



Mauritius
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Technology

Strengthening Food Security in Mauritius: the vital role of the fisheries sector

An overview with recommendations
to policymakers



December 2024



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FOREWORD

Mauritius faces significant challenges in achieving food security, as it relies heavily on imports to meet its food requirements. This dependence makes the country vulnerable to market fluctuations and disruptions. In 2022, food imports accounted for nearly MUR 47 billion (USD 1 billion), representing almost 20% of the country's total imports. The Mauritius Academy of Science and Technology (MAST) conducted a review of the status, constraints and challenges within the crops and livestock sectors. It made recommendations as to how local production can contribute to reducing food import dependency (MAST, 2024). Addressing food security requires a holistic approach, with resource optimisation being key to strengthening our food systems. The fisheries sector, with an undeniable potential, was not covered in the report. This review aims to fill that gap by highlighting the importance and potential of the fisheries sector, which, alongside the crop and livestock sectors, can contribute to the resilience and sustainability of Mauritius's food systems.

The fisheries sector in Mauritius is important to the nation's economy and vital for ensuring food security for its population. As a small island developing state with an Exclusive Economic Zone of 2.3 million km² (United Nations Sustainable Development Cooperative Framework, 2024-2028) and an extended continental shelf area of 396,000 km² jointly managed with Seychelles, Mauritius has, through various fisheries, including artisanal, tuna, deep-sea demersal and aquaculture, not fully utilised the potential of its marine resources. This document presents a thorough analysis of the fishing sector, accentuating its achievements, challenges and future prospects with respect to its role in food security.

Fish and seafood constitute fundamental components of the diet of Mauritian people with an approximate daily mean consumption 29.6 g of fresh/frozen fish *per capita*, compared to 30.8 g of poultry or white meat *per capita* (Mauritius Nutrition Survey, 2022). The nutritional value of fish and seafood is essential for the health and well-being of the population. The fishing industry contributes to food security by ensuring a steady supply of these critical basic nutritional elements, of proteins and nutrients. With the increase in fish production over the years, the dietary requirements of the population are being met. This document focuses on various types of fisheries practiced in Mauritius and their roles towards food security in the country, accentuating their importance in supporting food security.

Artisanal/coastal fishing, in particular, is one of the main sources of local fish supply, providing the nutritional needs of the local population. In spite of facing several challenges, such as the impact of overfishing, economic downturn, and climate change, the artisanal fisher folk remains resilient. Several initiatives, including the deployment of Fish Aggregating Devices (FADs), have helped in improving the productivity and sustainability of the local fisheries.

This 'Policy Booklet' was finalised following a Validation Workshop held on 28 November 2024 at the University of Mauritius. The workshop brought together key stakeholders from the fisheries sector, including representatives from ministries, academic institutions,

research and innovation institutes, economic and development bodies, international/regional organisations, and non-governmental organisations (NGO). The feedback from these diverse stakeholders has been invaluable in shaping the science-based recommendations provided to policymakers. Policy booklets developed by science academies, in consultation with such key stakeholders, play a critical role in bridging the gap between scientific research and policy-making.

We hope that this document will enable the reader to gain a better appreciation of the importance of the fisheries sector in relation to food security in Mauritius. Our ocean's resources, and the people who are dependent on them, need to be protected. Ensuring a sustainable and strong fisheries sector is essential for the nutritional needs of the population and for ensuring food security for the present and future generations.

Prof. Goolam Mohamedbhai, GOSK

President, Mauritius Academy of Science and Technology

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ACRONYMS AND ABBREVIATIONS

AFRC	Albion Fisheries Research Centre
CFPD	Catch per fisherman per day
EDB	Economic Development Board
EEZ	Exclusive Economic Zone
EU	European Union
FADs	Fish Aggregating Devices
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
MoBEMRFS	Ministry of Blue Economy, Marine Resources, Fisheries and Shipping
MOI	Mauritius Oceanography Institute
MUR	Mauritian Rupee
NGOs	Non-Governmental Organisations
PTM	Princes Tuna (Mauritius) Ltd.
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

The rich and diverse marine resources of Mauritius are part of the backbone of the economy and has the potential to increase its contribution to the food security of the country. With an Exclusive Economic Zone (EEZ) of about 2.3 million km² and a jointly managed extended continental shelf area of 396,000 km² with the Seychelles, the local fisheries industry comprises artisanal/coastal fishery, tuna fishery, deep-sea demersal fishery, and aquaculture fishery.

Over the last 20 years, fish production has increased from 7,842 tonnes in 2000 to 36,098 tonnes in 2023. This growth has resulted from an increase in the fisheries in the high seas and the lagoon, with artisanal fishery output increasing at an average annual rate of 1.64% while industrial fishery output growing at 3.53%.

The economy of Mauritius is heavily reliant on the import and export of fishery products, such as frozen and canned fish. The sector contributes close to 1% of the nation's GDP (MUR 16 billion in 2023), represents 19% of national exports, and provides employment to 22,000 people. However, it faces many challenges, including climate change, overfishing, illegal, unreported, unregulated (IUU) fishing, and lack of investment. These issues, along with institutional barriers and the pressing need for up-to-date scientific data, may restrict the sustainability and efficiency of the sector.

Fish and seafood are important components of a diet, providing high-quality protein and essential nutrients. The artisanal fishery, although facing ecological and economic inroads, is still a key supplier of fresh fish for local consumers, thus establishing the role of the industry towards ensuring food security for the population.

Addressing the sector's interrelated challenges requires an integrated response. Resilient legal policy instruments and their enforcement, as well as sustainable aquaculture practices, must be adequately promoted. Moreover, there is a need to promote community engagement, capacity development initiatives, and stakeholder involvement to ensure a resilient and productive fisheries sector. The government's investments, strengthened by international partnerships in sustainable practices, have the potential to improve food security and economic growth in this sector.

The report offers recommendations to policymakers to (1) prioritise the collection of data required for effective management, (2) support and empower small-scale local fishers, and (3) endorse sustainably managed oceans as prime suppliers of fish and other seafood as a component of healthy diets.

