destination. A majority of 53% of respondents explicitly stated that they do not know if Canada is an export destination, indicating a lack of awareness or indirect trading where intermediaries handle exports.

Overall, from these findings in Table 6 and Figure 2, it appears that there is limited direct knowledge of Canada as an export market suggesting that many traders who operate within regional markets may, to some extent, also engage in indirect exports to global supply chains through intermediaries, family networks or transit routes. The high percentage of “Don’t know” responses (53%) highlight low transparency in trade routes and limited access to international market information. Tanzania appears to have the strongest direct export linkage to Canada, while other countries exhibit lower or indirect participation in that market.

One of the most significant challenges reported by exporters is the lack of standardization in processing and packaging, which directly affects dagaa’s competitiveness in international markets. Informants highlighted that poor packaging and inconsistent drying techniques undermine the fish’s marketability and compliance with international quality standards (555:163-UG). While some exporters have adopted plastic packaging and cooler boxes to preserve product quality, these practices remain infrequent and largely inaccessible to small-scale traders, limiting their ability to meet global trade requirements and expand market reach (610:149-TZ). These results indicate that informants are convinced that these hindering gaps to the dagaa export market can be addressed through improved infrastructure, technical support, and regulatory alignment.

For instance, logistical barriers were identified as major challenges in the dagaa export market, significantly affecting trade efficiency. Responses from participants confirmed that dagaa is transported via road, air, and shipping, yet high transportation costs remain a critical constraint (603:122-TZ). Exporters reported that navigating these infrastructure-related challenges often leads to delays, supply shortages, and disruptions in the supply chain, further exacerbating the informality of the export market.

Notably, no responses from participants during the interviews indicated the existence of specific policies tailored to dagaa exports to ensure compliance with quality standards, improved packaging, and strengthened market linkages. The absence of such policies limits the sector’s ability to enhance trade competitiveness and expand access to high-value international markets. Another key factor that was notable in the data pertained to the lack of government involvement and support, with little formal assistance in securing

international markets (457:121-CD). This ties in with the difficulties reported by some exporters about facing currency fluctuations, making it difficult to establish stable trading patterns (555:152-UG).

6.2.4 Actors' satisfaction with the export market

A Likert scale was used to assess participants' levels of satisfaction with the dagaa export market. Participants were asked to rate their satisfaction with dagaa-related activities for international markets. Table 7 and Figure 2 present the distribution of responses across Likert scale items, categorizing participants into two groups: individuals within the value chain (such as fishers, traders, and processors) and officials outside the value chain (such as regulators and policymakers). This classification provides insights into differences in perspectives between direct market actors and external stakeholders regarding the efficiency and profitability of the dagaa export market.

Table 7: Participants by their level of satisfaction with the dagaa export market

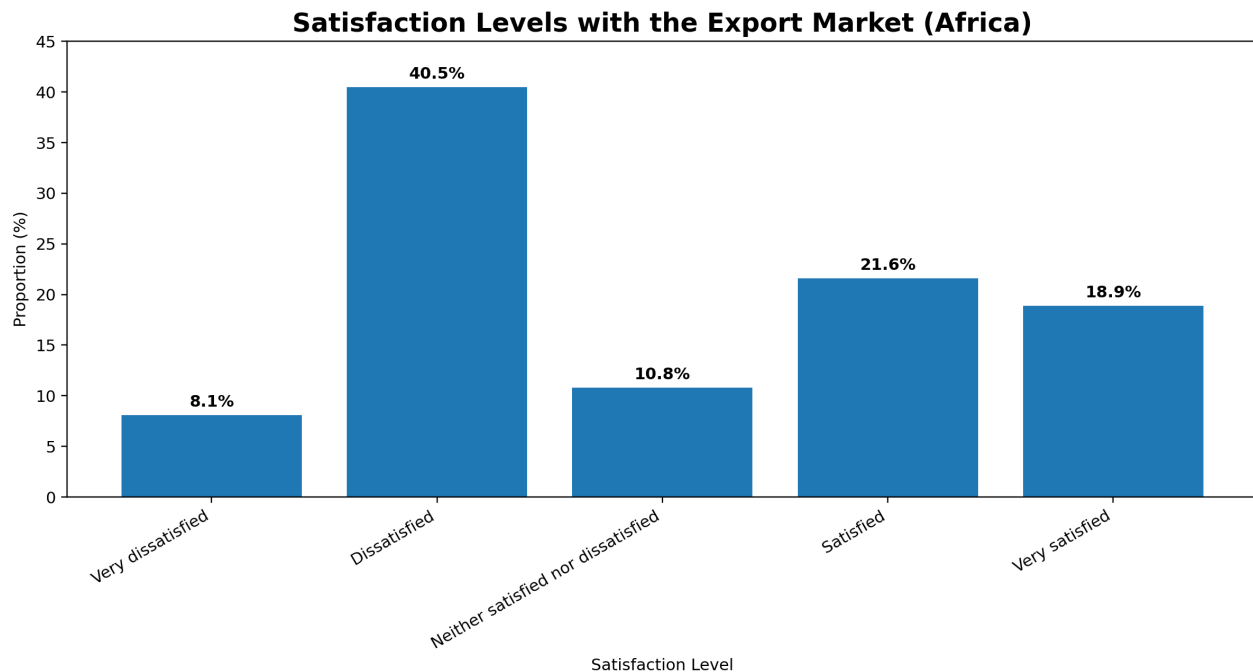
No	Satisfaction Levels with the Dagaa Export Market	Individuals' Participants	Officials' Participants	No of Counts	%
0	Very Dissatisfied	3	4	7	7
1	Dissatisfied	15	23	38	37
2	Neither satisfied nor dissatisfied	4	7	11	11
3	Satisfied	9	15	24	23
4	Very Satisfied	7	2	9	9
5	No Answer	13	1	14	14
	Total	51	52	103	100

As presented in both Table 7 and Figure 3, Satisfaction levels among participants varied significantly between officials and individuals within the dagaa value chain. Individual participants, including fishers, traders, and exporters across the five countries, generally expressed dissatisfaction with the export market, citing fluctuating prices, limited market access, and declining fish stocks as key challenges (558:141-UG; 603:132-TZ). Despite this widespread dissatisfaction, traders and middlemen, particularly those engaged in export activities, reported better earnings, reflecting their capacity to capitalize on market opportunities despite systemic barriers (576:184-UG).

This contrast suggests that the structure of the market allows those who are strategically positioned within the value chain to capture higher profits, often at the expense of primary producers and local traders. However, the fact that some intermediaries still express dissatisfaction, similar to harvesters, deserves at least tentative explanation. It may reflect pressures such as rising operational costs, heightened competition, or increased regulatory uncertainty that constrain their margins, even if their relative earnings remain higher.

Similarly, a significant proportion of officials (23 out of 53) expressed dissatisfaction with the dagaa export market. Their concerns primarily stem from observations of fishing communities that have strong export potential but have inadequate infrastructure for fishing and processing, preventing them from meeting international quality and regulatory standards. However, many officials acknowledged the possibility for improvement, particularly through targeted investments in infrastructure and compliance mechanisms.

Figure 3: Satisfaction levels with the dagaa export market



The data indicate that 40.5% of respondents are dissatisfied with the export market, reflecting a substantial level of discontent. In contrast, 21.6% report being satisfied and 18.9% very satisfied, suggesting that a notable share of participants have positive experiences. Meanwhile, 10.8% remain neutral and 8.1% are very dissatisfied, pointing to a polarized distribution of satisfaction levels. Overall, these findings highlight the need for targeted improvements to reduce dissatisfaction and enhance participant outcomes.

Thus, adding to this are regulatory inconsistencies, taxation policies, and high rejection rates due to quality concerns that further constrain the profitability of the dagaa export market (452:131-CD). While some traders have successfully established export businesses, the majority of actors remains dissatisfied with the prevailing market conditions, citing the need for improved financial support and enhanced infrastructure to facilitate trade (555:168-UG).

These findings align with a previous study assessing the economic feasibility of solar tent dryers in four pilot coastal districts in Tanzania. While most actors in that study expressed dissatisfaction with the export market, a subset of participants reported satisfaction,

indicating the potential for stakeholder empowerment and sectoral development through export-oriented interventions (Manyika & Box, 2021). This suggests that enhancing processing technologies, improving market linkages, and strengthening regulatory frameworks could drive greater inclusivity and profitability within the dagaa export sector.

6.2.5 Dagaa production and supply chain: conclusions

The dagaa market remains a crucial yet highly informal sector with significant economic potential. Despite the challenges in the production segment of the supply chain, it continues to provide livelihood opportunities for fishers, traders, and exporters across multiple countries. However, market inefficiencies, regulatory inconsistencies, and financial constraints hinder its full development. Addressing these issues through improved processing facilities, regulatory reforms, and enhanced financial accessibility could increase profitability and promote long-term sustainability.

Producers widely acknowledge dagaa's strong profit potential, emphasizing that market efficiency is key to maximizing gains. While this study does not directly link the dagaa trade to global fish trade dynamics, it is worth noting that integration in international fish markets continues to grow, with fish and fish products accounting for nearly 40% of global production traded across borders (Bellmann et al., 2016). In this context, targeted interventions, such as strengthening quality control measures, streamlining market linkages, and formalizing export frameworks, could help dagaa producers better position themselves to take advantage of opportunities in an increasingly vibrant sector of international trade.

6.3 Retail and consumption of dagaa in Canada.

This section analyzes the conduct of the imported dagaa market from Africa, providing insights into how it operates and functions in Canada. Specifically, it examines the retailing of dagaa from the African Great Lakes across Canada (Objective 2), as well as the current import processes to Canada. The analysis draws on 50 semi-structured interviews and 3 informal conversations conducted across 12 urban agglomerations in

Canada, with three cities in each of the four provinces studied, Alberta, Ontario, Manitoba, and Quebec. (See Table 3).

The analysis also relies on the second section of the interview guide and applies the Structure-Conduct-Performance (SCP) framework to capture, describe, and interpret participants' perspectives. It focuses on four key areas: (1) Market structure and retailing practices of African-sourced dagaa in Canada, (2) Importation and trade barriers, (3) the role of women traders and market networks, and (4) Consumer preferences, the potential for Canadian fish, and market expansion.

6.3.1 Market structure and retailing practices of African-sourced dagaa

The research question here seeks to explore how women-led market networks in the African small, dried fish trade operates in Canada, shedding light on the retailing practices, continued consumption of dagaa and its long-distance importation and demand profile.

Looking at the retailing of African-sourced dagaa (small, dried fish) in Canada, respondents reported that they primarily procure them through African, Chinese, and other ethnic food stores, which cater mainly to immigrant communities from the African Great Lakes region (195:148-ON; 180:175-AB). Unlike mainstream Canadian supermarkets, where dried fish options are limited, these ethnic stores serve as essential distribution points for African diaspora consumers seeking familiar food products (191:133-MB; 211:163-QC).

These findings align with an earlier quick inventory of the dagaa market in Canada, conducted as part of this research. This inventory provided qualitative insights into the market for African dried dagaa, helping to understand purchasing patterns and distribution networks. Table 8, generated from this analysis, presents the frequency distribution of responses to the question: "Where do you buy dagaa?" The participants included individuals from three major cities, Edmonton, Calgary, and Ottawa-Gatineau, which are recognized as having some of the largest African diaspora populations in Canada after Toronto and Montreal (Statistics Canada, 2019).

