

Article

Analysis of Fish Consumption in the ECOWAS Region and Mauritania: Current Constraints and Future Challenges

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Abstract: The objective of this paper is to present the issues of fish consumption in the ECOWAS region and Mauritania in the context of overexploitation of fishery resources, significant population growth, and increasing food and nutritional insecurity. The method involved compiling data on production (fishing and aquaculture), foreign trade in fishery products, and population to define net supply and apparent consumption. Numerical assumptions were made to project consumption trends up to 2030. The assumptions were based on the identification of past and recent fish consumption trends, incorporating political, ecological, and economic events that could impact the standard of living of West African populations. The results indicate that the production of fishery and aquaculture products in the ECOWAS region and Mauritania increased from 2.1 million to 3.6 million between 2008 and 2022, driven by significant catches in Mauritania and the burgeoning aquaculture industries in Nigeria and Ghana. The reliance on imports to compensate for the production deficit has grown increasingly important. Imports now exceed exports by a factor of three, with an average of 1.9 million tonnes imported compared to 0.6 million exported between 2009 and 2022. Despite a notable increase in fishery product exports from Senegal and Mauritania, this rise has not been sufficient to offset the negative trade balance of the region, exacerbated by substantial growth in imports from Ivory Coast, Ghana, and Nigeria. Even with the significant imports, per capita consumption within ECOWAS and Mauritania has decreased from 14 kg to 11 kg between 2008 and 2022. This decline in consumption is projected to continue in the coming decade, dropping to less than 9 kg by 2030. The current state of overexploitation of fish stocks, ecosystem degradation, climate change, and significant population growth do not favor an improvement in fish consumption over the next decade. However, meeting the ever-increasing demand for fishery products in West Africa is possible if radical changes are implemented at the forefront of decision-making processes.

Keywords: demand; supply; nutrition; policy; West Africa



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1. Introduction

The African continent is projected to experience the largest relative population increase by 2030, reaching 1.71 billion people [1,2]. Similarly, the Economic Community of West African States (ECOWAS) and Mauritania are expected to see their population nearly double over 20 years, reaching 500 million by 2030 [3–5]. West African countries exhibit the highest fertility rate globally, with dense populations concentrated in coastal and riparian regions [1,4,5]. This demographic trend, combined with a high reliance on fish as a primary source of animal protein, has led to escalating demand for fishery and aquaculture products [6–8]. Despite the growth recorded between 2009 and 2022 and the substantial imports, local demand remains unmet, and apparent consumption has steadily decreased from 14 kg per capita in 2008 to less than 11 kg in 2022. Projections indicate that by 2030, to maintain current per capita consumption levels, an apparent availability of 7 million tonnes will be necessary to cater to the 500 million inhabitants of the ECOWAS region and Mauritania, i.e., 4 million tonnes more than the current net supply. Current

production from regional fishery and aquaculture production will be insufficient to meet this need due to overexploitation of fishery resources as reported by CECAF, degradation of marine ecosystems (drastic reduction in the areas of mangrove and seagrass beds), and the vulnerability of pelagic fish to climate change [9–12]. Increasing reliance on imports will become increasingly unsustainable as European and Asian countries focus on meeting their own market demands through domestic production [13–15]. Within the ECOWAS region and Mauritania, the aquaculture sector, aside from Nigeria and, to a lesser extent, Ghana, remains nascent and is not yet capable of significantly reducing the region's fishery product deficit [16–18]. Consequently, per capita fish consumption is expected to continue its decline, reaching less than ten kilograms by 2030. Immediate and robust policy measures are imperative to reverse this trend and ensure sufficient fish supplies for West African markets.

The objective of this paper is to provide an overview of both current and projected fish consumption in the ECOWAS region and Mauritania for the year 2030. Additionally, it offers a detailed understanding of the anticipated evolution of the supply structure, nutritional coverage, and public policy issues necessary to align the demand and supply of fishery products. The results are derived from the collection of statistical data on fishery production, foreign trade, population growth, and a review of scientific literature concerning fisheries governance, the health status of the fishery stocks in the sub-region, and food security. This cumulative information has facilitated the creation of a comprehensive overview of both current and future consumption of fish in the ECOWAS region and Mauritania.

This study presents updated insights into fish consumption patterns in West Africa, contextualized within the challenges of declining fish stocks and increasing population, to forecast future regional fish consumption trends [19,20]. By refining consumption data, this research contributes to discussions on strategies to meet the rising demand for fish and address escalating food insecurity in the region [21–24]. Consequently, this work outlines recommendations for policymakers aimed at significantly enhancing fish consumption among West African populations in the foreseeable future.

The article is structured in four parts. In the first part, the contextual framework of the study is presented. In the second part, the research method is presented. In the third part, the evolution of the production and foreign trade of fishery products and aquaculture at the level of ECOWAS countries and Mauritania, the apparent availability, and the current and future consumption of fish are discussed. Finally, the discussion outlines the current issues of fish consumption in West Africa. The study concludes with crucial recommendations to align fish supply and demand in the coming years.

2. Method

2.1. Framework of the Study

This study covers the 15 ECOWAS countries and Mauritania (Figure 1). ECOWAS is a regional integration institution grouping the most productive coastal countries in terms of fishery resources in the West African region. In addition, ECOWAS has demonstrated a good performance in terms of free movement of goods, which can be an interesting lever for inter-regional fish trade [11]. Mauritania is involved in this study because it is a former member of ECOWAS, and its return is considered in this study, especially with the recent association agreement established with the said institution interpreted as a step towards reintegration (Figure 1) [25–27]. Apart from Mauritania, the possibility of ECOWAS enlargement with the accession of other countries remains very unlikely in the coming decade. We also hypothesize that it is not necessary to consider the suspension of Mali, Burkina Faso, and Guinea from ECOWAS due to military coups, as it is considered temporary.