1. INTRODUCTION

Mauritius has an Exclusive Economic Zone (EEZ) spanning more than 2.3 M km² (United Nations Sustainable Development Cooperative Framework, 2024-2028). It engages in diverse fishing activities, including coastal fishing tuna fishing, deep sea demersal fishing and aquaculture. The fishing sector plays an essential role in the Mauritian economy by supporting food security and offering employment opportunities for a considerable portion of the population. This industry contributes to 1% of the country's Gross Domestic Product (GDP). It plays a key role in generating foreign income by accounting for around 19% of national exports, while also providing jobs for approximately 22,000 individuals involved in various aspects of fish production.

The goal of the fisheries sector is to sustainably provide a steady supply of fresh fish and seafood to local markets to meet the dietary requirements of the local population. It also aims to boost the utilisation of fisheries, which contributes to food security by reducing dependency on imported fish, thereby improving the robustness of the food supply chain. Moreover, by backing the livelihoods of fishing communities and advocating for sustainable methods, the fishing industry contributes to enhancing the welfare and nutritional stability of the country.

2. TYPES OF FISHERIES

Coastal fisheries

Coastal fishery entails artisanal, amateur and sports fisheries. Local fishers engage mostly in the artisanal fishery and use traditional boats, pirogues and traditional fishing gears, including basket traps, hooks and lines, harpoons and various nets such as large, gull, canard and cast nets. The pirogues are fitted with outboard motors, oars, sails, and occasionally with inboard motors. Estimates of the total annual catch from coastal fisheries ranged from 606 to 840 tonnes over the period 2019-2023 and have been categorised by the gear used in Table 1.

Gear-type	2019	2020	2021	2022	2023
Basket trap	291,500	210,300	227,285	247,585	264,100
Line	242,800	175,100	189,295	206,202	219,900
Basket trap & Line	37,800	27,300	29,475	32,108	34,200
Large net	189,800	137,000	148,030	161,251	172,000
Gill net	10,900	7,900	8,515	9,276	9,900
Cast net/ Harpoon/ on foot	67,200	48,500	52,400	57,080	60,900
Total	840,000	606,100	655,000	713,502	761,000

Source: Annual Report on Performance for the Financial Year 2023-2024; Ministry of Blue Economy, Marine Resources, Fisheries, and Shipping

Fish Aggregating Devices

Twenty-one (21) out of twenty-eight (28) active Fish Aggregating Devices (FADs) around the island of Mauritius are providing a livelihood for local fishers. A FAD is a permanent, semi-permanent or temporary structure or device made from different materials and used to lure fish. They attract pelagic migratory fish species to facilitate fishing practices for local fishers. These fish species may include tuna (*Thunnus* sp.), common dolphinfish (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*) and marlin (*Makaira* sp.). FADs fishery produced 191 tonnes of fish (Annual Report MoBEMRFS, 2022-2023). In 2023, a Mobile App, RodMoFAD was developed and tested under the UNDP ECOFISH Project to help FADs' fishers locate and access fish data (Annual Report MoBEMRFS, 2023-2024).

Fisheries on remote banks

The Mauritius-Seychelles ridge includes the Nazareth and Saya de Malha Banks, St. Brandon Islands Banks, Soudan Bank and Albatross Bank. This is where most of the bank fishing activities are located. Most of the catch consists of *Lethrinus* species, such as *Lethrinus mahsena* (Dame Berri) and *Lethrinus rubrioperculatus* (Caya) while species such as *Caranx ignobilis* (Carangues), *Aprion virescens* (Vacoas), *Variola louti* (Croissant), and *Epinephelus* spp. (Vieilles) account for the remaining of the catch. The annual offshore demersal fishery production ranged from 1,068 to 2,046 tonnes for 2019-2023 (Table 2). It is noteworthy that though fish biomass (measured in kg/ha) is a vital metric in assessing the effects of fishing activities and the general condition of ecosystems, it is not a standard parameter quantified in the Western Indian Ocean (WIO). A recent study by Ricot *et al.*, (2024) indicated that five (5) out of eight (8) studied sites in St. Brandon exhibited total fish biomass above the WIO benchmark of 1,150 kg/ha, with fish biomass above 4,000 kg/ha at some sites. Some of the recorded high fish biomass are comparable to the Chagos and Seychelles waters. These are indicative of sustainable fisheries possibly being practised at the bank fisheries around St. Brandon and require further long-term studies to thoroughly understand the fish biomass and population dynamics for informing fisheries management.

Year	Saya de Malha	Nazareth	St. Brandon	Soudan	Albatross	Total
2019	719	895	273	13	146	2,046
2020	330	697	203	1	118	1,349
2021	116	856	171	1	73	1,217
2022	176	638	161	<1	92	1,068
2023	245	839	255	<1	102	1,442

Source: Annual Report on Performance for the Financial Year 2023-2024; Ministry of Blue Economy, Marine Resources, Fisheries and Shipping

Tuna and swordfish fisheries

Mauritius is a member of the Indian Ocean Tuna Commission (IOTC). Under regulated fishing licenses, purse seiners (Table 3) or foreign long liners (Table 4) engage in tuna fishing activities in the Western Indian Ocean. However, some local agencies have concerns concerning the fishing methods used and the sustainability of this fishery. Species such as albacore tuna (*Thunnus alalunga*), yellowfin tuna (*Thunnus albacares*), Bigeye tuna (*Thunnus obesus*) and swordfish (*Xiphias gladius*) make up most of the catch. From 2019 to 2023, no local vessel carried out sword fishing. In 2023, the IOTC Resolution

23/03 implemented a Voluntary Fishery Closure to rebuild overfished tropical tuna stocks. This closure took place for a whole month from 15 May to 15 June 2024 (Annual Report MoBEMRFS, 2023-2024).