Table 8: Dagaa sales point

Dagaa sales Points	Ottawa-Gatineau	Winnipeg	Edmonton	Calgary	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Home vendor Ladies	3 (27%)	7 50%)	4 (31%)	5 (50%)	19 (40%)
Chinese Food Stores	3 (27%)	2 (14%)	5 (38%)	5 (50%)	15 (31%)
African Food Stores	4 (36%)	1 (7%)	4 (31%)	0 (0%)	9 (19%)
Indian Food Stores	0 (0%)	3 (21%)	0 (0%)	0 (0%)	3 (6%)
Filipino Food Store	1 (9%)	1 (7%)	0 (0%)	0 (0%)	2 (4%)
Total	11 (100%)	14 (100%)	13 (100%)	10 (100%)	48 (100%)

Source: Author past work (2021)

As shown in Table 8, the majority of dagaa products are sold through home vendors, with 19 participants (40%) across the four cities reporting that they primarily purchase from these sources. However, respondents also indicated that dagaa is available in both Chinese and African food stores, which have been increasing in number and consistently stocking dagaa. Table 8 also highlights variations in purchasing patterns, with most respondents relying on home vendors, primarily women, with whom they have personal ties. These vendors play a crucial role in the distribution network, providing a more personalized, trust-based buying experience compared to retail stores. Additionally, participants across the four cities noted that the presence of dagaa sold by vendors from various African diaspora communities, beyond the four countries covered in this study, suggests that its consumption extends beyond these specific communities, indicating a broader demand for dagaa among African immigrants in Canada.

Both official and individual informants reported that retail networks for dagaa in Canada remain largely informal, relying on direct supplier contacts, personal relationships, and community-based marketing strategies. An analysis of vendor strategies revealed that retailers frequently utilize various techniques to market and distribute their products,

including WhatsApp, Facebook, and word-of-mouth referrals to notify customers of new stock arrivals (192:108-ON; 179:123-AB). Additionally, some respondents highlighted that extending informal credit to frequent buyers is a common practice among vendors. This approach was described as reinforcing trust-based transactions within the community, fostering customer loyalty and sustaining long-term business relationships (210:108-QC).

However, informants emphasized that dagaa availability remains inconsistent, with retailers reporting challenges in maintaining a steady supply due to importation barriers and logistical disruptions (186:93-MB; 212:105-QC; see next section). As a result, some consumers have adapted by relying on family members to bring dagaa from Africa when traveling, ensuring access to their preferred product (195:140-ON). Additionally, price fluctuations were reported as a significant concern, influenced by import costs, seasonal variations in supply, and retailer markups. In some cases, consumers pay as much as CAD 50–70 per kilogram, making dagaa a relatively high-cost product despite its traditional role as an affordable staple in African markets (180:176-AB; 215:84-QC). These findings reveal the economic and logistical constraints that limit consistent access and affordability for both traders and consumers, and help explain why dagaa distribution networks in Canada remain largely informal and fragmented.

6.3.2 Importation and trade barriers for dagaa

Respondents reported that the importation of dagaa into Canada remains fragmented and largely informal, with no centralized distribution network in place. As a result, traders and importers primarily rely on a combination of individual travelers, small cargo shipments, and air freight services to facilitate the trade (190:105-MB; 191:153-MB; 205:131-QC; 179:128-AB). This implies the absence of formalized trade structures that contribute to both supply inconsistencies and logistical challenges within the dagaa market in Canada.

Supply inconsistencies were frequently cited by respondents as a critical issue linked to the informal nature of trade. Without coordinated sourcing mechanisms or reliable

supplier networks, the availability of dagaa in Canada is irregular and unpredictable. Imports are often dependent on personal networks, fluctuating demand, and the availability of transport, resulting in periods of over- or under-supply. These inconsistencies hinder business planning for traders and limit consumer access to the product, undermining the long-term stability of the market.

Respondents highlighted a range of logistical challenges that significantly hinder the efficient importation of dagaa into Canada, particularly customs regulations, high transportation costs, and import restrictions (196:123-ON; 182:112-AB). These issues span the entire international export value chain, from sourcing in the countries of origin to final delivery in Canada, and were consistently emphasized across interviews.

At the point of origin, exporters in countries such as Tanzania face substantial regulatory barriers. Respondents pointed to bureaucratic inefficiencies, unclear documentation requirements, and increasingly strict border controls that complicate the formal export process (194:88-ON; 206:121-QC). In some cases, these constraints have led traders to reroute shipments through neighboring countries like Rwanda and Burundi, which adds considerable time, cost, and risk to the supply chain.

During the transit phase, the lack of access to affordable and efficient bulk shipping options presents additional hurdles. Due to the largely informal nature of the dagaa trade, many actors operate without links to formal logistics networks, relying instead on irregular and ad hoc transport arrangements. This fragmentation disrupts the consistency of supply and increases dependence on informal intermediaries.

At the point of entry into Canada, importers face further challenges related to high transportation costs and strict customs procedures. While some traders use international courier services such as DHL or FedEx, these are often prohibitively expensive, shipping fees can reach C\$150 for just 10 kg of dagaa, making it difficult to scale up imports economically (205:131-QC).

In Canada, respondents indicated that customs regulations impose additional restrictions on dagaa importation, as quality control measures, packaging requirements, and licensing rules create significant challenges for traders seeking to formalize their

operations (207:101-QC). In this regard, several accounts highlighted instances of confiscation of improperly declared goods at customs, which has further discouraged traders from engaging in large-scale imports (178:117-AB; 204:105-QC). These regulatory hurdles, combined with logistical constraints and high transportation costs, were cited by informants as factors contributing to the persistence of informal and fragmented trade networks within the dagaa market in Canada.

Taken together, these logistical barriers, operating at every stage of the export-import chain, help explain why dagaa importation into Canada remains largely informal and fragmented, limiting the ability of traders to expand or formalize their operations. Despite these obstacles, respondents emphasized that strong and consistent demand from African consumers continues to sustain the dagaa trade, even as it remains largely unregulated and informal (211:186-QC; 184:110-AB; 177:126-AB).

This enduring demand highlights the resilience of the trade and the central role consumers play in maintaining supply chains, even in the face of persistent regulatory and logistical barriers. Rather than calling for formalization as a blanket solution, these findings point to the need for a more participatory and context-sensitive approach to policy development, one that actively engages dagaa value chain actors in identifying practical strategies to improve livelihoods, reduce uncertainty, and enhance trade efficiency in ways that reflect their realities and priorities.

6.3.3 Role of women traders and market networks

This section examines the opportunities available to women fish traders who import dagaa to Canada. It also analyzes the numerous barriers they face across different stages of the supply chain.

Respondents emphasized the pivotal role of women in both the importation and retailing of dagaa in Canada, highlighting their active participation in small-scale trade networks. Many women traders operate independent businesses, supplying ethnic food stores or selling directly within African diaspora communities, a practice that closely mirrors their roles in their native Africa, where they dominate the fish processing and trading in local

and regional markets of dagaa (441:147-CD; 574:57-KE; 621:150-TZ; 558:120-UG). As previously noted, respondents reported that women traders face multiple challenges despite their significant contributions to sustaining the dagaa market across the entire value chain. One of the primary obstacles cited was limited access to formal financing, as lending institutions often do not provide financial support tailored to the needs of small-scale dagaa traders (595:181-UG; 615:127-TZ; 522:146-CD).

Given these financial constraints, many women traders rely heavily on informal trade networks and personal savings, whether individually or through group-based mechanisms, to finance their business activities (588:134-KE; 500:142-CD; 560:123-UG). This self-financing model reflects both resilience and necessity in contexts where formal credit remains inaccessible or unreliable. However, this approach also exposes them to heightened financial vulnerability, limiting their ability to expand operations, buffer against shocks, or invest in improved infrastructure. Without institutional financial support, many are caught in a cycle of subsistence-level entrepreneurship, where even minor disruptions in supply or demand can significantly impact their livelihoods.

Despite limited access to formal credit, many women traders draw on trust-based relationships with their customers to stabilize their businesses. These ties foster loyalty that enables traders to navigate frequent supply disruptions, delayed deliveries, or price fluctuations without losing their consumer base (205:139-QC; 187:102-MB; 594:152-KE). Such relationships are not merely transactional but rooted in long-term social capital, functioning as an informal form of economic security. In the absence of institutional support, this relational trust acts as a critical buffer, reinforcing the resilience of women-led informal trade networks.

These findings suggest a high degree of adaptive capacity among women traders, who rely on personal initiative, social capital, and community-based networks to keep their businesses viable despite persistent financial and logistical barriers. Rather than operating through formalized supply systems, respondents emphasized the importance of informal contacts, often built through religious, familial, or ethnic networks, that facilitate the movement of dagaa from African source regions to Canadian markets (204:118-QC;

187:97-MB; 186:86-MB). These networks help mitigate risk and uncertainty by pooling resources, sharing information, and coordinating small-scale shipments when possible.

While the majority of respondents participate in informal trade, a small number described themselves as licensed wholesale traders, selling at least one ton of dagaa per month (196:123-ON; 177:110-AB). These traders appear to operate with a higher degree of formality and may represent potential models for structured trade. However, the data do not provide sufficient detail about whether they have successfully overcome the supply inconsistencies or regulatory hurdles faced by smaller traders. It also remains unclear how these larger operators relate to their smaller counterparts, whether they collaborate, compete, or exist in parallel networks, and whether gender plays a role in this differentiation.

In some cases, traders reported working with community members who travel regularly between Africa and Canada, arranging for small quantities of dagaa to be transported informally in personal luggage (526:176-CD; 633:138-TZ). These carriers are typically compensated through informal arrangements, such as a flat fee, a share of the resale value, or reciprocal favors within their communities. This form of peer-supported, travel-based supply chain reflects both the ingenuity and the fragmented nature of the dagaa trade in the absence of institutional logistics or regulatory facilitation.

The findings highlight that dagaa trade networks in Canada remain largely informal, an arrangement that presents both opportunities and limitations. On one hand, informality enables flexibility and accessibility for small-scale actors; on the other, it restricts business growth, weakens supply chain reliability, and limits access to institutional support. The call for greater formalization emerged consistently across stakeholder groups, including wholesalers, retailers, and consumers, highlighting a shared recognition of the constraints imposed by unregulated trade systems (204:118-QC).

A striking example comes from Manitoba, where 100% of interviewed officials (7 out of 7) advocated for formalizing the dagaa trade to improve availability and market efficiency. One official emphasized that “With dagaa priced at CAD 60–70 per kilogram, improving export standards and market formalization could transform it into a sustainable economic

opportunity for African producers and Canadian retailers” (219:154-MB). Particularly, support for formalization was consistent across gender lines and geographic regions among individual participants, indicating a widespread recognition of the structural barriers inherent in informal trade practices. While informality has historically facilitated entry and adaptability, stakeholders increasingly regard formalization as crucial for ensuring long-term viability and fostering equitable market development.

6.3.4 Consumer preferences, potential for Canadian dagaa-like fish, and market expansion

This section examines the consumption patterns of Dagaa and the potential acceptability of a Canadian-sourced alternative among African consumers. It focuses on consumer preferences as the primary driver of demand. The analysis also considers whether such a product could represent a viable market opportunity for Canadian producers while contributing to the socioeconomic development of local fishing communities.