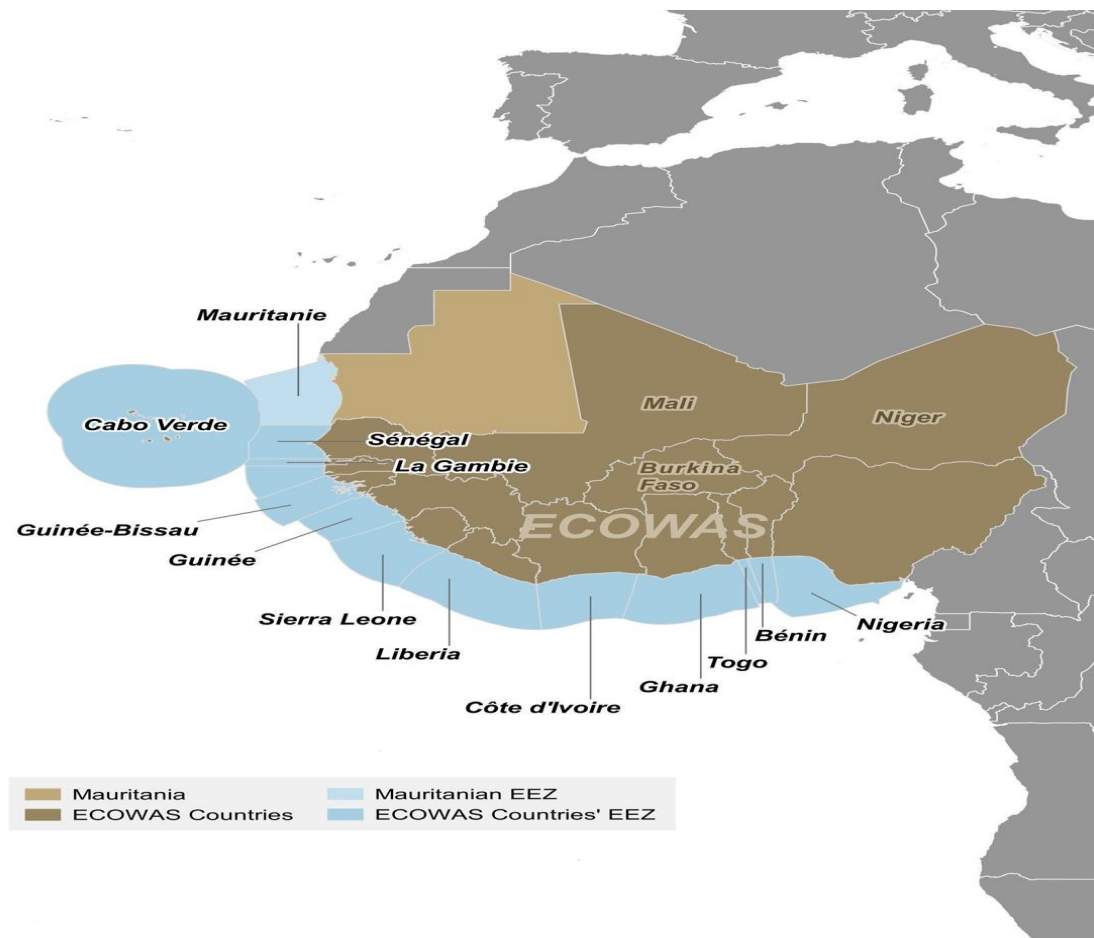


Figure 1. ECOWAS countries and Mauritania. Source: Own development.

Fishing activity is particularly developed in this regional area and Mauritania [28–30]. The region covers an ocean frontage of 7000 km and an Exclusive Economic Zone of more than 2 million km² [11]. The countries located in the northwest of the region (Mauritania, Senegal, Gambia, and Cape Verde) present particularly favorable conditions for marine fishing activities due to a wide continental shelf and specific hydro-climatic conditions, including upwelling [31]. In the Gulf of Guinea, fishing is certainly less productive, but it remains a very important activity that contributes to food security, wealth creation, and employment [16,32,33].

2.2. Research Methods

This work follows the method applied in the European Commission's report on fish consumption in the EU area in 2030 [34]. The first step was to build a regional database. Thus, a database nomenclature was set up for the region's catches and aquaculture production (live weight), imports, and exports (net weight) over the period 2009–2022. Then, a table of conversion factors from net weight to live weight is set up. The data for the coastal countries were provided by the national directorates, and those for the landlocked countries were taken from the FAO database (FishStatJ). The different data sources allowed us to harmonize the database according to the FAO nomenclature for species. The second step was to separate the part for human consumption and the part for animal feed. The data on demographics from 2009 to 2030 come from the national statistical offices of the countries.

Following this work on the database, which lasted more than six months (June and December 2022), we organized a regional workshop in Senegal (Dakar), bringing together regional experts and fisheries stakeholders. The objective of this workshop was twofold. First, to have expertise on the regional data and to assess the overall consistency of the

database. Secondly, to discuss the assumptions for the projections to 2030. Thus, the assumptions were made considering the diagnosis of past and recent trends in fish consumption in the ECOWAS region and Mauritania based on expert knowledge. They consider events (Political, demographic, economic, and ecological) that could lower the standard of living of West African populations and/or compromise the current production level. The diagnosis shows that most of the commercial fish species in ECOWAS countries and Mauritania are either fully exploited or overexploited, and the current production quantities (fish and aquaculture) and apparent net supply will hardly be maintained at their current level in the coming decade. Imports from Asia and Europe to make up the production shortfall will be difficult to sustain, given the current tendency of these countries to domesticate their production to meet local demand. The factors detailed and referenced in the following table underpin these main assumptions (Table 1).

Table 1. Demographic, political, and environmental factors affecting the growth of fisheries production in West Africa.

Factors	Details	Bibliographic References
Population growth and political situation	The increase in regional demand for seafood products will continue, driven by factors such as population growth, the preference for fish as the diet of choice for economic and health reasons, and the growth of the African middle class.	[14,17,22,28,34]
	By 2030, political instability in the West African region is likely to be exacerbated by recurrent coups in countries such as Mali, Guinea, Niger, and Burkina Faso. Focal points of terrorism-related tensions are in Nigeria, Niger, and Mali. These political tensions will block intra-regional trade and the improvement of fish consumption.	[35–37]
Climate change	Climate change and variability are already having an impact on African aquatic systems. Projections of each country's Exclusive Economic Zone capture potential indicate significant declines in capture potential under current conditions and under conditions of increasing greenhouse gas emissions.	[11,23,38,39]
	Global warming is expected to cause a 21% decline in the annual value of fish landings in West Africa and a decline of nearly 50% in fishing-related employment by 2050.	[38]
	This will result in increased migration of fishermen in search of livelihoods and food security opportunities elsewhere.	[16]
Degraded ecosystems	Intense urbanization of coastal areas, unsustainable logging, especially of mangroves, coastal erosion, and offshore oil exploration threaten the future structural and functional integrity of ecosystems.	[36]
	Decades of destructive fishing, such as mesh size reduction, bottom trawling, blast fishing, and poison fishing, have led to precipitous declines in major fish stocks, as well as collateral effects on other marine life.	[39,40]
	By-catch is also largely unregulated and generally unreported in most areas, which has a devastating effect on protected and commercially viable stocks.	[41,42]

Based on these detailed factors from the literature review and expert knowledge, it is justified to suggest that the latest downward trends in production from 2016 will continue through 2030. The observations mentioned in Table 1 are considered credible because they come from validated and published scientific articles that have undergone rigorous peer review processes, thus guaranteeing their reliability and validity.

2.3. Data Processing

The current apparent consumption of fish in the ECOWAS region and Mauritania was obtained by dividing the net supply by the number of inhabitants in the region. The apparent net supply was obtained by subtracting production and exports and adding

imports. Future fish consumption was obtained by maintaining the current annual growth rate of 3.6%, which may be lower in the coming decade. The factors advanced above justify maintaining this growth rate. Furthermore, the trade deficit here represents the difference between the quantities exported and those imported. To avoid double counting here, the work was conducted at the country level.