Table 3. Catch of purse seiners (tonnes) from 2019-2023	
Year	*Catch of purse seiners (tonnes)
2019	27,082.7
2020	20,549.0
2021	25,803.2
2022	25,804.7
2023	24,920.0

*Include tunas and tuna-like species

Source: Annual Report MoBEMRFS, 2023-2024

Table 4. Catch of long liners (tonnes) from 2019-2023	
Year	Catch of long liners (tonnes)
2019	804.3
2020	58.2
2021	21.8
2022	3,384.8
2023	5,866.2

Source: Annual Report MoBEMRFS, 2023-2024

Marine macro-invertebrates

Marine macro-invertebrates from the local reefs serve as a source of protein for the coastal residents. Due to easy access to the reefs, the marine macro-invertebrates have been overharvested for local consumption (Mohammed, 1994). These species include marine snails *Turbo setosus* (rough turban) and *Pleuroploca trapezium* (striped fox conch or trapezium horse conch).

Aquaculture and other products

Sea-floating cages

In 2011, approximately 458 tonnes of fish were estimated to have been harvested from floating cages, including *Sciaenops ocellatus* (red drum), *Dicentrarchus labrax* (sea bass),

Rhabdosargus sarba (goldlined sea bream). According to the Albion Fisheries Research Centre (AFRC) Report (2011), 236 tonnes of chilled red drum of the production were mainly exported to destinations such as France, Italy, Portugal, Spain, South Africa and USA. For 2022-2023, production from aquaculture totalled 1,680 tonnes (Annual Report MoBEMRFS, 2022-2023).

Barachois aquaculture: freshwater fishes, crabs, prawns

Barachois are shallow closed/semi-closed lagoons or ponds selected as fish farming zones. This type of fishery involves stocking up fingerlings of targeted marine organisms and letting them grow until they reach maturity and are suitable for the market. According to the AFRC report, in 2011, the barachois-based fish farming production amounted to 1 tonne of marine fish, 1.2 tonnes of mud crabs, 71.1 tonnes of Berri Rouge, and 3 tonnes of freshwater prawns.

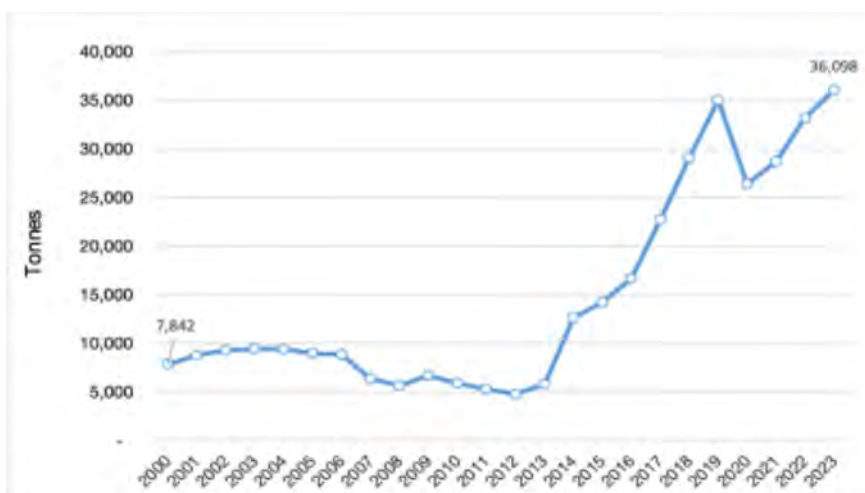
Coral nurseries and transplantation

Over the last decade, the AFRC and the Mauritius Oceanography Institute (MOI) have been involved in coral nursery initiatives. Additionally, local non-governmental organisations (NGOs) such as Reef Conservation and Eco-Sud, have also participated in the coral nursery initiatives as well as mangroves and seagrass restoration programmes. They aim to restore local coastal ecosystems as well as explore potential opportunities of trading farmed corals. Coastal ecosystems provide habitat and offer feeding and breeding grounds to marine organisms, in turn supporting the marine production and the coastal economy. Hence, the initiative of rehabilitating the coastal ecosystems would not only highly benefit the fisheries sector but also contribute to the nation's economy.

3. FISH PRODUCTION

The fisheries sector in Mauritius is vital in maintaining food security by providing fish and fish products to its population. Fish production has been on the rise over time, contributing significantly to the dietary needs of the Mauritian people (Figure 1).

The total production of fish and fish-related production has risen from 7,842 tonnes in 2000 to 36,098 tonnes in 2023, reflecting a consistent annual increase of approximately 7.02% over the period 2000-2023. This significant rise in production is related to the increase in catch from the high seas. Venturing into deeper waters such as Saya de Malha, Nazareth and St. Brandon, foreign fleets undertake the majority of industrial fishing in Mauritian seas. Princes Tuna (Mauritius) Ltd. (PTM) is the largest tuna business in the Indian Ocean and the African continent, with over 40 years of tuna processing experience.



Source: Statistics Mauritius 2000-2023

Figure 1. Total fish production (tonnes) for Mauritius from 2000 to 2023

Thousands of households rely on artisanal fishing for a supply of protein in the form of fresh fish from local markets. They also face obstacles such as the degradation of marine and coastal biodiversity, competition from semi-industrial fishing and the impact of COVID-19 lockdowns in 2020-2021. Despite these challenges, local artisanal fishermen continue to be the primary providers of fresh fish to the local market, making a substantial contribution to the island's food security. Numerous programmes were executed in Mauritius to aid fishermen and artisanal fishing, including:

Fish project (UNDP, 2023): enforced by the United Nations Development Programme (UNDP), the initiative helps artisanal fishermen discover new fishing areas and encourages sustainable fishing methods, thereby increasing their climate change resilience and protecting the marine biodiversity.

Canotte scheme (MoBEMRFS, 2022): The programme facilitated the purchase of fishing equipment, including boats and accessories, tailored for deep sea fishing.

Fish Aggregating Devices (FADs): FADs have been used since 1985. They attract pelagic fish species and create new off-lagoon fishing zones by placing them in strategic locations, hence allowing artisanal fishers to boost their per-day catch. Compared to 5-6 kg in the demersal lagoon fishery, the mean catch from the FAD fishery is about 35 kg. Rodriguez-Tress *et al.* (2017) has documented 23 FADs fishing zones around Mauritius.