The majority of informants indicated a strong consumer preference for dagaa varieties sourced from Lake Tanganyika and Lake Victoria, as these are widely perceived as being of higher quality compared to other dried fish options available in Canada (197:102-ON; 183:75-AB; 211:157-QC). One key factor driving this preference is taste, with consumers consistently attributing superior flavor and texture to dagaa from these two lakes. Several respondents emphasized the importance of taste in determining consumer choices.

One respondent remarked, "The dagaa brought in by the Chinese is tasteless, and taste is a big factor in why people eat dagaa" (177:115-AB). Another respondent further reinforced this sentiment, stating that "I've heard that the other dagaa from Asia don't have a very good taste" (204:99-QC). These perspectives highlight the significant role of sensory qualities in consumer decisions, reinforcing the attachment to dagaa from African sources. This preference also suggests limited acceptance of alternative dried fish varieties available in Canada, further shaping importation trends and trade networks catering to African diaspora communities.

In response to the question regarding their consumption of dagaa in Canada, individual respondents unanimously stated that they have consumed dagaa since childhood and have continued to do so after migrating to Canada, albeit to varying degrees influenced by multiple factors. Based on these responses of several participants, it appeared that dagaa in Canada is predominantly consumed by African immigrants, particularly those from Tanzania, Uganda, the DR Congo, and Burundi (211:163-QC).

In connection with this, participants were asked whether their consumption of dagaa has changed since they arrived in Canada and what might be the reason. Responses are provided in Table 9, which presents data on changes in dagaa consumption among African immigrants in Canada, categorized by the length of time they have lived in Canada. The table also includes the reasons for changes in consumption patterns across provinces.

Table 9: Changes in dagaa consumption among African immigrants in Canada

Change in dagaa consumption	Lime length in Canada				Total	Percent (%)
	1 - 10 years	11 -20 years	21 + Years	Unspecified		
Increased	6	3	1	0	10	23
Decreased	13	10	3	0	26	60
No change	2	2	0	0	4	9
No answer	2	0	0	1	3	7
Total	23	15	4	1	43	100
Reasons for change	Across study provinces of Canada				Total	Percent (%)
	Alberta	Ontario	Quebec	Manitoba		
Available	3	2	1	0	6	14
Affordable	0	3	3	1	7	16
Not available	4	7	7	4	22	51
Too expensive	3	0	1	0	4	9
No answer	0	0	3	1	4	9
Total	10	12	15	6	43	100

Table 9 presents two key findings: (1) that a significant majority of respondents (60%) reported a *decrease* in dagaa consumption since arriving in Canada, with the decline most pronounced among immigrants who have lived in the country for 1 to 10 years, and (2) that *inaccessibility* and *cost* are the major reasons for this change. Regional disparities are particularly notable. Ontario and Quebec report relatively better *affordability* (3 respondents each), yet they also have the highest number of respondents citing *unavailability* (7 each), suggesting uneven and unreliable supply chains. Alberta also reports high unavailability (4) and the highest rate of *price-related barriers* (3 respondents citing dagaa as “*too expensive*”), indicating that affordability issues are especially acute in that province. Manitoba reports fewer total responses but still shows evidence of restricted access, with four citing unavailability and only one citing affordability.

Overall, the data illustrate that both affordability and availability are uneven across provinces, with structural barriers likely influenced by location-specific supply chains, local demand, and possibly proximity to major urban centers or African grocery outlets. These challenges appear to be disproportionately felt by newer immigrants, whose consumption has declined more sharply than those residing in Canada for longer periods. This supports the need for targeted interventions to improve access and affordability of culturally significant foods like dagaa across provinces.

The findings illustrate that the length of time spent in Canada influences dagaa consumption patterns among African immigrants. Although some continue to consume dagaa regularly, albeit to varying degrees across provinces, the majority report a decline in consumption, largely due to issues of limited availability and high cost.

6.3.5 Retail and consumption of dagaa in Canada: Conclusions

The analysis of retail and consumption patterns of dagaa in Canada reveals a resilient yet constrained trade system shaped by informality, social networks, and persistent demand among African immigrants. Women-led retail networks serve as the backbone of dagaa distribution, navigating significant financial and logistical challenges through

community-based strategies, trust-based relationships, and informal credit systems. While these networks offer accessibility and flexibility, they also operate without the institutional support required to scale and stabilize trade. The dominance of informal and fragmented supply chains underscores the vulnerability of this market to disruptions, price volatility, and regulatory risks, limiting its long-term sustainability and growth potential.

Also, there are importation challenges, ranging from high transportation costs and customs regulations to bureaucratic bottlenecks in countries of origin, that further reinforce the informal character of dagaa trade. Despite these barriers, strong consumer demand persists, particularly for dagaa sourced from Lake Tanganyika and Lake Victoria, which are valued for their taste and familiarity. However, availability and affordability vary across provinces, with newer immigrants and residents in regions like Alberta and Manitoba facing the most pronounced barriers to access. These findings highlight the need for inclusive policy approaches that engage dagaa value chain actors in designing practical pathways toward formalization, improved trade efficiency, and culturally relevant food security. Addressing these challenges in a participatory and context-sensitive manner could help unlock the potential for more equitable and sustainable dagaa markets in Canada.

6.4 Assessing the socioeconomic and environmental impacts

This section applies the third dimension of the Structure-Conduct-Performance (SCP) framework to the third section of the interview guide to analyze the value chain performance of dagaa trade from the African Great Lakes region (Objective 3). We discussed some conduct-related performance challenges in the previous section. In this section, we highlight two other performance concerns related to socio-economic value and environmental impacts of the international trade in dagaa. Additionally, the section explores the potential sustainability outcomes of substituting Canadian fish for African fish and evaluates conservation efforts aimed at mitigating environmental threats and ensuring the long-term viability of fisheries resources. The analysis is structured into four key areas covered in the interviews: (1) Socioeconomic value of International women-led dried fish markets, (2) Environmental impacts of dagaa export/import activities, (3) Value

and efforts for conservation, and (4) Environmental sustainability outcomes of substituting Canadian fish for African fish.

6.4.1. Socioeconomic value of international women-led dried fish markets

In the fisheries literature, the socioeconomic value of a resource or related activities is primarily assessed based on its contribution to the well-being of those who access the resource (Allison & Ellis, 2001; Béné et al., 2016). Such assessments may be conducted directly or indirectly by examining how resource use contributes to livelihoods, including employment, income generation, and food security. Thus, the socioeconomic analysis of international women-led dried fish markets aims to identify and understand the specific benefits and contributions these markets bring to different social groups within their communities, particularly in terms of well-being, while also highlighting the challenges faced, especially by women, who are the primary actors in the dagaa export trade. By focusing on income generation and social dynamics, it becomes possible to identify the mechanisms through which women-led dried fish markets affect various stakeholders across the value chain, including fishers, traders, processors, and consumers.

A. Economic contributions

A.1 In the African Great Lakes region

To the question of how important the dagaa fishing was, which supplies the export market, responses from participants in Tanzania, DR Congo, Kenya, and Uganda consistently emphasized the economic significance of dagaa fishing. Many recognized its essential role in providing income and employment opportunities within their communities. For instance, a Tanzanian fisher reported, *"I don't have any other activity to do, so I decided to fish dagaa"* (602:116-TZ). Similarly, a fish trader in Uganda stated, *"Catching, drying, and selling dagaa provides me with an income ranging from 2,000,000 to 10,000,000 Ugandan shillings (C\$754.14 to C\$3,770.68) a month, depending on the season"* (553:26-UG). In Kenya, another respondent highlighted, *"dagaa (Omena) is highly valued*

as it has provided employment to many youths in the village" (575:57-UG). The quotes speak to the direct economic contribution of dagaa fishing.

Long-term benefits of dagaa fishing and trade were also mentioned by several participants. For instance, in DR Congo, respondents linked dagaa fishing to long-term economic stability, with one interviewee stating, *"Most families rely on dagaa to pay for school fees, build houses, and save for future investments"* (452:113-CD). The reliance on dagaa as a primary source of livelihood was echoed by another respondent who remarked, *"If the lake were to be closed, it would be disastrous for many families"* (441:163-CD). These affirming responses illustrate how dagaa fishing and trade are deeply intertwined with the economic well-being and stability of those engaged in the sector. The personal accounts provided by participants demonstrate the lived realities of dependency on dagaa fisheries, highlighting their critical role in local economies and food systems across the region.

Beyond its economic value, dagaa was also reported to be an essential food source for many families regardless of their economic status. A participant in Kenya stated, *"Omena is a cheap source of protein and a vital part of local diets"* (575:56-KE). In Uganda, a fisher mentioned that dagaa helps alleviate poverty by providing an affordable food option (553:28-UG). A trader in DR Congo reported that dagaa is widely consumed locally and exported to meet demand abroad (452:115-CD).

Furthermore, an analysis of economic income variations reveals disparities both across countries and between market segments. Respondent data indicates notable differences between those operating in local markets and those engaged in export trade. Table 10 highlights income disparities between export and local market sellers across Uganda, Kenya, DR Congo, and Tanzania, illustrating variations in monthly earnings and price per kilogram of dagaa. The table presents mean income distributions and unit prices, derived from individual participant responses to questions regarding their total income from the previous month and the sales price per kilogram in their most recent transaction.

Table 10: Income variation between export market and local market sellets (in USD)

Countries	Export Market			Local Market		
	Participants N=20	Mean Price per KG (US\$)	Mean Monthly income (US\$)	Participants N=40	Mean Price per KG (US\$)	Mean Monthly income (US\$)
Uganda	7	5.69	7,861.55	6	11.30	920.82
Kenya	1	3.07	1,156.79	9	11.48	3,958.79
DR Congo	2	2.79	20,139.88	14	3.13	2,716.03
Tanzania	10	19.47	7,462.10	11	7.07	7,154.58

As it can be seen, Table 10 reveals significant income disparities between export market sellers and local market sellers in the dagaa trade across the four countries Uganda, Kenya, and DR Congo. For example, In Uganda, the price per kilogram in the local market (\$11.30) is nearly double that of the export market (\$5.69), yet exporters earn significantly more per month (\$7,861.55) compared to local sellers (\$920.82). It can, therefore, be established that high trade volumes compensate for lower per-unit prices, allowing exporters to maintain higher earnings. A similar pattern is observed in DR Congo, where local sellers receive a slightly higher price per kilogram (\$3.13) compared to export sellers (\$2.79), yet exporters earn nearly seven times more (\$20,139.88 vs. \$2,716.03). Therefore, this DR Congo example further exhibits how market access can drive significant income disparities, with exporters benefiting from regional and international demand.

However, Tanzania presents an exception, where the export market price per kilogram (\$19.47) is significantly higher than the local market price (\$7.07). Despite this, monthly earnings between export and local sellers remain nearly identical (\$7,462.10 vs. \$7,154.58). This implies a more balanced trade structure, where both markets provide viable economic opportunities, unlike in Uganda and DR Congo, where exporters dominate earnings. Kenya, on the other hand, presents a unique reversal of trends, local market sellers earn more than their export counterparts. With a higher price per kilogram

in the local market (\$11.48) versus export (\$3.07), local sellers report significantly greater monthly incomes (\$3,958.79 vs. \$1,156.79). This indicates that strong domestic demand sustains higher local prices, while export barriers, such as regulatory costs and restrictive policies, may reduce profitability for those selling outside Kenya.