Data processing and analysis were carried out using Excel software (2021-Microsoft 365). The analysis is descriptive in the context of this work.

3. Results

3.1. Profile of Fisheries and Aquaculture Production by Country in the ECOWAS Region and Mauritania

Between 2009 and 2022, the production of fishery products in the ECOWAS region + Mauritania has shown an overall upward trend, increasing from 2.1 million tonnes in 2009 to 3.8 million tonnes in 2022 (Figure 2). The production statistics reveal three major phases. The first phase, from 2009 to 2012, was marked by stagnant production, averaging 2.3 million tonnes. This was followed by a significant increase between 2013 and 2016, with an estimated annual average of 3 million tonnes, culminating in a record high of 3.2 million tonnes in 2016 (Figure 2). After 2016, the production trend in the ECOWAS region and Mauritania has been downward with slight fluctuations, averaging 3.6 million tonnes annually (Figure 2).

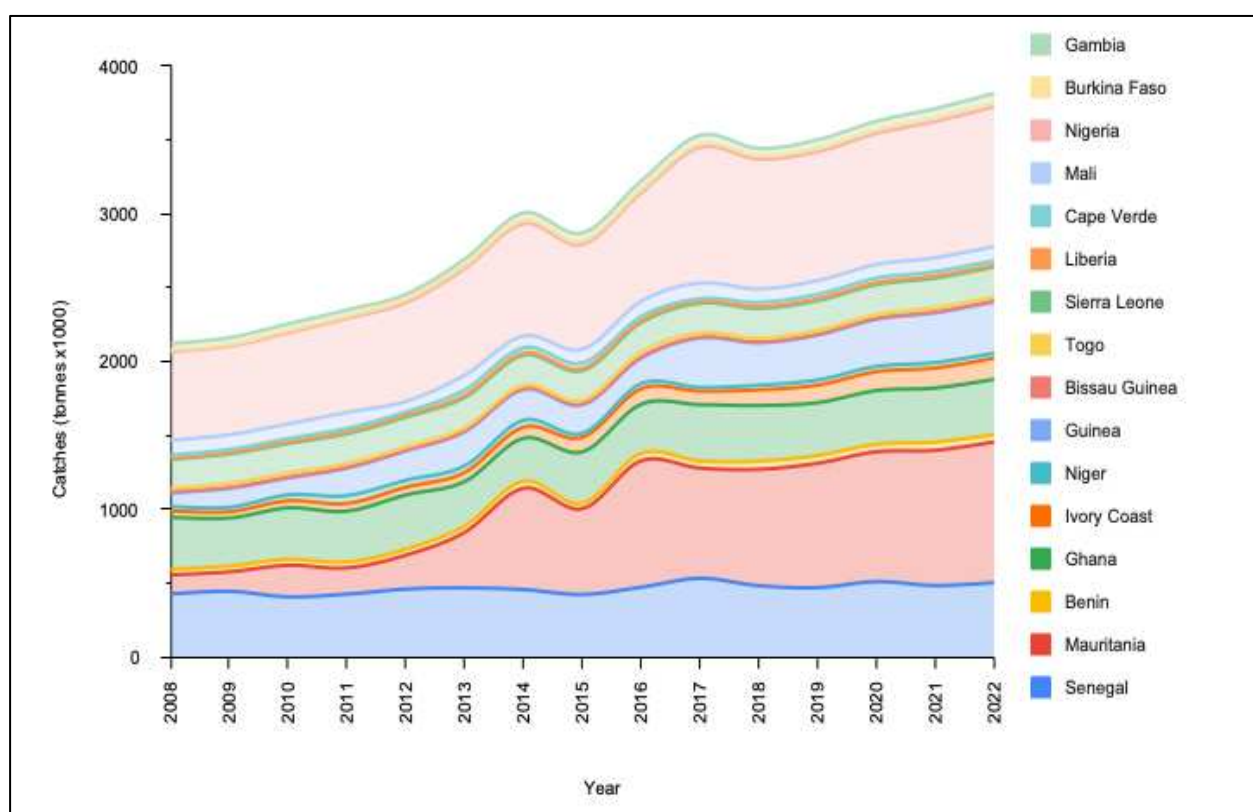


Figure 2. Production of fishery products (all species) in the ECOWAS region and Mauritania over the period 2009–2022. Source: Data from national statistical offices and FAO FishStatJ.

It is important to note that these regional figures conceal significant disparities between countries, reflecting the variability of capacities and development of fisheries and aquaculture across the region. The major producers of fishery products in the ECOWAS region and Mauritania are Nigeria, Mauritania, Ghana, and Senegal. The national production of these four countries is above an annual average of 350,000 tonnes over the period 2009–2022 (Figure 2). These countries account for more than 70% of total production in the subregion.

Countries such as Guinea and Sierra Leone fall into an intermediate category within the ECOWAS region, including Mauritania, with average annual fishery productions ranging between 200,000 and 220,000 tonnes. The rest of the countries in the ECOWAS region, along with Mauritania, have lower yields, estimated at less than 100,000 tonnes per year.

Aquaculture production in West Africa remained relatively low over the period from 2008 to 2022. It is largely driven by Nigeria, which accounts for more than 82% of the output, averaging 274,000 tonnes annually out of a total of 331,000 tonnes (Figure 3). Ghana also displays a growth trend in its aquaculture production, which increased from less than 5500 tonnes in 2008 to just under 80,000 tonnes in 2022 (Figure 3).