In 2010, around 2,104 tonnes of fresh fish were produced by the artisanal fishery in Mauritius but this decreased to 1,442 tonnes in 2022 (Table 5). This decline in fish production by the artisanal fishery may be attributed to multiple factors, including the decline of fish stocks in the lagoons, the disruptions caused by the COVID-19 lockdowns and the MV Wakashio oil spill event in 2020, which temporarily paused all fishing activities by local fishers. Several fish species, mostly fin fish, shellfish, and molluscs, were affected. It is noteworthy that the total fish production increased from 5,887 tonnes in 2010 to 33,226 tonnes in 2022, primarily due to increases in industrial fishery (Table 5).

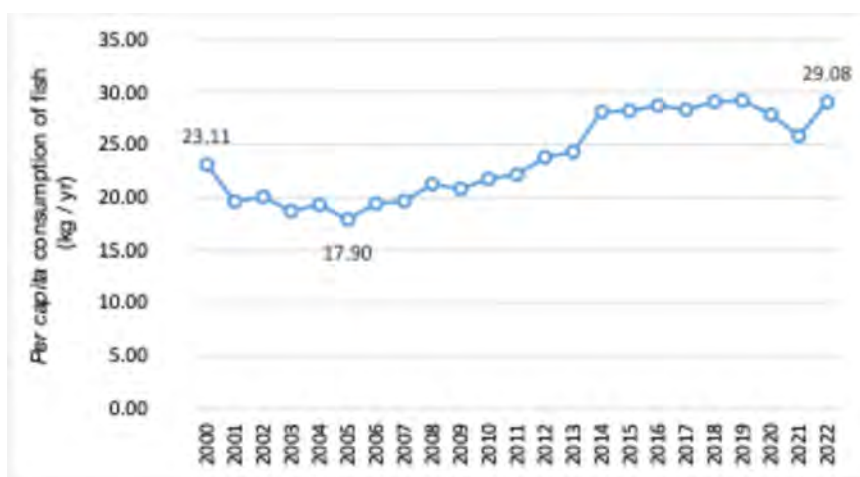
Table 5. Artisanal and industrial fishery production (tonnes)				
Year	Artisanal fishery	Industrial fishery	Fresh water and marine aquaculture	Total fish production
2010	2,104	2,882	561	5,887
2011	2,100	2,662	520	5,283
2012	1,888	2,383	509	4,780
2013	1,749	3,625	421	5,795
2014	1,409	10,189	774	12,351
2015	1,559	10,339	771	12,650
2016	1,804	13,877	1,017	16,698
2017	1,758	19,887	1,087	22,732
2018	2,050	25,503	2,052	29,255
2019	1,722	30,099	3,234	35,055
2020	1,133	22,000	3,282	26,415
2021	1,140	25,335	2,294	28,769
2022	1,442	30,261	1,523	33,226

Source: Statistics Mauritius (2010-2022)

4. PER CAPITA CONSUMPTION OF FISH AND RELATED PRODUCTS

The importance of fish in the local diet is reflected by the *per capita* consumption of fish in Mauritius which has been rising consistently over time. Fish has a high nutritional value and is a source of essential proteins, omega-3 fatty acids and other components crucial for wellbeing and health. This explains the growing consumption of fish and fish products by the population. According to the Food and Agriculture Organisation (FAO), fish is a major source of protein in the local diet and worldwide, accounting for almost 25% of the annual animal protein intake of an individual. The Mauritius Nutrition Survey (2022) reports that 87.2% of the population aged between 12 and 74 years old consumes fresh or frozen fish, among whom 66.7% consume this product weekly. This growing trend has also been facilitated by the increased availability of seafood both locally caught and imported fish.

Figure 2 depicts the evolution of fish consumption *per capita* in Mauritius from 2000 to 2022. Between 2000 and 2005, a general decline in consumption (25%) was observed. However, fish consumption began to increase steadily as from 2006. By 2022, the average annual *per capita* fish consumption in Mauritius reached approximately 29.08 kg. This represents a significant rise of 49.9% compared to 2006, when the annual *per capita* consumption was about 19.40 kg.

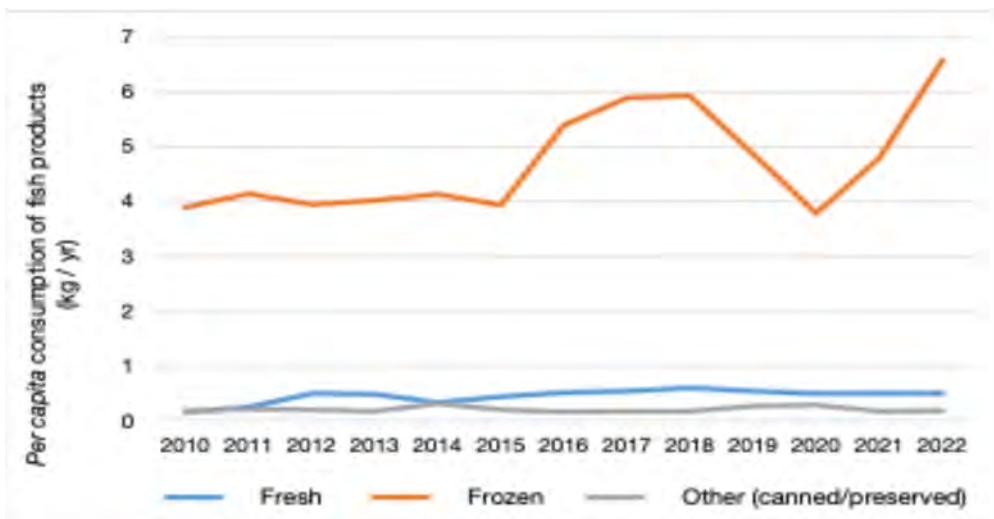


Source: Statistics Mauritius 2000-2022

Figure 2. Evolution of *per capita* consumption of fish (kg/year) for period 2000 to 2022

The consumption of fish products, such as frozen fish, has also increased over time leading to an overall rise in fish consumption. Frozen fish has gained significant popularity among consumers due to its availability, convenience and extended shelf life (Figure 3).

Between 2012 and 2022, frozen fish's annual *per capita* consumption increased by approximately 66%, rising from 3.95 kg in 2012 to 6.57 kg in 2022. These figures highlight the growing dependency of the local economy on frozen fish products. Given these trends, the frozen fish market is expected to continue expanding in the coming years.