So, connected to the preceding, in relation to income contribution of dagaa trade from its African Great Lakes region, it is clear that dagaa trade exhibits income disparities between export market sellers and local market sellers, influenced by varying prices per kilogram, trade volumes, and market accessibility. In Uganda and DR Congo, exporters earn significantly more despite lower per-unit prices, indicating that high trade volumes compensate for reduced pricing. In contrast, Tanzania's export market offers higher per-unit prices but similar earnings for both market types, suggesting a more balanced trade structure. Kenya presents a unique reversal, where local sellers earn more than exporters due to higher domestic demand and potential export restrictions.

As many informants pointed out earlier, this income variation is likely shaped by the dominance of intermediaries in the dagaa trade. Respondents reported that middlemen control price determination and market distribution, often securing higher profits than fishers and small traders (555-152-UG). In DR Congo and Tanzania, intermediaries purchase locally and reroute exports through countries with less stringent regulations, bypassing trade barriers and increasing their margins. In Kenya, reliance on local market intermediaries helps explain why domestic sellers achieve higher earnings, as they avoid price reductions imposed by the export chain. Higher export earnings in DR Congo and Uganda stem from bulk sales rather than better per-unit pricing, whereas in Tanzania, profitability remains stable across market types.

In summary, these findings demonstrate income disparities within the dagaa trade, while still acknowledging its income contribution to local livelihoods and the improvement of living conditions across varying income levels. Although export markets present greater income potential, actual earnings are shaped by market accessibility, trade volume, and the influence of intermediaries.

A.2 In the Canadian context

The import and distribution of dagaa from the African Great Lakes offers important insights into the functioning of diaspora markets in Canada. In response to the question, “How much (Kg) dagaa do you sell/consume in a month? At what price do you purchase/sell one kilogram?”, participant vendors emphasized persistent challenges in aligning supply with market demand, which directly affect both the quantities available and the prices at which dagaa is sold and consumed. Several respondents reported that their stocks were depleted within one or two months, while others described extended waiting periods, sometimes lasting several months, for new shipments to arrive. As one participant noted, “*I often have more buyers than the quantity I have*” (187:91-CD). Such accounts suggest that access to dagaa in the Canadian market is constrained less by consumer demand than by shipping schedules, freight costs, and broader logistical uncertainties. Table 11 summarizes sales patterns across the four provinces, Alberta, Manitoba, Ontario, and Quebec, while qualitative accounts from vendors provide additional context regarding the dynamics of supply, pricing, and demand.

Table 11: African Great Lakes imported dagaa in the Canadian market

Province	African Great Lakes imported dagaa in the Canadian market					
	Participant Vendors	Mean Sale Price per KG (C\$)	Mean Quantity Sold Monthly (KG)	Mean Purchase Price per KG (C\$)	Mean Purchase Cost (%)	Mean Monthly Sales Revenue (C\$)
Alberta	3	48	300	28	8,500	14,500
Manitoba	3	70	28	24	680	1,983
Ontario	4	63	184	25	4,508	11,500
Quebec	4	58	111	25	2,781	6,397

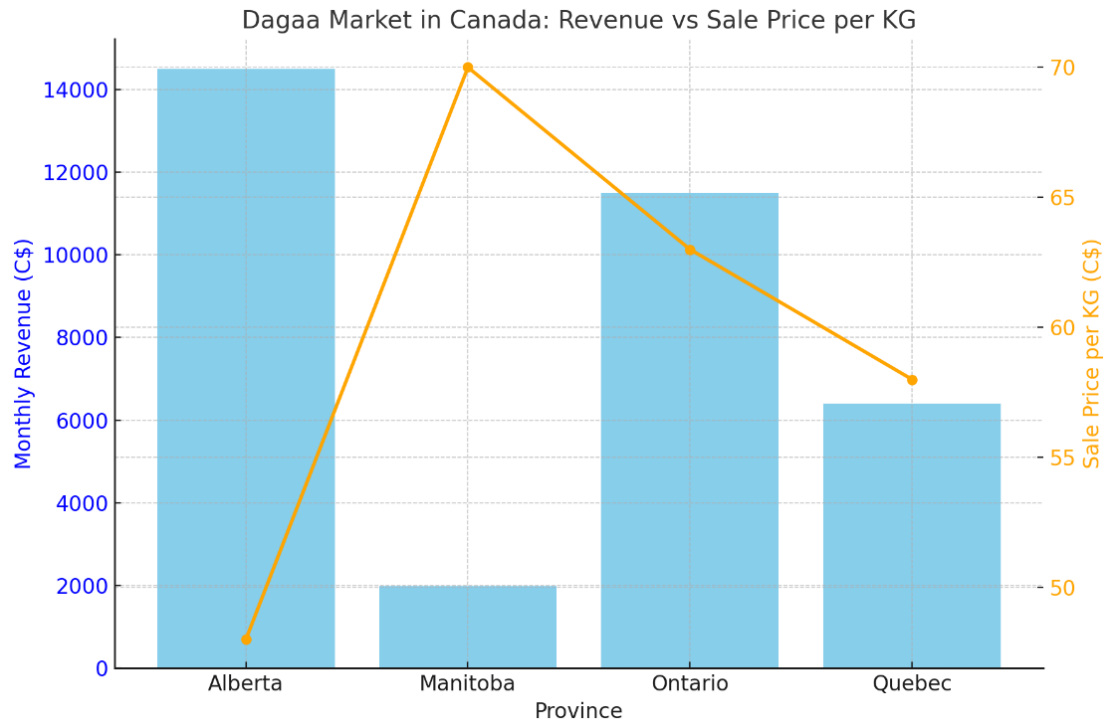
Table 11 illustrates the emerging market for dagaa and summarizes sales patterns in four Canadian provinces. Qualitative accounts from vendors further contextualize these patterns, particularly in relation to supply, pricing, and demand. Regional variations are

evident, with Ontario and Alberta generating the highest revenues, reflecting larger diaspora populations, stronger demand, and more established trade channels. By contrast, Manitoba and Quebec represent smaller but growing markets. Price differences are also notable: Manitoba recorded the highest mean sale price at C\$70/kg, suggesting niche demand within Winnipeg's diaspora communities, where dagaa is positioned as a specialty product. Alberta, on the other hand, reported the lowest mean price but the highest sales volumes, indicating a more competitive bulk-market model. In terms of market potential, the data point to opportunities for expanding distribution in Quebec and Manitoba, where demand exists but revenues remain relatively modest.

The data from participants' responses clearly show that higher prices do not necessarily result in higher revenues. Alberta and Ontario achieved the strongest revenues (C\$14,500 and C\$11,500 per month, respectively), driven by larger and more consistent consumer bases. Manitoba, despite the highest prices, recorded the lowest monthly revenues (C\$1,983), underscoring that volume and market scale are stronger determinants of revenue than unit price. Quebec presented moderate revenues (C\$6,397), reflecting a growing but less mature market segment. This pattern aligns with provincial pricing variations: while Manitoba reported the highest average price at C\$70/kg, it lacked the consumer base to generate significant revenue. Conversely, Alberta maintained the lowest mean price at C\$48/kg yet achieved the highest sales volumes, suggesting that broader market reach and distribution capacity outweigh pricing strategies. Ontario and Quebec, with intermediate price ranges (C\$58–63/kg), illustrate how steady demand within sizeable immigrant populations sustains consistent, though varied, revenue streams.

The data further suggest that cultural factors play an important role in the dagaa market in Canada, beyond its economic value. Dagaa serves not only as a nutritional product but also as a cultural food that connects African immigrant communities to their heritage. In Canada, this positions dagaa within the broader "ethnic foods" market, increasingly valued for diversity and authenticity. Figure 4 in chart bar visualizes mean monthly sales revenues and pricing of dagaa across provinces

Figure 4: Dagaa sales revenues and pricing differences per KG across Canadian provinces



In Figure 4, the blue bars represent monthly revenues, while the orange line illustrates the average sale price per kilogram. This figure highlights Alberta and Ontario as the strongest markets, with Quebec and Manitoba showing smaller but emerging potential. As to the mean sale price per kilogram of dagaa across provinces, Manitoba stands out with the highest price point, while Alberta has the lowest, suggesting different consumer dynamics and market positioning. This makes it clear that high prices (like in Manitoba) don't necessarily translate into higher revenues, while larger markets (Ontario, Alberta) sustain strong revenues even with moderate pricing.

Some key dynamics in the Canadian dagaa market can be highlighted from the chart. First, Alberta and Ontario generate the highest revenues despite moderate sale prices (\$48–63/kg). This suggests these provinces benefit from larger and more consistent consumer bases, likely tied to stronger African diaspora networks and wider distribution. Second, Manitoba has the highest average price (\$70/kg) yet records the lowest revenues. This indicates a smaller, niche market where dagaa is positioned as a specialty product rather than a bulk commodity. Third, Quebec demonstrates a middle ground, with

moderate prices (\$58/kg) and steady, though modest, revenues, pointing to growth potential if demand is further cultivated. Overall, the dagaa market strength is not driven by high prices but by volume and consumer base size. Strategic expansion efforts could focus on increasing availability and consistent retail sources of supply in smaller markets like Manitoba and Quebec, while establishing consistent and reliable sources of supply in Alberta and Ontario.

In summary, the Canadian dagaa market is shaped by a combination of cultural demand, logistical constraints, and regional variations in pricing and revenues. Market strength lies less in high pricing strategies and more in consistent supply and consumer base size. Alberta and Ontario exemplify bulk-market growth driven by diaspora density, while Manitoba illustrates niche, high-price consumption in smaller communities. Quebec, meanwhile, represents an emerging market with potential for expansion. Overall, the evidence suggests that strategies for strengthening the dagaa trade in Canada should prioritize improving distributional reliability and expanding availability in underserved provinces. By consolidating supply chains in Alberta and Ontario and cultivating awareness in Manitoba and Quebec, dagaa can continue to bridge cultural identity with economic opportunity in the Canadian context.

B. Social Status and Dynamics

Beyond economic aspects, the trade of dagaa also has social implications regarding community development and family well-being. One of the more concrete aspects of the social implications linked to fish trade, not exclusively to dagaa, is the gendered disparity in economic activities and outcomes, which was evident across all four countries. Women tended to be dominant in roles such as processing and marketing, while men were more dominant in fish catching and transporting activities.

In addition, participants' responses highlighted a socioeconomic divide within the trade. While some respondents reported achieving economic stability, and even prosperity, through their involvement in dagaa-related activities, others were found to be struggling. This was attributed to several factors, including fluctuating fish prices, inadequate storage

facilities, and limited market access (553:27-UG, 575:70-KE). In Kenya, a woman trader recounted how her involvement in dagaa trading allowed her to *"raise her living standard from poor to average and provide education to her children"* (574:51-KE). However, not all families view the trade favorably; some respondents mentioned that their children refuse to engage in the business, considering it an occupation for those with limited educational backgrounds (574:63-KE). This underscores a social perception issue that may impact the trade's sustainability over generations.