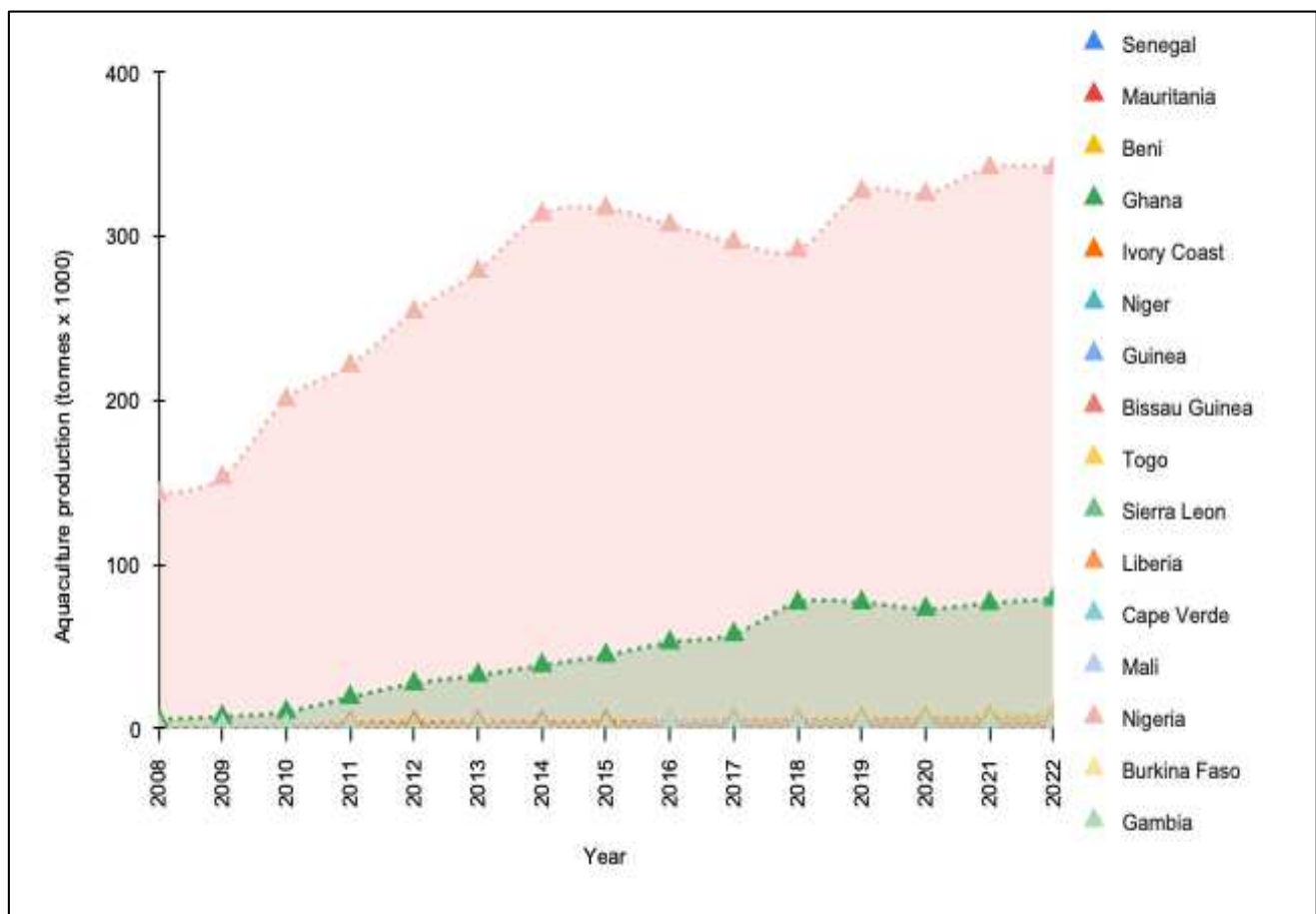


Figure 3. Trends in aquaculture production by country in West Africa. Source: Data from national statistical offices and FAO FishStatJ.

Beyond these two countries, aquaculture is still in a nascent stage in the other ECOWAS countries and Mauritania, with an annual production not exceeding 5000 tonnes and subject to significant year-on-year volatility (Figure 3).

3.2. External Trade in Fish in the ECOWAS Area and Mauritania

All ECOWAS countries and Mauritania have a quantitative trade balance in fishery products that is largely in deficit due to a volume of imports that is almost three times higher than that of exports. Thus, imports have averaged nearly 1.9 million tonnes per year over the period 2008–2022, against only 0.6 million tonnes exported. A record high in imports was recorded in 2011, with more than 2.5 million tonnes (Figure 4). ECOWAS countries and Mauritania have a trade deficit of an average of 1.4 million tonnes.

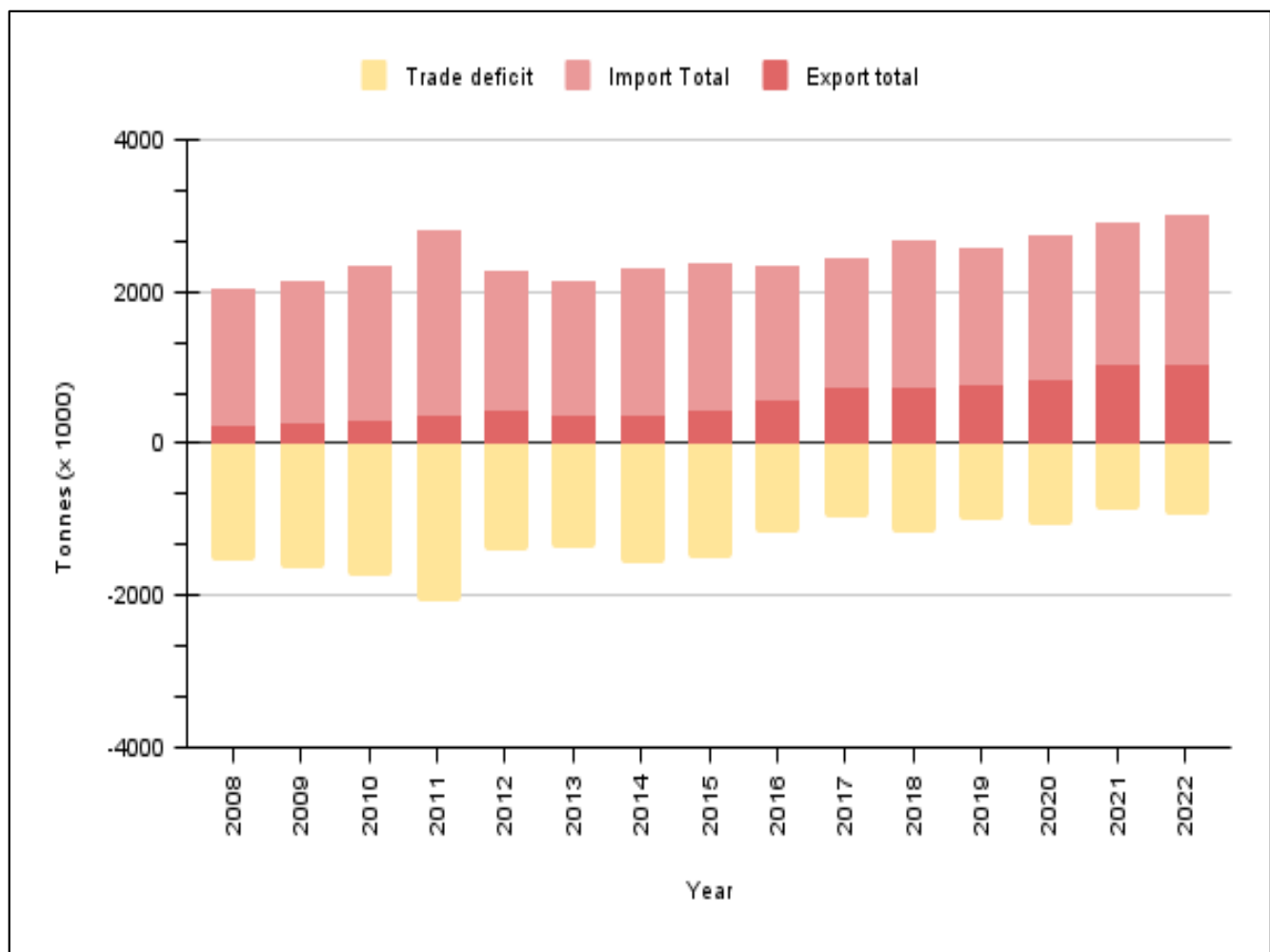


Figure 4. External trade in fishery products in the ECOWAS region and Mauritania from 2009 to 2022. Trade deficit in fishery products = Exports – Imports.