Source: Statistics Mauritius 2010-2022

Figure 3. *Per capita consumption (kg/year) of fish products – crustaceans, molluscs and products (fresh, frozen, canned/preserved) from 2010-2022*

5. IMPORTS AND EXPORTS

Mauritius's economy heavily relies on importing and exporting fishery products, such as frozen and canned fish (Figure 4). Approximately 20% of the nation's exports are from the fisheries sector which also generates employment for the local population. The entire export of fish and fish products led to a revenue of about MUR 16 billion in 2023. Given that Mauritius is one of the biggest exporters of canned tuna in the Indian Ocean, canned tuna is one of the most significant export products. Around 25% of the canned tuna exported from Mauritius is consumed in the European Union (EU). According to the Economic Development Board (2024), in 2023, preserved fish was the most exported domestic product from Mauritius, with an export value of about MUR 11.5 billion.

The fish trade in Mauritius heavily relies on imports to satisfy local demands. Import data for chilled and frozen fish from 2019 to 2023 highlights substantial amounts, with 1,365 tonnes of chilled fish and 49,771 tonnes of frozen fish imported in 2023 alone (MoBEMRFS, 2022-2023). These imports are crucial for both local consumption and processing industry, underscoring the island's dependence on international markets to complement domestic fish production. The import of frozen and canned fish is crucial for ensuring a steady supply of seafood which is essential for both local consumption and re-export (EDB, 2024). PTM, one of the major companies in the local fish processing sector, processes around 103,000 tonnes of tuna annually with an annual export value of MUR 10.15 billion. Another noteworthy local company is the Ferme Marine de Mahébourg Ltd., which runs a cutting-edge facility and produces fresh and frozen fish products worth MUR 1.08 billion in exports. These companies contribute significantly to the country's GDP.



Source: Statistics Mauritius 2000-2023

Figure 4. Import and export values of fish and fish preparations (in million MUR) for period 2000-2023

6. CONSTRAINTS AND CHALLENGES IN THE FISHERIES SECTOR

The fisheries sector in Mauritius faces several constraints and challenges that impact the sustainability and contribution to food security.

Climate change

Fish stocks and marine biodiversity have been impacted by major biological changes brought about by rising sea surface temperatures, ocean acidification and shifting weather patterns. As a result, due to these environmental issues, fishermen find it challenging to predict and plan their activities due to the increased uncertainties in fish catches and interference in fishing patterns.

Overfishing

The long-term sustainability of the fisheries industry is at risk due to the overexploitation of fish stocks, which are driven by both local and foreign fishing fleets.

Illegal, Unreported and Unregulated (IUU) Fishing

Sustainable management techniques and conservation initiatives are harmed by IUU fishing. Despite regulatory measures, enforcement remains a major concern due to limited resources and the vastness of the maritime area to be monitored, enforcement remains a major concern.

Maritime accidents

Oil spills and other maritime mishaps have a significant impact on the fisheries sector. The local food supply is impacted, the livelihoods of artisanal fishermen are disrupted, and the spills contaminate critical fishing grounds and coastal habitats. The potential long-term ecological damages from maritime accidents put the health of the local fisheries sector at risk. For instance, in 2020, MV Wakashio, a bulk carrier, struck a coral reef in the southern part of the island causing 800 tonnes of oil leakage into the southern marine ecosystem. As a result, Government imposed no fishing activities to be carried out in affected areas for nearly one year, thus impacting the livelihood of both fishermen and their families as well as the fishmongers and consumers.

Plastic pollution

Plastic pollution has a significant negative impact on fisheries. For instance, plastic pollution could trigger a decrease in fish biomass. Plastic pollutants can accumulate in fish species, hence rendering them inedible.

Economic challenges

Fishermen, especially small-scale artisanal fishers with limited access to capital and financial support, are increasingly burdened financially by rising input prices, such as of gasoline and equipment. The competition from cheaper imported fish products also impacts the local market, putting pressure on regional producers to maintain profitability.

Institutional challenges

There is a lack of recognition of the importance of the fisheries sector due to cultural, social, and high-level decision-making (political) factors. Moreover, fisheries management authorities also face constraints due to limited budgets, which affect the effectiveness of operations, productions, and performances.

Cultural factors: Undervaluation of fishing as a profession leading to a lack of recognition and respect for those in the sector. Despite their experience and knowledge, this has caused for community members to be perceived as passive beneficiaries rather than active stakeholders during artisanal fishery assessments (Bhavnah *et al.* 2020).

Social factors: Inadequate support and recognition, resulting in the needs and contributions going unnoticed, leading to insufficient resources allocated to the sector. Lack of understanding of the human-environment relationship, especially on the dependency of the coastal livelihood. Supporting the sea-dependent population, with capacity-enhancing subsidies such as equipment, has only contributed to overfishing due to increased fishing capacity (Bhavnah *et al.* 2020).

High-level decision-making related factors: Inadequate high-level support results in the sector receiving insufficient policies and financing. Hence, these result in limited capacity for data collection, poor data quality and analysis and/or underestimation of the true data, detrimental for effective fishery management (Bhavnah *et al.* 2020).

Budget constraints: Financial limitations can slow down the overall efficiency and productivity of the fisheries sector due to a lack of investment in training, infrastructure and technology. For instance, small-scale fishing, due to the lack of motor equipped boats, is restricted to several fishing zones, mostly nearshore coral reefs. This could result in intensified pressure on the resource of a specific region (Bhavnah *et al.* 2020).

Poor management of resources: Financial limitations can slow down the overall efficiency and productivity of the fisheries sector due to a lack of investment in training, infrastructure and technology. For instance, small-scale fishing, due to the lack of motor equipped boats, is restricted to several fishing zones, mostly nearshore coral reefs. This could result in intensified pressure on the resource of a specific region (Bhavnah *et al.* 2020).

Another barrier to investment is the limited availability of suitable sites for project implementation. For instance, in lagoon-based aquaculture, unclear policies on medium-scale operations pose difficulties for investment and development. In land-based aquaculture, despite the availability of various incentives, certain facilities remain constrained, such as limited water supply. These issues may lead to inefficiencies and delays in establishing sustainable aquaculture systems which are key to enhancing food security.