Furthermore, disparities were also evident among groups with different marital statuses. The data suggest that single respondents, particularly women, tended to benefit more from both local and export markets compared to their married counterparts. This advantage was often linked to their greater mobility and ability to establish stronger trade networks, including participation in self-help groups that offer informal access to financial resources within the value chain (555:166-UG). Table 6.9 provides a distribution of African dagaa value chain participants by gender, marital status, and average monthly income, offering insight into the intersection of social identity and economic participation.

Table 12: Participants by Marital Status and Average Monthly Income (US\$)

Dagaa Value chain actors - African context	Female		Male	
	Number	Mean income (US\$)	Number	Mean income (US\$)
Married	19	5,017	12	7,125
Single	12	7,603	1	925
Divorced	4	3,475	0	0
Widowed	7	2,047	0	0
No answer	3	0	2	0
Total	45		15	

The data in Table 12 reveal clear socioeconomic disparities across different marital categories and between male and female actors in the trade, reinforcing earlier discussions about uneven economic outcomes within this sector the trade. The data in Table 6.9 suggest notable socioeconomic variation across marital status categories and between male and female actors in the dagaa trade. Of particular interest is the relatively higher mean income reported by single women compared to other groups. While this pattern may indicate that single women are more actively engaged in trade networks, potentially benefiting from greater mobility, autonomy, and participation in market exchanges, this finding should be interpreted with caution given the small number of respondents in each category. Rather than indicating a definitive trend, these results point to a possible dynamic that warrants further investigation. They nonetheless align with qualitative insights suggesting that participation in trade networks, and the ability to access export-oriented markets, may vary across social categories, including marital status.

Conversely, as shown in Table 12, divorced and widowed women reported lower average incomes of \$3,475 and \$2,047, respectively. These figures suggest that women in these marital categories face compounded economic vulnerabilities, possibly due to social challenges that can include caregiving responsibilities and limited mobility to network opportunities and market constraints. The limited economic returns in these groups underscore the importance of considering marital status as a key variable in understanding income inequality within the dagaa value chain.

These data also highlight gender-based income disparities among married participants. Married men reported a mean income of \$7,125, which is notably higher than that of their married female counterparts. This finding reflects persistent gender-based inequalities in income generation, even within the same marital status, and suggests that men may have greater access to capital, market opportunities, or more favorable terms of trade. Interestingly, male representation in non-married categories is nearly absent, with only one single male respondent earning a markedly low income of \$925, and no divorced or widowed males reported. While this may reflect limitations in the sample, it may also

suggest lower economic engagement or visibility of men in these categories within the dagaa trade context.

Overall, the data in Table 12 underscore the differentiated economic experiences of dagaa value chain actors, shaped by both gender and marital status. These findings lend quantitative support to the broader qualitative analysis, illustrating how social structures mediate access to and benefits from economic opportunities in the dried fish trade.

However, these advantages do not negate the challenges women face in the dagaa trade, many of which were reported as systemic barriers. Key challenges include limited access to formal credit from larger financial institutions and cultural constraints that disproportionately affect married women, restricting their market participation and decision-making autonomy. Such structural limitations may be an indication of the persistent inequalities within the fisheries sector.

In conclusion, while the dagaa trade serves as an economic lifeline for many communities, it also presents significant social challenges. The disparity between successful and struggling traders, gender-related barriers, and the influence of intermediaries shape the overall social dynamics within the value chain. Addressing these inequalities through better market access, financial inclusion, and community-driven initiatives could help ensure that the trade remains a sustainable source of income and empowerment for all involved.

6.4.2 Environmental impacts of dagaa export/import activities

As outlined in the research question, this section explores participants' perceptions of the environmental impacts associated with the dagaa export market. Drawing on their accounts, it examines the degree of awareness and consideration given by resource users to the conservation of lake resources, alongside the existing regulatory measures in place. The analysis also considers how these environmental and regulatory dimensions intersect with the dynamics of the dagaa export trade, offering insight into both the perceived challenges and the potential implications for sustainability within the value chain. To focus the analysis, this section will concentrate on two key categories that are

most relevant to the core of this study: (1) the environmental impacts of dagaa export/import activities and (2) the value and efforts for conservation.

A. Environmental Impacts of the dagaa trade

A.1 The wider ecology of the Lake

Participants across the African Great Lakes region reported the changes in the lakes' production as well as in the variety of fish in their catches in response to the question of whether their dagaa-related activity have affected or threatened the ecology of the lake. Table 13 captures participants' perceptions of whether dagaa-related activities pose a threat to the ecology of the lake.

Table 13: Perceptions of dagaa fisheries' threats to the lake's ecology

Dagaa fisheries threaten the lake?	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	OFF	IND	OFF	IND	OFF	IND	OFF	IND	OFF	IND
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
No threat	5(45%)	7(54%)	5(50%)	3(30%)	13(81%)	8(50%)	6(40%)	11(52%)	29(56%)	29(48%)
Yes	6(55%)	3(23%)	5(50%)	2(20%)	2(13%)	3(19%)	8(53%)	5(34%)	21(40%)	13(22%)
No & Yes	0(0%)	0(0%)	0(0%)	0(0%)	1(6%)	0(0%)	0(0%)	0(0%)	1(2%)	0(0%)
Don't know	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(5%)	0(0%)	1(2%)
No answer	0(0%)	3(23%)	0(0%)	5(50%)	0(0%)	5(31%)	1(7%)	4(19%)	1(2%)	17(28%)
Total	11(100%)	13(100%)	10(100%)	10(100%)	16(100%)	15(100%)	14(100%)	21(100%)	52(100%)	60(100%)

Table 13 offers a cross-national overview of how both officials and individual actors across Uganda, Kenya, the DR Congo, and Tanzania understand the environmental consequences of dagaa fisheries, particularly in relation to wider lake ecology. The responses show a general trend of divided perceptions, with a slight majority across all countries suggesting that dagaa-related activities do not pose a threat to the lake's ecology. Specifically, 56% of officials and 48% of individual respondents across the region stated that there is no ecological threat associated with dagaa fishing. This sentiment is especially pronounced in DR Congo, where 81% of officials and 50% of individuals saw

no threat, and in Uganda, where similar perspectives were expressed by 45% of officials and 54% of individuals. These views may reflect either a lack of direct observation of ecological degradation, or a perception that the scale or methods of dagaa fishing remain within sustainable limits. It is also possible that such responses are shaped by the economic dependency on the trade, influencing how ecological risks are acknowledged or downplayed.

Conversely, a notable minority, 40% of officials and 22% of individuals, believe that dagaa fisheries pose a threat to the lake's ecology. This concern is particularly evident among Tanzanian and Ugandan officials, possibly reflecting direct exposure to environmental pressures such as overfishing or habitat degradation. In contrast, ambiguity remains in places like the DR Congo, where a few respondents gave unclear or contradictory answers. Additionally, 28% of individual respondents did not answer, perhaps indicating uncertainty or reluctance to speak on a sensitive issue. Overall, the data in Table 13 point to a fragmented understanding of the environmental risks associated with dagaa fisheries. While many downplay ecological concerns, a significant minority, especially among officials, recognize potential threats. These differing views highlight the need for stronger environmental monitoring, greater stakeholder awareness, and inclusive dialogue around sustainable lake resource management.

Secondly, building on the preceding discussion, participants were asked to share their opinions on the current health of the lake compared to when they first entered the fisheries sector. Table 14 presents their responses, categorized by country, across the four African Great Lakes nations, and by respondent type, distinguishing between officials and individual actors.

Table 14: Respondents' views on the health of the lake today compared to the past

Health of the lake	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	OFF	IND	OFF	IND	OFF	IND	OFF	IND	OFF	IND
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Better	2(18%)	2(15%)	2(20%)	0(0%)	1(6%)	1(6%)	2(13%)	7(33%)	7(13%)	10(17%)
Worse	8(73%)	6(46%)	8(80%)	4(40%)	9(56%)	6(38%)	5(33%)	7(33%)	30(58%)	23(38%)
Unchanged	0(0%)	2(15%)	0(0%)	0(0%)	5(31%)	6(38%)	4(27%)	1(5%)	9(17%)	9(15%)
Don't know	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
No answer	1(9%)	3(23%)	0(0%)	6(60%)	1(6%)	3(19%)	4(27%)	6(29%)	6(12%)	18(30%)
Total	11(100%)	13(100%)	10(100%)	10(100%)	16(100%)	16(100%)	15(100%)	21(100%)	52(100%)	60(100%)

Table 14 illustrates a dominant view of ecological decline, albeit with notable variations across countries and respondent categories. The majority of officials across Uganda, Kenya, the DR Congo, and Tanzania indicated that the health of the lake has worsened since they began their involvement in the fisheries sector. For instance, 73% of Ugandan officials, 80% of Kenyan officials, 56% of officials in the DR Congo, and 33% of those in Tanzania expressed concern over a decline in lake health. These responses point to a growing recognition, particularly among institutional actors, of environmental deterioration potentially linked to pressures from increased fishing activities, pollution, or unregulated shoreline development.

Among individual respondents, however, the perception of lake health is more mixed. While 46% of Ugandans, 40% of Kenyans, 38% of Congolese, and 33% of Tanzanians reported that the lake's condition had worsened, others either viewed it as unchanged or better than before. A noteworthy proportion, especially among Tanzanian individuals (33%), considered the lake to be in better condition, which contrasts sharply with the institutional responses. This discrepancy may reflect differing frames of reference, access to environmental information, or localized ecological conditions. It could also indicate that individuals assess lake health based on short-term changes in fish availability or water appearance, rather than broader ecological indicators.

A notable number of respondents, particularly individuals, chose not to answer the question, with 60% of Kenyan and 29% of Tanzanian individuals offering no response. This may reflect limited awareness or reluctance to comment on potentially sensitive environmental issues tied to livelihoods or governance.

Taken together, the data from Table 14 indicates a prevailing concern, especially among officials, that lake ecosystems are deteriorating. However, the mixed and sometimes non-committal responses from individual actors suggest a fragmented perception of environmental change. This underscores the need for broader environmental education, transparent dissemination of ecological data, and community engagement in environmental monitoring. Bridging the perceptual gap between institutional actors and local stakeholders will be essential for building a shared understanding of lake health and for informing sustainable fisheries management.