Senegal and Mauritania play a crucial role in reducing the trade deficit in fishery products within the West African region. Together, these two countries have shown increasing levels of fishery product exports. Over the past fifteen years, Senegalese exports have seen a remarkable increase, quadrupling from 70,000 tonnes to over 295,000 tonnes (Figure 5). Mauritania, a leading player in the region's fishery export market, has almost octuplet its exported quantities. Other countries like Guinea, Guinea-Bissau, and Cape Verde have a modest trade surplus, averaging less than 20,000 tonnes annually. However, the trade surpluses from Senegal, Mauritania, Guinea, Guinea-Bissau, and Cape Verde are contributing, albeit modestly, to the reduction in the region's trade deficit. This offset is tempered by significant imports by countries such as Nigeria, Ghana, and Ivory Coast, which surpass 400,000 tonnes per year (Figure 5).

Nevertheless, since 2015, there has been a gradual decline in the trade deficit, primarily due to the substantial exports from Senegal and Mauritania, along with Nigeria's drastic reduction in its imports, dropping from just over a million tonnes in 2009 to slightly less than 500,000 tonnes in 2022.

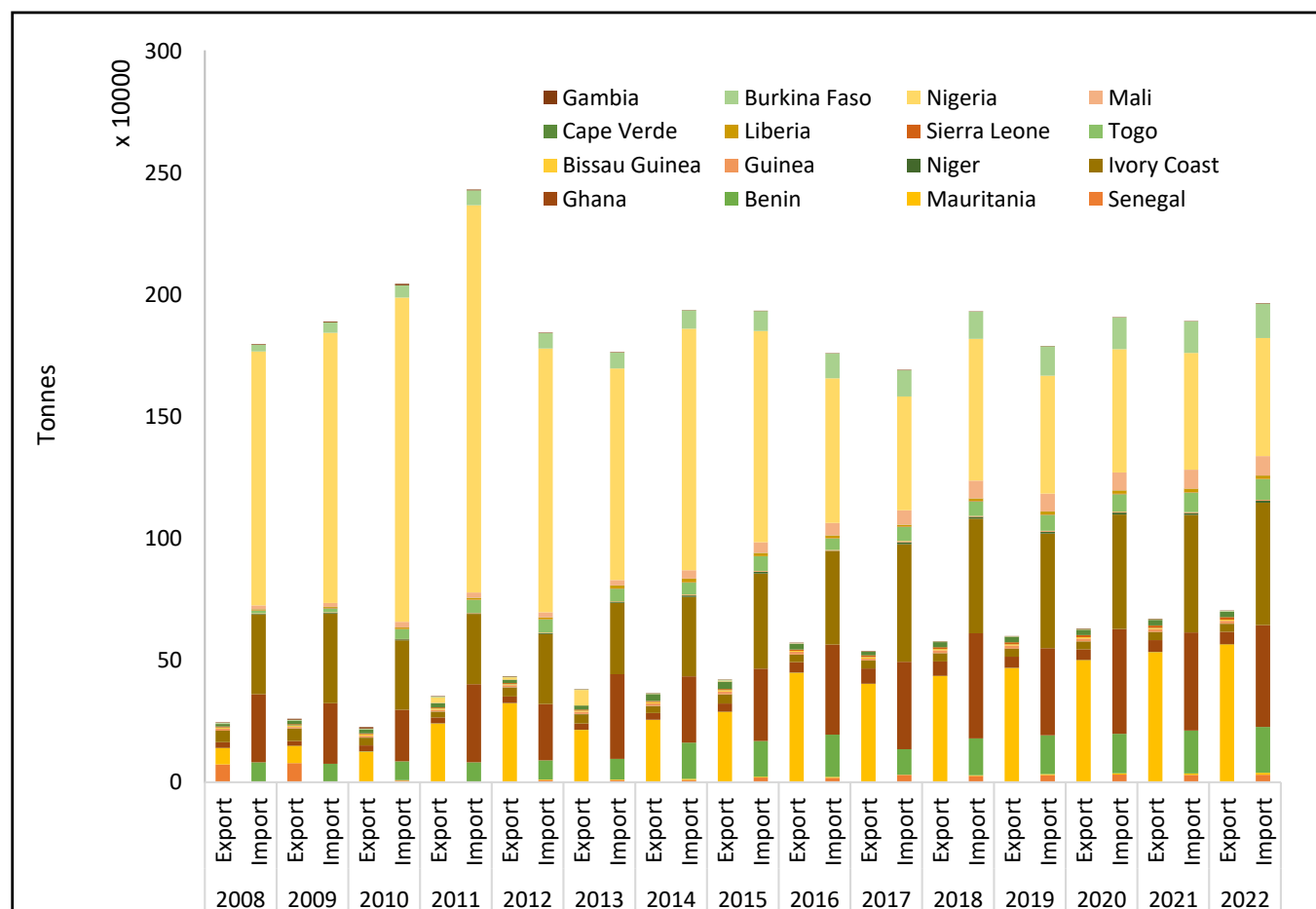


Figure 5. External trade in fishery products between ECOWAS countries and Mauritania over the period 2008–2022. Source: Data from national statistical offices and FAO FishStatJ.

3.3. Current Net Supply of Fish in the ECOWAS Area and Mauritania

The apparent net supply of fishery products has fluctuated significantly over the period 2009–2020. It hovers around an average of 4.5 million tonnes (Figure 6). The lowest net supply quantity was recorded in 2009, with 4.2 million fishery products, and the highest quantity was recorded in 2011, with more than 4.7 million tonnes of fishery products of all species on the markets of ECOWAS countries and Mauritania (Figure 6). Thus, the high level of supply in 2011 is related to the significant quantities of fishery products recorded in the same year. In 2012, a significant drop of more than 300,000 tonnes was recorded in the net supply. This was followed by slight fluctuations between 2013 and 2017 (Figure 6). Since 2018, the apparent supply has been growing steadily, with nearly 10,000 additional tonnes each year (Figure 6).