Lack of stock assessment methods and reporting: Generally, the importance of data collection for long-term monitoring is mostly overlooked. There is little information on fish biomass data, ecological data, biological data of the catch and frequency of fishing from small-scale fisheries. Despite the strict enforcement of laws and regulations, the lack of information on the total catch from local small-scale fisheries creates a significant hurdle to the effective management of the local fishery market (Bhavnah *et al.* 2020).

The Mauritian waters have been experiencing several issues which are putting the island's coral reef biodiversity at risk. Contributing factors including long periods of high sea surface temperature, damaged watersheds from intensive coastal tourism, farming and development, fishing, and maritime mishaps and oil spills have resulted in coral degradation and loss of structural richness (Bhagooli *et al.* 2021; Bhagooli and Kaullysing, 2019; Elliott *et al.* 2018; McClanahan and Muthiga, 2021).

Prior to the COVID-19 lockdown in 2020, coastal tourism was thriving, hosting up to 1.4 million tourists in 2019 (Statistics Mauritius, 2020). Due to coastal tourism, diversified sea-based activities with various nautical sports and related disputes have increased (Graham *et al.* 2007). It is noteworthy that there has been an increase in building permits from 367 permits in 2000 to 1,162 in 2011 (Digest of Environment, 2018), thus resulting in a surge in the number of lodgings, including hotels, guesthouses and other tourists' accommodations. Additionally, 2,000 registered fishers are annually harvesting about 800 metric tonnes of fish, mainly for tourists and local consumers (FAO, 2020). With local pressures, combined with recurrent thermal stress and worldwide economic and touristic volatility, coral reef ecosystems are not receiving sufficient time to recover.

Encouraged by subsidies and salaries, fishers have exploited the nearshore coral reef fisheries. Such an incentive may have prompted fishers to remain in the fisheries sector, making them reluctant to switch careers, and hence resulting in continued exploitation of the fishery resources (Daw *et al.* 2012). With the significantly low levels of stock fish biomass recorded in half of the reefs, it is suspected that the fisheries may take 4 to 8 years to recuperate, without any disturbances (McClanahan *et al.* 2016).

7. OPPORTUNITIES AND PROSPECTS FOR THE FISHERIES SECTOR

The Ministry of Blue Economy, Marine Resources, Fisheries, and Shipping (now the Ministry of Agro-Industry, Food Security, Blue Economy and Fisheries), developed a strategic plan for 2024 to 2027 to promote, through various strategies, the Blue Economy as a significant pillar of the Mauritian economy (MoBEMRFS 2024). The focus areas include (1) improving local fish production and exports, (2) further development of aquaculture, (3) mitigating IUU activities, (4) restoration of coral reefs and lagoon stock enhancement, and (5) capacity development and stimulation of investors.

The strategic plan also describes measures that include registration of artisanal fishers, training of fishers on alternative fishing practices, promoting sustainable fishing, allocation of barachois to develop fish farming, promoting fish farming around the 29 identified zones under the Fisheries Act 2023, enhancement of monitoring activities, engaging in coral reef restoration, restocking the lagoons with high market value species and other related activities. Additionally, the plan outlines several strategic initiatives to advance the fishing industry while prioritising sustainability and food security. Key measures include providing incentives to attract investors to the sector, encouraging the development of innovative products, conducting surveys of fish species to ensure effective management and promoting registration of foreign vessels involved in tuna fisheries under the Mauritian flag. This strategic plan emphasises improving local fish production to strengthen food security while promoting sustainable fishing, safeguarding the marine ecosystem and ensuring the long-term viability of fish stock. These efforts aim to create a balanced approach that supports economic growth while protecting natural resources.

Mauritius may strive towards a sustainable and resilient fisheries sector that supports food security and the nation's welfare. To achieve this, a thorough and multi-faceted approach would be needed, as indicated below.

- Adoption and implementation of more effective fisheries management frameworks and science-based policies must be implemented to promote sustainable fishing practices and safeguard marine resources (closed seasons, catch limits, size limits, fishing reserves, etc.).
- Improving best practices for sustainable aquaculture development to cater for both the national economic growth and the marine environment.
- Establishment of clear policies for designated sites in lagoon-based and land-based aquaculture.
- Stakeholders could work together to identify areas suitable for lagoon-based operations without interfering with other marine activities or conservation goals.
- Identification of sites for sustainable water sources for land-based aquaculture projects.

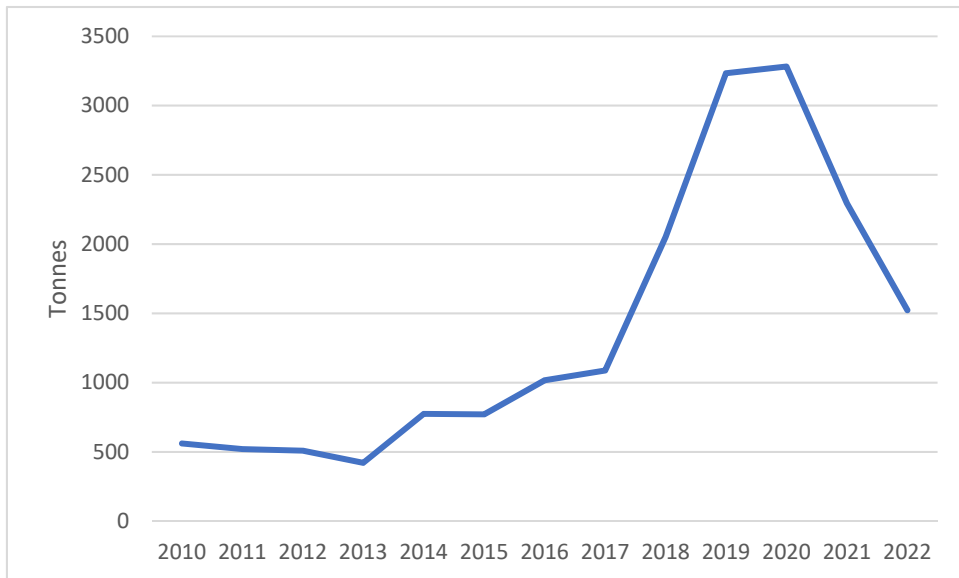
- Improving the enforcement of laws and regulations and enhancing monitoring activities more strictly to combat IUU fishing and guarantee compliance.
- Promoting sustainable aquaculture development to lessen the strain on wild fish populations and provide an alternative source of income to fishing communities.
- Providing capacity development initiatives and financial assistance for fishermen are crucial to improve their resilience to economic and environmental issues.
- Community engagement and stakeholder participation in decision-making processes in fisheries management strategies to ensure that the needs and viewpoints of the local population are taken into account.
- Undertaking sensitisation campaigns (workshops, training sessions, and outreach agenda) for educating and motivating people to embrace sustainable and responsible fishing methods while raising awareness about the negative consequences of overfishing, IUU fishing and others.