A.2 Declining quantity of fish produced

Respondents were asked to assess how the lake's fish production compares to five years ago. Table 15 presents the distribution of their responses, capturing concerns related to dagaa fisheries and perceived changes in the lake's productivity across different countries. Table 15 which follows, has actual catch data by FAO FishStat 2019–2022 (2024)

Table 15: Perceptions of changes in fish catches compared to five years ago

Change in the fish quantity	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	OFF	IND	OFF	IND	OFF	IND	OFF	IND	OFF	IND
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Decreased	6(55%)	3(23%)	7(70%)	5(50%)	10(63%)	11(69%)	11(73%)	8(38%)	34(65%)	27(45%)
Increased	2(18%)	1(8%)	2(20%)	1(10%)	0(0%)	1(6%)	2(13%)	1(5%)	6(12%)	4(7%)
Unchanged	2(18%)	1(8%)	1(10%)	3(30%)	5(31%)	2(13%)	0(0%)	3(14%)	8(15%)	9(15%)
Don't know	0(0%)	0(0%)	0(0%)	0(0%)	1(6%)	0(0%)	0(0%)	0(0%)	1(2%)	0(0%)
No answer	1(9%)	8(62%)	0(0%)	1(0%)	0(0%)	2(13%)	2(13%)	9(43%)	3(6%)	20(33%)
Total	11(100%)	13(100%)	10(100%)	10(100%)	16(100%)	16(100%)	15(100%)	21(100%)	14(100%)	17(100%)

Table 16: Capture fisheries production in inland waters by major producer & region

Country	2019	2020	2021	2022
	(thousand tonnes, live weight equivalent)			
Uganda	603	579	635	445
Tanzania	384	405	414	403
D.R. Congo	254	241	253	266
Kenya	103	105	114	108
Total of the Four	1,344	1,330	1,416	1,222

Source: FAO 2024¹

As shown in Table 16, A majority, 65% of officials and 45% of individuals, reported that catches had decreased. This perception was particularly strong among officials in Kenya (70%), the DR Congo (63%), and Tanzania (73%), as well as among individual actors in the DR Congo (69%). Only a small minority, 12% of officials and 7% of individuals, felt that production had increased, while about 15% in both groups perceived no significant change. Notably, high levels of uncertainty or non-response were recorded among individuals, especially in Uganda (62%) and Tanzania (43%), which may reflect either hesitancy to comment or limited information.

When considered alongside the FAO FishStat catch data (Table 16), these perceptions show both alignment and divergence. The statistical record confirms a sharp decline in Uganda, where production fell from 635,000 tonnes in 2021 to 445,000 tonnes in 2022, representing a drop of nearly 30%. Tanzania's catches, after peaking at 414,000 tonnes in 2021, also declined slightly to 403,000 tonnes in 2022. By contrast, the DR Congo shows a gradual increase, rising from 254,000 tonnes in 2019 to 266,000 tonnes in 2022, while Kenya's catches fluctuated but remained broadly stable, moving from 103,000 tonnes in 2019 to 108,000 tonnes in 2022.

¹ FishStat:Global Capture production 2019-2022) (Accessed on Aug 29, 2025). In FishatJ. Available at <http://www.fao.org/fishery/en/statistics/software/fishstatj>

Overall, the combined total for the four countries fell from 1.416 million tonnes in 2021 to 1.222 million tonnes in 2022, a significant regional decline of about 14%. These data suggest areas of clear alignment with fishers' perceptions, particularly the sharp downturn observed in Uganda and the regional decline overall, which resonate with officials' widespread concern about diminishing catches.

For instance, Tanzanian officials' strong perception of decline also reflects the downward trend visible after 2021. At the same time, notable contrasts emerge. In the DR Congo, despite many respondents perceiving reduced catches (63% of officials and 69% of individuals), FAO statistics show a gradual increase in overall production. This discrepancy may be explained by local ecological stressors such as stock composition changes, species-level declines, or intensified fishing effort, which affect fishers' daily experiences but are not necessarily reflected in aggregate national totals. Similarly, in Kenya, while 70% of officials reported a decline, the FAO data indicate a relatively stable production pattern. Such differences could stem from distributional issues, access to fishing zones, or localized overfishing pressures that are masked in the broader datasets.

Overall, the comparison underscores that perceptions of declining productivity are widespread and, in several cases, corroborated by FAO data. Importantly, the official statistics confirm this study's findings that the lake's productivity is in decline, a trend likely linked to the degradation of the wider lake ecosystem through destructive fishing practices and other environmental pressures. At the same time, the differences between perception and aggregate data highlight the need to integrate both statistical monitoring and fishers' experiential knowledge to form a more comprehensive understanding of fisheries sustainability. Despite some variation across countries, the findings point to mounting concern over ecological sustainability and reinforce the call for more inclusive and effective resource management strategies.

A.3 Changes in the diversity of fish

A second key area of environmental impact identified in the study concerns potential changes in fish biodiversity, particularly shifts in the variety of species present in the lakes. This is based on what respondents observe in their catches, whether targeted or incidental. To explore this dimension, participants were asked whether, compared to five years ago, they have noticed any changes in the variety of fish species harvested from the lake. Table 17 indicates responses provided by participants to the question of whether there have been changes in the variety of fish in their catches.

Table 17: Respondents' perceptions of changes in changes in the variety of fish species

Change in fish varieties	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	Officials	Individuals	Officials	Individuals	Officials	Individuals	Officials	Individuals	Officials	Individuals
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Decreased	10(91%)	9(69%)	7(70%)	4(40%)	8(50%)	7(44%)	9(60%)	8(38%)	34(65%)	28(47%)
Increased	0(0%)	0(0%)	0(0%)	1(10%)	8(50%)	0(0%)	0(0%)	3(14%)	8(15%)	4(7%)
Unchanged	1(9%)	1(8%)	2(20%)	0(0%)	0(0%)	7(44%)	3(20%)	2(10%)	6(12%)	10(17%)
Don't know	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
No answer	0(0%)	3(23%)	1(10%)	5(50%)	0(0%)	2(13%)	3(20%)	8(38%)	4(8%)	18(30%)
Total	11(100%)	13(100%)	10(100%)	10(100%)	16(100%)	16(100%)	15(100%)	21(100%)	52(100%)	60(100%)

As shown in Table 17, there appears to be a broad concern about declining fish diversity, particularly among officials. Across all countries, 65% of officials and 47% of individual participants reported a decrease in fish variety, indicating a widely shared perception that the lake's ecological composition is shifting, potentially due to environmental stressors, overfishing, or habitat degradation. Overall, the data from Table 17 suggest that a majority of actors, especially those in institutional roles, perceive a decline in the fish species' diversity. This perception reinforces broader concerns about the ecological impacts of

intensified fishing activities and highlights the importance of biodiversity monitoring within the dagaa trade context.

If one focuses the analysis on Kenya, which appears to have more readily available secondary data on catches by species, it is possible to select the years 2018 and 2023 to align with the question posed to participants in 2023 regarding their perceptions of changes in species diversity over the past five years. Accordingly, Table 6.15 presents the recorded catch data by species in 2018 and 2023 on the Kenyan side of Lake Victoria, allowing a concise comparison between participants' perceptions and the official catch records.

Interviews data in Table 18 show that over the five-year window, going back to 2018, most Kenyan officials perceived a decrease in the variety of fish species (70% “decreased,” 0% “increased”), while individual respondents were mixed, with many declining to answer (40% “decreased,” 10% “increased,” 50% “no answer”). This perception of narrowing diversity is consistent with what fishers and traders experience day-to-day, especially the visible decline of iconic or high-value species in landings and markets. Particularly, Kenya officials were among the most concerned, 70% observing a decline. The pattern of non-response may reflect either uncertainty or limited access to official catch data.

Table 18: Fish landings by Species in 2018 and 2023, Kenyan side of Lake Victoria

Species	2018 in Kg	2023 in Kg
Alestes spp-	7,829.71	3,709
Bagrus spp-	24,068.77	2,419
Micropterus spp (Black bass)-	34,444.22	8,762
Clarias spp-	748,785.72	1,133,053
Rastrineobola argentea	46,416,527.86	37,910,108
Labeo spp	3,040,174.36	9,117
Haplochromis spp	810,635.62	9,274,556
Lates niloticus	34,387,757.88	9,220,204
Mormyrus spp	935,734.74	17,155
Protopterus spp-	613,179.97	618,264
Synodontis spp	491,158.76	833,350
Oreochromis niloticus	2,919,046.96	6,224,640
Tilapia others	433,824.37	0
Carp	0	522
Caradina niloticus	7,175,517.00	860,229
Schilbe mystes	29,561.07	137,780
TOTAL	98,068,247	66,253,868

Source: Kenyan Annual Statistical Buletin 2018 and 2023²

Table 18 with the catch data for Kenya's side of Lake Victoria between 2018 and 2023 reveal a pronounced shift in species composition rather than a simple, uniform decline in catch quantities. The most economically salient drops are stark: Nile perch (*Lates niloticus*) fell by roughly 73% (≈ 34.4 million $\rightarrow \approx 9.2$ million kg), and *Caridina nilotica* by about 88% (≈ 7.18 million $\rightarrow \approx 0.86$ million kg). *Dagaa/omena* (*Rastrineobola argentea*) also declined, though more moderately (about 18%, ≈ 46.4 million $\rightarrow \approx 37.9$ million kg).

² Available on <https://kefs.go.ke/sites/default/files/2018%20Bulletin%20FINAL.pdf>

Such declines in species that historically dominate value chains strongly reinforce the perceived loss of “diversity,” because stakeholders often equate diversity with the continued presence of the familiar, high-value mix they depend on. At the same time, several groups increased notably: *Haplochromis* spp. rose by an order of magnitude (≈ 0.81 million $\rightarrow \approx 9.27$ million kg), *Oreochromis niloticus* (Nile tilapia) more than doubled (≈ 2.92 million $\rightarrow \approx 6.22$ million kg), and catfishes such as *Clarias* spp. and *Synodontis* spp. also grew.

In a strict ecological sense, this points to a compositional shift, from a perch- and *Caridina*-heavy assemblage toward a greater share of small cichlids, tilapiines, and some catfishes. Depending on how “diversity” is defined (richness vs. evenness vs. economic diversity), observers might reasonably experience this as a loss (because key flagship/value species waned) even though other species expanded. In short, perceived diversity fell because the economically and culturally salient species mix deteriorated, while the data show a re-balancing of the assemblage rather than an unambiguous collapse of biological variety.

Taken together, the Kenyan case suggests that the perception of declining species diversity over 2018–2023 reflects (i) a sharp contraction in total landings, and (ii) the disappearance or steep reduction of emblematic species (especially Nile perch and *Caridina*) from catches and markets. The official landings, however, also document countervailing increases in *Haplochromis* and tilapiines, indicating a redistribution of catch composition. Policy and management discussions should therefore track both: the social-economic salience of particular species (which shapes perceptions and livelihoods) and the ecological composition of the catch (which reveals system-level shifts and potential regime change).

B. Value and efforts for conservation

Efforts to balance fisheries sustainability with socioeconomic benefits emerged in participants' accounts from across the countries included in the study. Respondents were first asked to identify specific environmental impacts and conservation efforts they had

observed. The inquiry also sought to understand whether those whose livelihoods depend on fisheries value conservation, in order to contextualize the reported challenges.

Across the responses, a consistent theme was the inadequate implementation of fishing regulations, a lack of coordination among countries sharing the lakes, and economic pressures that often push fishers toward unsustainable practices. To a multiple response question on what specific environmental impacts are associated with the export/import activities of dagaa on the lake, the responses given by official participants are shown in Table 19 below.