The analysis of the net supply of fishery products within ECOWAS and Mauritania allows for the classification of countries into three categories of consumers. The large consumers, with a net supply of more than 400,000 tonnes, include Nigeria, Ghana, and Côte d'Ivoire. The intermediate consumers of fishery products, with a net supply between 200 and 400,000 tonnes, are Senegal, Burkina Faso, and Benin (Figure 7). The countries with low fish consumption, with an apparent net supply of less than 200,000 tonnes, include Gambia, Mauritania, Mali, Niger, Guinea, Guinea Bissau, Togo, Liberia, and Cape Verde.

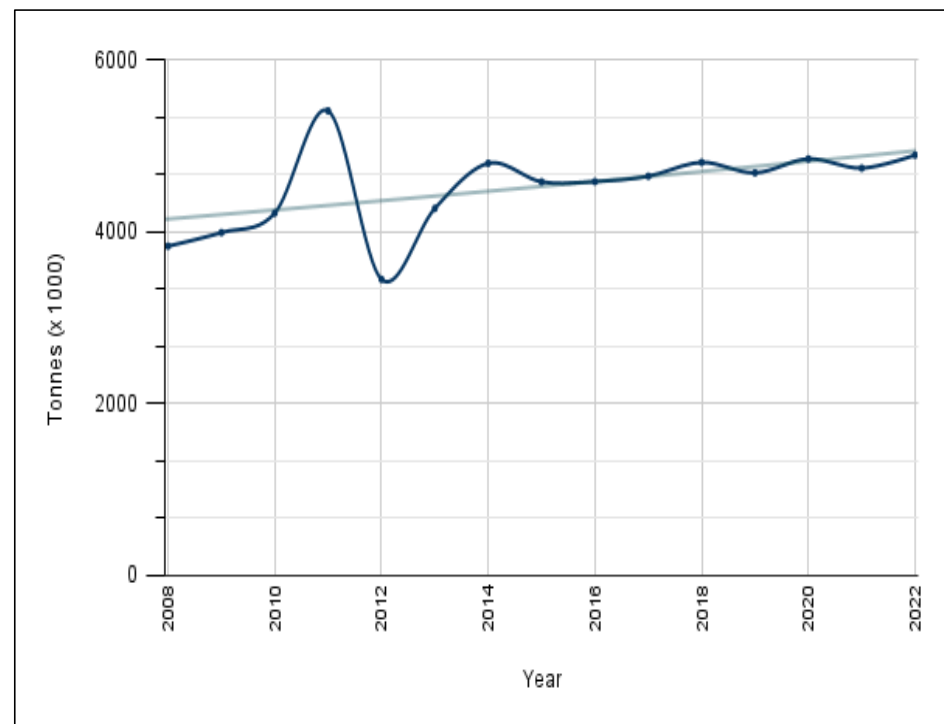


Figure 6. Evolution of the apparent supply of fishery products (all species combined) in the ECOWAS region and Mauritania. ON_i represents the net supply at time t for product group i and is defined as follows: $ON_i(t) = Prod(t) + Imi(t) - Exi(t)$. Net supply (ON_i) is therefore calculated by adding together local production ($Prod$) and imports (Imi), then subtracting exports (Exi). This formula is used to determine the local quantity of fishery products available for consumption in the region at a given time.

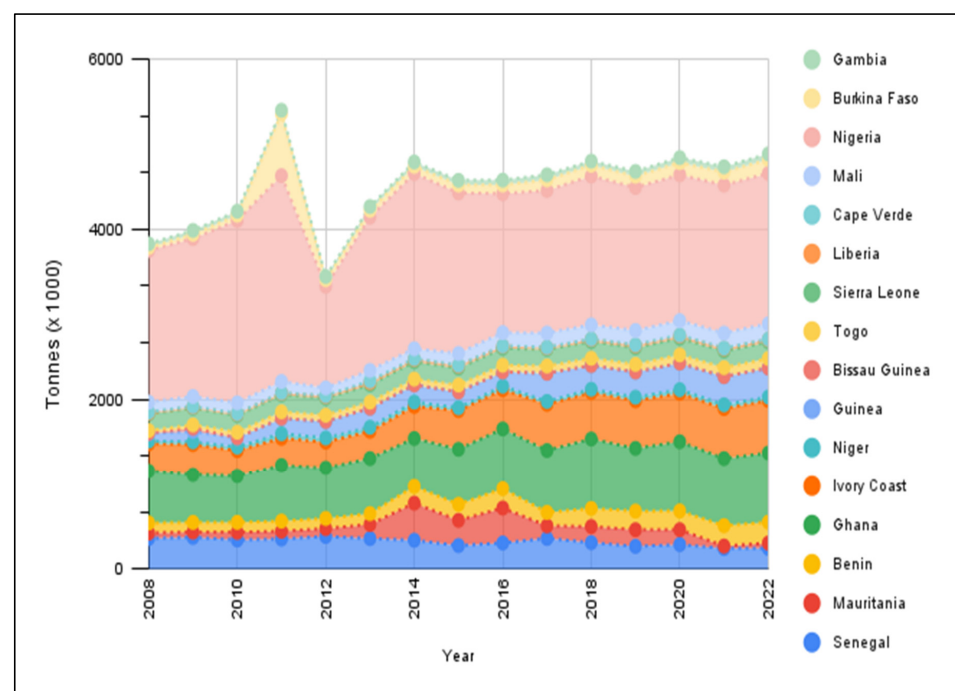


Figure 7. Trends in apparent supplies to ECOWAS countries and Mauritania over the period 2008–2019. ON_i represents the net supply at time t for product group i and is defined as follows: $ON_i(t) = Prod(t) + Imi(t) - Exi(t)$.

In an analysis of the distribution of fishery products within ECOWAS, including Mauritania, it's evident that Nigeria overwhelmingly leads in consumption within the region, with 1.8 million tonnes, accounting for 40% of the total supply estimated at 4.5 million tonnes (Figure 7). Ghana and Côte d'Ivoire also exhibit a high demand, with each country's consumption exceeding 400,000 tonnes. At an intermediate level, Senegal, Burkina Faso, and Benin record notable consumption figures, ranging between 200,000 and 400,000 tonnes. Other countries such as The Gambia, Mauritania, Mali, and others have a lower consumption, not exceeding 200,000 tonnes (Figure 7).

Substantial fluctuations are evident in the trends of apparent supply among the countries. Nigeria saw a peak in supply around 2014, which was followed by a significant downturn, while Mauritania has shown a consistent rise, signaling a vibrant fisheries sector. Unlike Mauritania, Senegal's supply has decreased in recent years. Ghana and Côte d'Ivoire also demonstrate steady growth, whereas other countries such as Guinea, Guinea-Bissau, and Togo have maintained more modest and stable supplies over time.