The prospects for the Mauritian fisheries sector are promising, driven by several strategic initiatives and sustainable practices. The government's support for sustainable fisheries and aquaculture is a key factor, with regulations and policies meant to strengthen resource management, conservation efforts, and technological innovation. The growth of aquaculture is significantly noteworthy, as it offers a sustainable alternative to wild-capture fisheries and eases pressure on overfished fish stocks. Furthermore, the sector stands to gain from global partnerships and investments which may bring cutting-edge fishing technologies and practices. The creation of value-added products, including processed and packaged seafood, can also increase export revenues and create new market opportunities. Overall, Mauritius' fisheries sector has the capacity to greatly boost the nation's economic development and food security if long-term viability, innovation, and market diversification are given adequate attention.

The aquaculture sector in Mauritius has the potential to expand for economic development and food security (Figure 5). In an effort to boost fish production and lessen pressure on wild fish stocks, the government has been actively supporting and promoting sustainable aquaculture methods. One such initiative, the Aquaculture Master Plan, launched in 2006, is a strategic move to encourage sustainable aquaculture development and enhance the nation's fish production. The project aims to encourage prospective investors to adopt sustainable practices while establishing a distinctive brand for fish farmed in the island's clear waters by advertising Mauritius as a base for Marine Aquaculture Projects.

According to the Fisheries Act 2023, 29 potential farming zones for aquaculture development were identified, mainly in the South-East lagoon, to guarantee ideal environmental conditions and effective monitoring. It was also predicted that a medium-term and long-term yearly production of 29,000 tonnes and 39,000 tonnes of fish, respectively, could be achieved. Red drum, sea bream and rabbit fish were the targeted species due to their high commercial value. Aquaculture production in Mauritius has shown significant growth, increasing from 565.5 tonnes in 2010 to 1,012 tonnes in 2016 and reaching 1,350 tonnes by 2023. This growth underscores the potential of the

aquaculture sector to strengthen the local economy, generate job opportunities and contribute to food security while ensuring the sustainability of the marine environment.



Source: Statistics Mauritius 2010-2022

Figure 5. Fish production for Mauritius (tonnes) through freshwater and marine aquaculture for period 2010-2022

Notably, data on fishery stock assessments must be regularly reviewed and made available to the appropriate stakeholders. Regular documentation on the number of people involved in fisheries and their catches is important. Acquiring information on fish stocks is essential for developing appropriate strategies to manage fisheries sustainably. It is necessary to address this shortcoming to ensure that data are collected and made available for future planning and sustainability. A stated objective is required to coordinate efforts to increase the sector's contribution to food security.

8. CONCLUSION

The fisheries sector in Mauritius is a vital component of the nation's economic growth and food security. Despite significant achievements, such as the increase in fish production and the importance of artisanal fishing in local markets, the sector still faces numerous challenges that call for prompt and suitable solutions. However, there are also promising opportunities for the sector's development. Effective fisheries management frameworks, strengthened enforcement, and the promotion of sustainable aquaculture can mitigate many of the current challenges. International partnerships and projects like the Aquaculture Master Plan promise to improve resource management and introduce advanced technologies. By increasing community engagement, supporting fishermen through capacity development initiatives, and emphasising sustainable practices, Mauritius can guarantee its fisheries' long-term resilience and production.

The future prospects of the industry will hinge on a well-rounded strategy that incorporates continued investment in sustainable practices, strict enforcement of regulations, and implementation of science-based policies. Addressing the limitations and difficulties is vital to ensuring a consistent and sustained flow of fish, which is essential for the nation's food security. Adequate focus on sustainability, innovation, and market diversification will enable the fisheries sector in Mauritius to make a substantial contribution to the country's economic growth and food security while also preserving marine biodiversity for future generations.

9. RECOMMENDATIONS TO POLICYMAKERS

The fisheries sector is at a crossroads. It faces pressing challenges such as declining fish stocks, climate change impacts, and balancing economic growth with environmental sustainability. At the same time, it holds immense potential to significantly contribute to food security, livelihoods, and public health. MAST advocates a fresh perspective on how strategic changes can unlock the untapped potential of fisheries to provide affordable, nutritious food and sustainable economic opportunities.

Through collaborative effort and a commitment to sustainable practices, the fisheries sector can emerge as a vibrant pillar of food security, benefiting current and future generations. This vision can be realised by addressing four critical areas:

1. Prioritise the strengthening of data collection and analysis for effective fisheries and aquaculture management
 - To support evidence-based policymaking and enhance the management of fisheries and aquaculture at both national and regional levels, it is critical to prioritise efforts to improve data collection and analysis. Accurate and up-to-date data are required to effectively guide initiatives. For instance, regular collection of ecological data on fish biomass and catches is essential. This includes monitoring small-scale fisheries in lagoons, off-lagoon areas, marine protected zones, and fish aggregating devices (FADs), as well as recreational, bait, and illegal fishing activities. Additionally, both spatial and temporal data on how climate change is affecting the lagoon ecosystem should be collected.
 - Significant resources should be invested in enhancing regular data collection systems, building analytical capacity, and developing advanced tools and methodologies for better management of these sectors. Collaboration with partners of different institutions both locally and abroad will be essential to ensure that these efforts lead to more informed decision-making and the sustainable management of fisheries and aquaculture resources.
 - Informed decision-making and operational efficiency are only achievable when data collection, management, and dissemination are effective. Standardization of methods applied in data collection and documentation ensures consistency, while stakeholder involvement ensures accuracy and relevance of data. Centralization of data, through a Fisheries Information System, within one organization or institution simplifies the process, thus ensuring that whatever is collected is managed and disseminated accordingly. Data sharing policies between organizations enhances resource and time efficiency, reduces costs, and increases credibility of data. This approach eventually helps make more informed

decisions across sectors. It is important that Mauritius becomes a member of the Fisheries Transparency Initiatives (FiTI), a global multi-stakeholder partnership to strengthen transparency and participation for sustainable fisheries.