Table 19: Environmental impacts of dagaa export/import

No	Specific environmental impacts associated with the export/import activities of dagaa	Frequency (N=75 responses)				TOTAL	
		Uganda	Kenya	DR Congo	Tanzania	N	%
1	Climate change & global warming	1	1	0	1	3	4
2	Deforestation	1	2	1	0	4	5
3	Domestic waste discharge into the lake	1	1	1	0	3	4
4	Eutrophication,	0	1	0	0	1	1
5	Floods from rising water levels	1	0	0	0	1	1
6	Growing population near the lake	3	2	4	2	11	15
7	Increased destructive fishing practices	1	3	0	3	7	9
8	Increased fishing efforts and gears	0	2	0	1	3	4
9	Loss of biodiversity	1	0	0	0	1	1
10	Nearshore farming - Runoff of chemicals	0	0	7	1	8	11
11	Pollution & unregulated waste disposal	7	7	8	3	25	33
12	Sand & stone extraction from the lake	0	0	1	0	1	1
13	Sedimentation	1	0	0	0	1	1
14	Unregulated lakeside constructions	0	0	2	0	2	3
15	Weeds proliferation	1	0	0	1	2	3
16	No impact	0	0	0	2	2	3
		18	19	24	14	75	100

Table 19 highlights a range of environmental issues cited by respondents, but not all can be directly attributed to dagaa fishing or trade. The most frequently mentioned issue was pollution and unregulated waste disposal (33%), which respondents across all four countries viewed as a significant threat to the lake ecosystem. While this suggests an association between fishing activities and increased pollution, it is not always clear whether these pressures originate from dagaa-related activities or from broader anthropogenic sources.

Population growth near the lake, reported by 15% of respondents, further reflects concerns about settlement expansion and general environmental stress, but again, this

factor is likely exogenous and not necessarily driven by the dagaa trade. Other commonly cited concerns include nearshore farming and chemical runoff (11%), particularly noted in the DR Congo, and increased destructive fishing practices (9%) in Kenya and Tanzania. Although these activities may coincide with dagaa fishing, the data do not provide conclusive evidence that the trade itself is the primary driver of these impacts. Less frequently mentioned issues include deforestation, climate change, and unregulated lakeside construction, which point to broader environmental challenges in the region. Only 3% of respondents reported “no impact,” indicating that environmental pressures are widely perceived, though their direct causal link to dagaa trade remains uncertain.

Overall, the data suggests that officials across the region recognize a wide array of interrelated environmental pressures, with pollution, population growth, and destructive fishing standing out as the most salient. These perceptions highlight the need for coordinated regulatory frameworks, improved waste management, and sustainable practices across the dagaa value chain to mitigate further environmental degradation.

Additionally, the same official respondents were asked whether local communities who observe these environmental impacts value conservation efforts related to the lake. Table 20 presents the proportions of their responses, indicating whether or not they believe communities place value on such efforts.

Table 20: Respondents’ views on local communities’ valuing of conservation efforts

Value of Conservation	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Yes	6	55	4	80	2	13	5	33	17	33
No	4	36	5	10	13	81	8	53	30	58
No answer	1	9	1	0	1	6	2	13	5	10
Don’t know	0	0	0	10	0	0	0	0	0	0
Total	11	100	10	100	16	100	15	100	52	100

Table 20 presents the perspectives of official respondents regarding whether local communities who rely on lake resources value conservation efforts. The data reveal a prevailing sentiment of skepticism among officials, with a majority, 58% of respondents

across all four countries, believing that communities do not value conservation. This view is particularly strong among officials in the DR Congo (81%) and Tanzania (53%), suggesting that in these contexts, conservation awareness or engagement is perceived as limited or inconsistent.

By contrast, only 33% of officials overall felt that local communities do value conservation. Support for this view was strongest in Kenya (80%) and Uganda (55%), indicating some degree of confidence in community-level environmental awareness and stewardship in those countries. These differences may reflect variations in national environmental policies, outreach programs, or levels of civil society engagement in conservation-related activities. A small proportion of respondents either did not answer the question (10%) or were not recorded as having a clear position, possibly indicating uncertainty or hesitancy in making such assessments. Notably, no respondents selected "*Don't know*," which suggests that most officials felt sufficiently confident in their perceptions of community behavior to provide a definitive answer.

Overall, the responses in Table 20 underscore a perceived disconnect between conservation goals and local community engagement, particularly in DR Congo and Tanzania. This highlights the need for more inclusive and participatory conservation initiatives that directly involve community members, raise awareness of environmental impacts, and build trust between local users and regulatory institutions. These findings suggest that advancing sustainable fisheries and lake management will require more than policy enforcement; it also demands active investment in fostering conservation values within the communities that depend on these ecosystems.

Regarding specific conservation measures, participants were asked whether they had observed any efforts to regulate fishing activities on the lake and, if so, to cite those efforts. Table 21 summarizes and categorizes the responses to this multiple-response question, as provided by both official and individual participants. As shown in Table 21, a range of conservation efforts observed by both official and individual participants across Uganda, Kenya, the DR Congo, and Tanzania is presented. Respondents were asked: "What conservation efforts have you observed that aim to keep the lake and its fish, particularly those linked to the dagaa trade, sustainable?" The responses collected highlight a

diversity of environmental interventions designed to protect lake ecosystems and fish populations, with particular reference to dagaa fishing practices.

The most frequently reported measure was the enforcement of fishing laws, such as patrols and the arrest of violators, cited in 35% of all responses. This emphasis was especially notable in the DR Congo (14 mentions) and Tanzania (6 mentions), indicating that formal regulatory enforcement is seen as the most visible strategy for managing dagaa fisheries. Other commonly mentioned measures included regulating fishing activities (15%), temporary seasonal closures of the lake (15%), and tree and macrophyte planting or watershed reforestation (also 15%), the latter being particularly prominent in the DR Congo.

Measures such as breeding area protection (13%) and sensitization or education campaigns on sustainable fishing practices (12%) also featured prominently. These suggest growing awareness of the need to protect fish habitats and engage communities in sustainable practices. Less frequently reported, but still notable, were actions like the establishment of protected areas, co-management initiatives, and bans or restrictions on nearshore construction, each mentioned by around 4–5% of respondents.

Table 21: Conservation efforts observed by participants to sustain the lake

No	Conservation measures seen being carried out	Frequency (N=108 responses)				TOTAL	
		Uganda	Kenya	DR Congo	Tanzania	N	%
1	Ban Omena (dagaa) fishing	0	1	0	0	1	1
2	Ban or restriction of nearshore construction	3	0	1	0	4	5
3	Breeding areas protection	0	3	4	3	10	13
4	Co-management	0	2	0	1	3	4
5	Constructions of waste disposal sites	0	1	1	0	2	3
6	Enforcing fishing laws, Patrols, violators arrests	3	3	14	6	26	35
7	Establish protected areas	1	2	0	1	4	5
8	Lake Cleanup Campaign, waste removal	1	1	0	0	2	3
9	Monitoring industrial discharge limit to the lake	0	1	0	0	1	1
10	Pit Latrine construction	0	1	0	0	1	1
11	Plastic recycling	1	0	0	0	1	1
12	Promote alternative livelihoods / Monitor water quality	0	1	1	0	2	3
13	Regulating fishing activities	1	2	4	4	11	15
14	Restocking fish	1	0	0	0	1	1
15	Sensitization of people to smart fishing, educating fishers	2	2	2	3	9	12
16	Temporary Seasonal Closure of the Lake	1	1	6	3	11	15
17	Tree & macrophytes, planting, watershed reforestation	2	0	9	0	11	15
18	Waste & pollution reduction, prevent waste dumping	1	2	0	0	3	4
19	Regional Management Mechanism	2	1	1	0	4	5
20	None	1	0	0	0	1	0
	Total	20	24	43	21	108	100

While these responses highlight a range of conservation strategies being implemented or observed, they also point to significant variation across countries. For instance, tree planting was noted only in the DR Congo, and construction of waste disposal sites appeared solely in Kenya and the DR Congo. A small number of respondents (just 1 out of 108 responses) indicated no observed conservation efforts, suggesting a generally

positive awareness of ongoing environmental initiatives, even if their effectiveness may vary.

In sum, Table 21 reflects both the diversity and uneven distribution of conservation activities across the region. It illustrates that enforcement remains the most visible and widely recognized intervention, while participatory and ecological approaches, such as education, habitat restoration, and co-management, are gaining traction in certain contexts. These findings underscore the need for more integrated, cross-border conservation strategies that combine regulation with community-based and ecosystem-focused approaches to ensure long-term sustainability of lake resources.

The final question under this theme was directed specifically to official participants, a category composed exclusively of individuals outside the dagaa value chain. It examined the possible influence of conservation efforts on dagaa export activities, whether positive or negative. Table 22 presents their responses.

Table 22: Views on the influence of conservation measures on dagaa export activities

Conservation measures' effects	Uganda		Kenya		DR Congo		Tanzania		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Positively	5	45	8	80	14	88	6	40	33	63
Negatively	4	36	1	10	1	6	4	27	10	19
No effect	1	9	0	0	0	0	0	0	1	2
No answer	1	9	1	10	1	6	5	33	8	15
Total	11	100	10	100	16	100	15	100	52	100

Table 22 presents respondents' views on whether conservation measures have an effect on the dagaa export market, revealing a generally positive perception of the relationship between environmental protection and trade outcomes. Across the four countries, 63% of respondents indicated that conservation measures positively affect the dagaa export market. This view was most strongly held in the DR Congo (88%) and Kenya (80%), suggesting that in these contexts, regulatory and environmental efforts are perceived as

contributing to the long-term viability and perhaps even the quality or marketability of dagaa exports.

In contrast, a smaller proportion of respondents (19%) overall viewed conservation measures as having a negative effect on the export market. This sentiment was particularly noticeable in Uganda (36%) and Tanzania (27%), potentially reflecting concerns that restrictions or regulatory enforcement might limit fishing activities, reduce supply, or increase operational burdens on local actors involved in the trade. Only one respondent believed that conservation measures had no effect, while 15% did not provide an answer, with Tanzania showing the highest proportion of non-responses (33%).

These findings suggest that while there is broad support for conservation among stakeholders, there remains a degree of ambivalence or concern in some contexts regarding the short-term trade-offs involved. Overall, however, the dominant perception across countries is that conservation measures are beneficial to sustaining the dagaa export market, likely by supporting ecological stability, ensuring product availability, and enhancing compliance with quality or sustainability standards required by international buyers.

Furthermore, the findings revealed tensions between economic and environmental priorities, which varied depending on the actors' positions within the dagaa value chain. Many fishers prioritized economic survival over conservation efforts, as poverty and the absence of alternative livelihoods often compelled them to disregard existing regulations. In the DR Congo, for instance, some fishers expressed the view that lake closures for conservation purposes could lead to starvation (441:163-CD). Among fish sellers, there was a shared concern that conservation measures negatively impacted their sales due to reduced availability of fish amidst persistently high demand. Additionally, actors with lower capital investment perceived conservation regulations as disproportionately favoring wealthier traders. In contrast, smaller-scale fishers and traders often struggled to comply with the regulations while sustaining their livelihoods (574:74-KE).

To conclude, the dagaa trade on Lake Tanganyika and other East African lakes reflects a complex interplay between economic survival and environmental sustainability. Although

various conservation efforts are in place, their effectiveness is often undermined by weak governance, inadequate infrastructure, and persistent economic pressures that drive unsustainable fishing practices. Ensuring the long-term sustainability of the trade will require strengthened regulatory enforcement, targeted investments in storage and processing infrastructure, and the development of inclusive policies that balance the livelihood needs of fishers with broader conservation objectives.

7.0 Discussion and conclusion

This section synthesizes the findings presented in Section 8 with the key themes outlined in the literature review (Section 3), while connecting the main results to the research questions (Section 6) and objectives (Section 4). The aim is to interpret the significance of the study's results, highlight key insights, and propose implications for policy and future research.