3.4. Current Fish Consumption in the ECOWAS Region and Mauritania

The general trends in fish consumption across the ECOWAS region and Mauritania indicate a steady decline in product consumption from 2009 to 2022 (Figure 8). Thus, the apparent consumption per capita of fish fell from 14 kg in 2009 to less than 11 kg in 2022 (Figure 8). The highest per capita consumption was recorded in 2011, at 15 kg. The average fish consumption in the ECOWAS region and Mauritania is around 13 kg per person (Figure 8). This constant population decline is mainly linked to the quasi-stagnation of the net supply in recent years and a significant growth in demography and, consequently, in the demand for fishery products. Between 2009 and 2022, the population of the ECOWAS region and Mauritania increased from 300 to 400 million, i.e., an increase of 100 million individuals in one decade (Figure 8). The regional consumption of fish within the ECOWAS region and Mauritania conceals significant disparities among the various member countries.

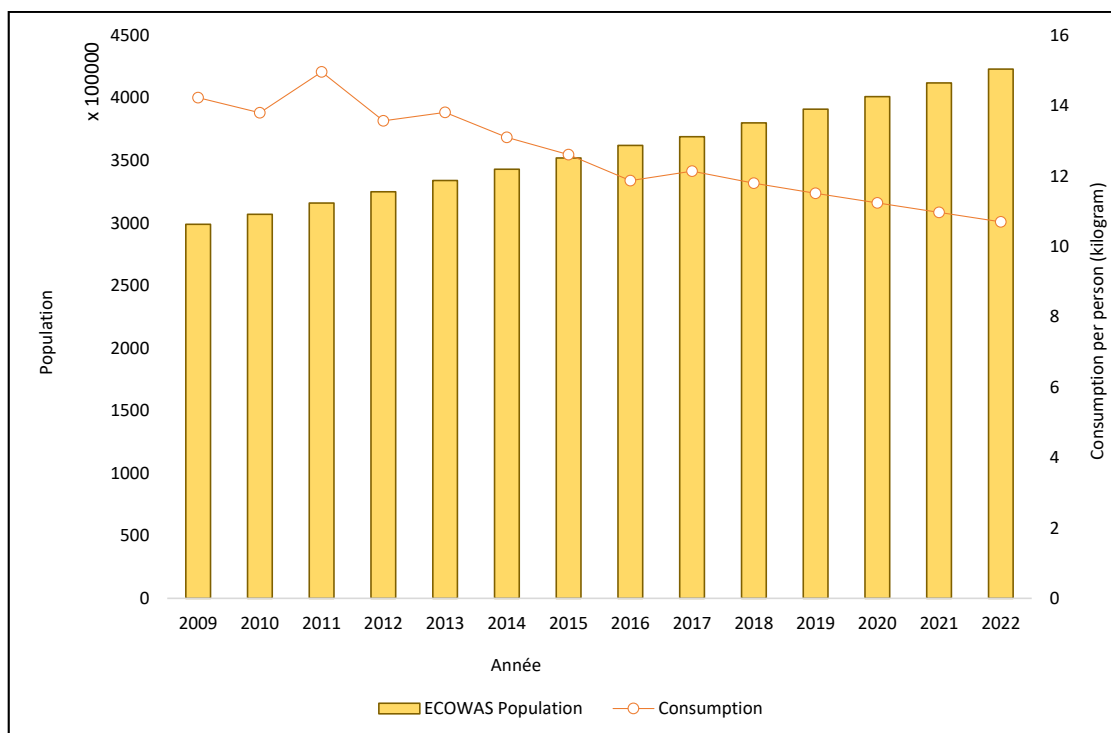


Figure 8. Population growth in ECOWAS and Mauritania and change in apparent consumption per capita over the period 2009 to 2022. Per capita consumption was calculated as follows: Consumption per capita (t) = $\Sigma ON_i(t) / \text{Population}(t) = \Sigma [(Prodi(t) + Imi(t) - Exi(t)) / \text{Population}(t)]$.

Fish consumption in the ECOWAS region and Mauritania has revealed four distinct trends. In Mauritania, there is a sustained increase in consumption, which has risen from 13 kg per person in 2008 to 23 kg in 2022 (Figure 9). A similar pattern is emerging in Benin, with an increase from 13 kg to 19 kg, and in Côte d'Ivoire, where it has increased from 16 kg to 22 kg, indicating a growth in fish consumption per capita (Figure 9). Ghana and Gambia, on the other hand, show signs of stabilization in fish consumption, with little variation over the years (Figure 9).