2. Recognise, support and empower small-scale artisanal fishers

- This can be achieved by facilitating access to marine resources and markets for these fishers.
- Understanding of the human-environment interaction needs to be integrated into effective management frameworks to fairly distribute benefits such as capacity enhancing subsidies.
- Recognition of small-scale artisanal fishers as major and active shareholders and the use of their acquired knowledge and experience during stock assessment would be highly beneficial.
- Capacity development should be done based on scientific data, including the training of fishermen in the collection of scientific data and modern fishing.
- Making the occupation lucrative to fishermen, besides incorporating reward systems for reporting illegal activities, can ensure their inclusion into food security and sustainability endeavours, thereby attracting youth into the sector and giving fishers more recognition.
- Increasing the number of FADs can also be very useful.
- Financial supports in the form of grants, loans, and monetary incentives for the maintenance of boats and technology or equipment provisions will further strengthen this sector.
- Circular economy for the small-scale fishers could be encouraged, for instance, having hotels/restaurants in a given locality to purchase fish caught by the local fishers from the same vicinity.

3. Promote production of fish and value-added fish preparations for healthy diets from healthy oceans

- The policy should promote the production of fish and fish products as a key component of healthy diets. Fish and fish products provide high-quality proteins and key nutrients including omega-3 fatty acids, minerals and vitamins, while ensuring that this production is sourced from sustainably managed and healthy ocean ecosystems. This approach will support both nutrition and the long-term viability of marine resources.
- Identification of market demands, especially for pharmaceutical and nutraceutical products, through the promotion of offshore aquaculture will help in strengthening the fisheries sector sustainably.

- Diversification of the market by increasing the range of products and use of land for value-added goods will meet the varied market needs and enhance economic resilience.

4. Advancing Research and Collaboration

- The research and development with respect to fisheries sector and food security aspects should be enhanced to further develop the blue economy of Mauritius.
- Encouraging the diversification of fish species in aquaculture and supporting universities in conducting research into offshore aquaculture are essential steps for sustainable development.
- Research and regular reporting on fish diversity, biomass and distribution, along with ecosystem health especially for coastal fisheries are needed for a sustainable fisheries sector and responsible fisheries management.
- There is a need for collaboration between universities and industries to enhance research work. Such collaboration will drive innovation, ensure sustainability, and eventually contribute toward the development of a strong blue economy in Mauritius.

The above recommendations provide key priorities with practical and actionable measures. These strategic actions will together strengthen the fisheries sector to ensure food security and sustainable economic development. Together with policymakers and stakeholders, the fisheries sector can be transformed into a resilient pillar of food security, safeguarding both livelihoods and ecosystems for generations to come.

10. CONCLUDING REMARKS: SYNERGY FOR ACHIEVING FOOD SECURITY IN MAURITIUS

Pursuing food security in Mauritius necessitates the integrated and synergistic efforts of the crop, livestock, and fisheries sectors. While each sector faces unique challenges and opportunities, their combined contributions can lead towards a resilient, sustainable, and self-reliant food system.

- 1. Integrated Resource Optimisation:** The agricultural and fisheries sectors need to be integrated into a framework for food security, making optimal use of land, water, and marine resources. Innovations in sustainable aquaculture can complement terrestrial agriculture by providing alternative protein sources while reducing pressure on traditional farming systems.
- 2. Advancing Science-Based Policies:** Mechanization, technological innovations, and advanced ICT applications across agriculture, aquaculture, and livestock production are essential for boosting productivity and resilience.
- 3. Sustainability and Climate Resilience:** Adaptation and mitigation strategies should be in place to alleviate the impacts of extreme climatic events. Enhancing the resilience of farming systems and implementing sustainable fisheries practices are fundamental to safeguarding long-term productivity and environmental health.
- 4. Capacity Development and Community Engagement:** Empowering local communities with knowledge and skills is critical. Training initiatives targeting youth, farmers, and fishers can foster a new generation of skilled practitioners across all sectors, ensuring sustainability and innovation.
- 5. Market and Food Production Diversification:** Promoting diversified crop, livestock, and fish production reduces dependency on imports and strengthens national food security. Artisanal fishing, coupled with sustainable aquaculture, can be expanded to meet local dietary needs.
- 6. Collaboration and Governance:** Effective governance and multi-sectoral collaboration, including partnerships between researchers, policymakers, and the private sector, are vital. Shared initiatives like the Aquaculture Master Plan and the Strategic Plan 2024-2030 for the food crops and livestock sectors provide frameworks for unified progress.
- 7. Reliable and accurate data on crops, livestock, and the fisheries sector:** Data are essential for informed decision-making and strategic

planning. Such data provides insights into production trends, resource utilisation, and challenges, enabling policymakers and stakeholders to design targeted interventions and allocate resources effectively. Ensuring this information is accessible supports the sustainable development of these sectors, fosters resilience against threats like climate change, and advances efforts to achieve food security for present and future generations.

By aligning the strengths of the crop, livestock, and fisheries sectors under a cohesive national food security strategy, Mauritius can reduce its import dependency, ensure a steady and affordable food supply, and enhance its socio-economic resilience. A holistic approach emphasising sustainability, innovation, and community empowerment is essential for achieving the overarching goal of food security in the face of evolving global and local challenges.

The setting up in November 2024 of the Ministry of Agro-Industry, Food Security, Blue Economy and Fisheries could not have arrived at a more opportune time to revitalise the three aforementioned sectors.

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