7.1 Key findings and contribution

The analysis of women-led dagaa trade networks from the African Great Lakes to Canada confirms many of the dynamics observed in existing literature but also reveals important new insights. Consistent with the literature (Belton et al., 2022; FAO, 2022; Basurto et al., 2025), the study reaffirms the essential role of small-scale fisheries in local livelihoods and international trade. Participants across the value chain, especially women, occupy central positions in fish processing and distribution, reinforcing longstanding findings in the fisheries literature (Basurto et al., 2025; Harper et al., 2013; Pedroza-Gutiérrez & Hapke, 2022; Weeratunge et al., 2010) that women are indispensable yet often under-recognized actors in the fisheries economy.

One of the most important contributions of this study is its illumination of the dual economic and ecological pressures affecting dagaa fisheries. While economic pursuit remains the dominant priority for most fishers and traders, ecological concerns are evident, particularly among officials. As highlighted in the literature (LVFO, 2021; Njiru et al., 2012), overfishing, habitat degradation, and pollution continue to threaten the

sustainability of small fish species such as dagaa. This study builds on these concerns by documenting respondents' perceptions of changing fish varieties and lake health (Table 14 and Table 17), which suggest a gradual but concerning ecological decline.

Another important finding is that respondents across the four countries emphasized the positive role of conservation measures in supporting the dagaa export trade. In both the DR Congo and Kenya, this view was expressed particularly strongly, with regulatory and environmental initiatives seen as safeguarding the long-term future of the fishery. Such measures are not only associated with sustaining catches but also with enhancing the quality and market appeal of dagaa. This suggests that conservation is understood locally as a forward-looking investment in livelihoods and trade opportunities.

From a structural perspective, the findings confirm that the dagaa trade remains largely informal and highly fragmented, with weak regulatory oversight and significant barriers to accessing international markets. The Structure-Conduct-Performance (SCP) model applied in the study effectively highlights how intermediaries dominate market operations and exert price control, often at the expense of producers and small-scale traders. These dynamics reflect a value chain architecture that perpetuates inequality and limits the economic mobility of women-led businesses. Furthermore, the Political Ecology framework sheds light on how broader socio-environmental pressures, such as climate change and weak governance, constrain both ecological sustainability and socioeconomic inclusion.

Ultimately, the study underscores the urgent need to balance economic livelihood strategies with ecological sustainability and gender equity. Only through integrated and participatory approaches can small fish value chains such as dagaa continue to contribute meaningfully to global food security and inclusive development.

7.2 Answering the research questions

In addressing the first research question, which asked about the organization of the dagaa export market and its environmental impacts, the study reveals a disjointed supply chain with low levels of coordination and enforcement. Conservation efforts, while present, are

perceived as insufficient or inequitably applied. Table 22 shows that although a majority of participants acknowledge some positive conservation outcomes, many also express concerns about poor implementation and lack of community engagement.

The second research question, focusing on consumption patterns and cultural value in Canada, confirms that dagaa retains high cultural significance for diaspora communities. However, findings also indicate missed opportunities to connect this demand with Canadian fisheries through local substitution strategies. This gap aligns with earlier observations by the World Bank (2012) and Ward (2003) on the challenges of integrating diaspora demand into local food systems.

With regard to the third research question, exploring potential for dagaa-like fish production in Canada, the study finds cautious optimism. While participants acknowledged the sensory and cultural importance of African-sourced fish, they also recognized that with proper adaptation in processing and marketing, Canadian fish could serve as a viable alternative. This insight opens pathways for local economic development and sustainability through diversification of supply sources.

7.3 Concluding summary

This research focused on women-led dagaa trade networks between the African Great Lakes region and Canada, mapping key actors, financial flows, and market connections. Using data from both regions and global fish sustainability literature, it assessed the trade's socio-economic and environmental impacts as well as explored the potential of Canadian-sourced alternatives to meet the growing demand of the African diaspora. Applying the Structure-Conduct-Performance model and Political Ecology framework, findings reveal that small-scale fisheries in the Great Lakes region underpin a culturally significant but environmentally pressured trade, with dagaa sold at premium prices in Canada due to limited supply and high diaspora demand. The research underscores the need for further study and policy development to support a market that could potentially complement imported dagaa with Canadian-sourced small fish, easing pressure on AGL fisheries and creating economic opportunities in Canada.

In conclusion, this study advances debates on global small-scale fisheries and transnational trade in several ways. First, it highlights entrenched informalities and inequities in the dagaa value chain, felt most acutely by small-scale women traders. Second, it documents the central yet ambivalent role of intermediaries who coordinate cross-border logistics and working capital but also exercise disproportionate market power, set prices, extract high margins, and shift risk downstream, thereby amplifying gendered and scale-based inequities. Third, it identifies an ecological knowledge gap at the grassroots level, with many respondents unaware of long-term environmental impacts. Fourth, it draws attention to the disconnect between trade policy and conservation goals, suggesting a need for more integrated, cross-border governance frameworks.

Building on these findings, the study recommends policy interventions that improve market transparency and price transmission (e.g., simple contracts, public reference prices), expand women-focused finance and cooperative procurement, and formalize intermediary functions through light-touch regulation and digital traceability. It further calls for harmonized regional standards to align trade facilitation with sustainability objectives. Finally, it underscores the potential of Canadian small-fish value chains to complement imports if suitable local substitutes can be developed, reduce pressure on African fisheries, and create inclusive economic opportunities within diaspora communities, provided that intermediary power is balanced by fair competition, cooperative models, and informed local ecological stewardship.

Table 23: Summary of key Findings within the Structure-Conduct-Performance framework

Segment	Structure STRUCTURE of the Supply Chain	Conduct CONDUCT of the export dagaa market	Performance PERFORMANCE of dagaa trade
Production	Key Actors: Small-scale fishers, community fishing groups Key Resources: Lake access, fishing gear, boats, informal knowledge Features: Declining catch volume and species diversity; limited fishing zones	Key Behaviors: Fishers prioritize daily income over regulations Decision Drivers: Poverty, lack of alternatives, weak monitoring Power Dynamics: Limited voice in regulation design; often excluded from co-management	Outcomes: Environmental degradation (overfishing, biodiversity loss) Benefits: Basic income support for vulnerable groups Challenges: Resource depletion, marginalization of small-scale actors in policy spaces
Distribution	Key Actors: Female fish processors and traders, middlemen, informal transporters Key Resources: Drying racks, storage (often lacking), local markets, cross-border access Features: Dominated by women, highly informal	Key Behaviors: Reliance on personal networks and intermediaries Decision Drivers: Lack of infrastructure, capital constraints, inconsistent rules Power Dynamics: Middlemen control pricing; women face barriers to formal market access	Outcomes: High post-harvest losses; unequal profit distribution Benefits: Income for informal women-led businesses Challenges: Infrastructure gaps, lack of coordination between countries, gendered access to resources
Consumption	Key Actors: Diaspora consumers, small-scale exporters/importers, informal vendors Key Resources: Cultural identity, informal social networks, digital platforms (e.g. WhatsApp) Features: Niche, ethnic-based growing demand	Key Behaviors: Informal sourcing and sharing among diaspora communities Decision Drivers: Cultural preference, high demand, limited supply Power Dynamics: No formal retail system; diaspora relies on personal ties for access to dagaa	Outcomes: Unmet market demand; low health or quality standards Benefits: Cultural connection and food security for diaspora groups Challenges: Informality, regulatory absence, missed opportunity for fair and formal trade

7.4 Policy recommendations:

(i) Make intermediation fair & transparent

This study points to a practical agenda that begins with intermediaries. Because they coordinate capital and logistics yet shape prices and risk, policy should make their role fair and transparent, with public reference prices, simple micro-contracts in local languages with payment-on-delivery via mobile-money escrow, and light licensing conditions (digital receipts, posted spreads, fast grievance resolution). Such measures align with broader evidence emphasizing the importance of transparency, inclusive market governance, and equitable value chain participation in improving outcomes for small-scale fisheries actors (Gereffi et al., 2005; FAO, 2015; Bush et al., 2019).

(ii) Enable women's upgrading in the chain

Women's participation rises when access and finance are redesigned: reserve priority time blocks for women at drying racks, storage bays, and stalls; pair this with inventory-backed microcredit and micro-leases for improved technology including, where practical, solar dryers and moisture meters so women traders can scale with quality and reliability.

(iii) Unclog logistics & borders

To reduce recurrent stock-outs and price spikes, pilot "green corridors" for small-fish consignments at one-stop border posts, pre-cleared documents, sealable bins, and risk-based inspections, while trader associations pool freight and publish shipment calendars tied to basic moisture/packaging standards.

(iv) Align governance with real trading practices

Meet practice where it happens: offer amnesty-to-compliance pathways and joint spot audits to bring rerouted volumes on-book without suppressing informality; tie license renewal to price display, digital receipts, and participation in dispute mechanisms; test these through 90-day pilots at key lake nodes. Such adaptive and incentive-based approaches are consistent with governance strategies that emphasize co-management, gradual formalization, and alignment with existing practices rather than strict enforcement alone (Ostrom, 1990; FAO, 2015; Kooiman et al., 2005).

(v) Leverage the Canada–diaspora channel

Organize diaspora purchasing cooperatives (e.g., in Winnipeg, Toronto, and Edmonton) with importer facilitation and QR-based traceable labels (indicating lake, species, month, and association) that comply with CFIA regulations. At the same time, explicitly promote Canadian-sourced fish substitutes in diaspora markets to reduce ecological pressure on African lakes, particularly during conservation measures, fishing closures, or supply bottlenecks

7.5 Future research directions and plans

The research underlying this report contributed to the development of a successful proposal to the New Frontiers Research Fund–International program and to an ongoing collaboration with the Common Market for Eastern and Southern Africa (COMESA). Both initiatives seek to integrate climate resilience into fish food systems in Africa and Canada, with a particular emphasis on women-led market networks and their role in advancing sustainability, nutrition, and economic development. An important goal of these initiatives is to support more sustainable food systems by better coordinating trade in dried dagaa between Africa and Canada.

Other research directions deriving from this work can include projects along the following lines:

- (i) Longitudinal studies to monitor ecological changes and fish diversity in dagaa-producing lakes.
- (ii) Furthermore detailed analysis of dagaa value chains in the African Great Lakes region.
- (iii) Comparative analyses of dried fish trade networks between Africa and other global regions.
- (iv) In-depth exploration of the cultural dimensions of fish consumption among African diaspora communities in Canada.
- (v) Product development experimentation using Canadian sourced small-fish species.

- (vi) Policy impact assessments on gender-inclusive fisheries governance in the African Great Lakes region.
- (vii) Examination of gendered dynamics of economic engagement and visibility in the dagaa trade, clarifying whether observed imbalances reflect sampling limitations, structural barriers, or shifting roles across the value chain.

Beyond this report, the project has also generated a companion photo essay that visually documents key actors, places, and practices across the African Great Lakes dagaa value chain. Future knowledge mobilization activities will continue to build on both this report and the photo essay to engage academic, policy, and public audiences and to promote greater awareness of women-led fisheries, sustainability, and transnational dried fish trade (Namwira & Johnson, 2024).

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