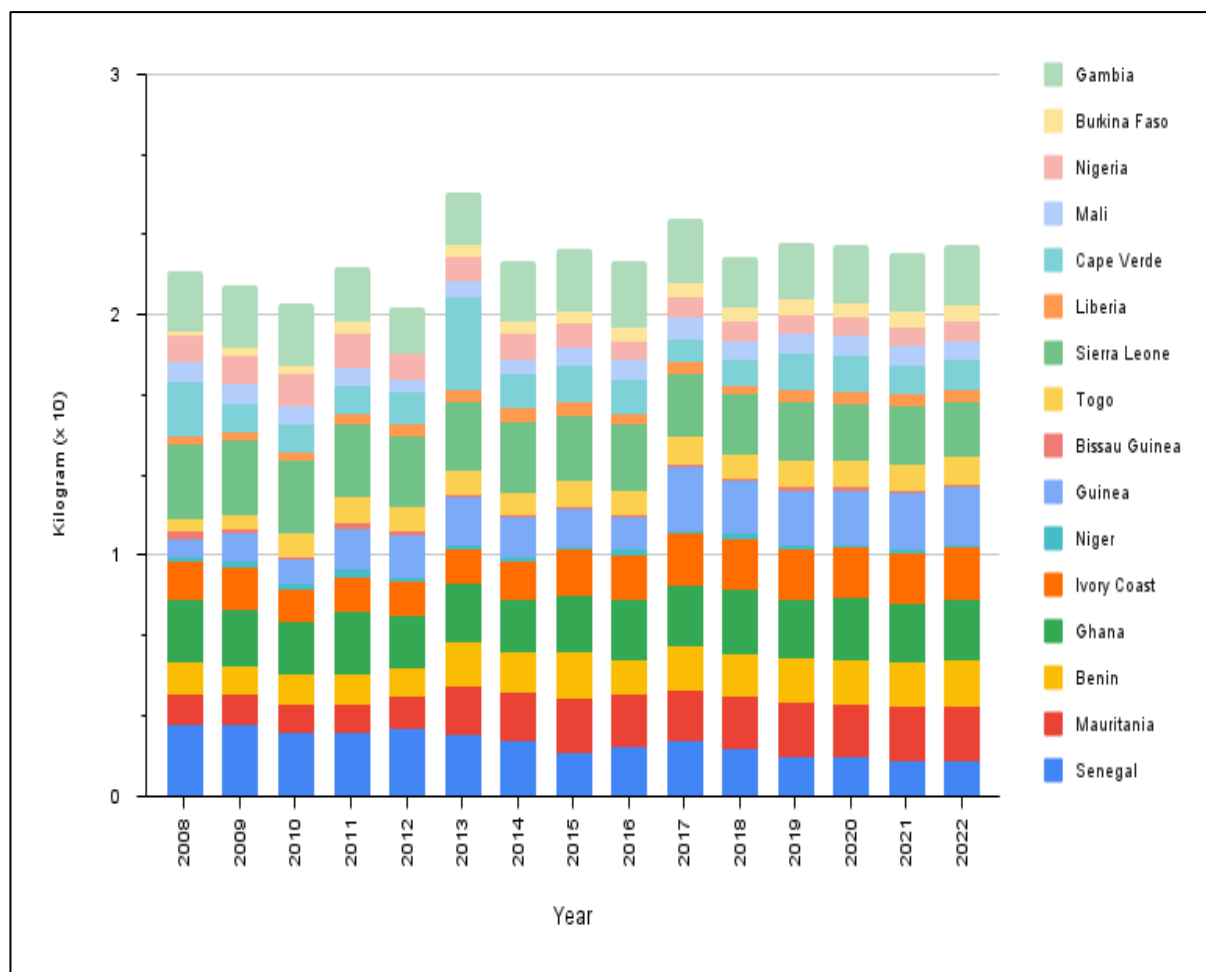


Figure 9. Apparent consumption of fish in kilograms per person/year in ECOWAS countries and Mauritania over the period 2008–2022. A country's per capita consumption was calculated as follows: $\text{Per capita consumption (t)} = \frac{\sum \text{ONI (t)}}{\text{Population (t)}} = \frac{\sum [(\text{Prodi (t)} + \text{Imi (t)} - \text{Exi (t)})]}{\text{Population (t)}}$.

On the part of Senegal, Nigeria, and Sierra Leone, a downward trend was recorded. Senegal, starting with a consumption of 29 kg per person in 2008, has seen this figure decrease to 14 kg in 2022 (Figure 9). Sierra Leone is also experiencing a decline, with consumption falling from 31 kg to 23 kg over the same period (Figure 9). Finally, countries such as Niger, Guinea-Bissau, and Liberia display relatively stable fish consumption, with some slight fluctuations over the years studied.

3.5. Future Fish Consumption in the ECOWAS Region and Mauritania

Projections from 2023 to 2030 show that the decline in consumption observed between 2016 and 2022 will continue. Thus, by 2030, fish consumption in the ECOWAS region and Mauritania will be between 10 and 9 kg per year. In 20 years, consumption has decreased by 5 kg per person (Figure 10).

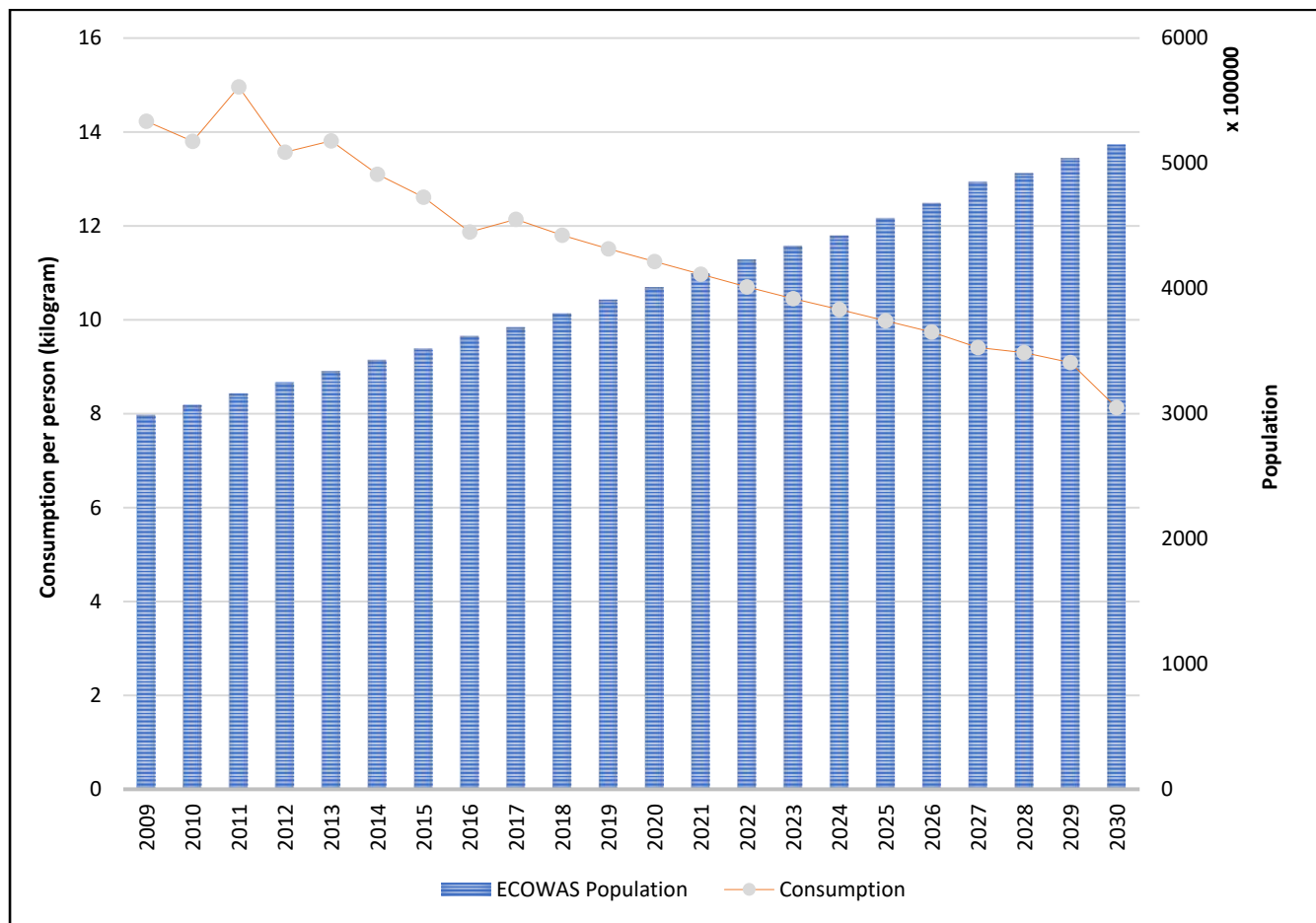


Figure 10. Population growth and future evolution of fish consumption in the ECOWAS region and Mauritania.

This is justified by the fact that the population has almost doubled over this period, and the production and supply of fishery products has not kept pace with the population growth. The significant imports of fishery products have not made it possible to raise the level of fish consumption at the regional level. Thus, it can be deduced that the demand is largely superior to the supply despite the region's fishery potential.

4. Discussion

Fish consumption in the ECOWAS zone and Mauritania, which averages 13 kilos per person per year, is subject to various national and regional factors. At the national level, differences in sea access, specific fishing policies, and disparities in production levels significantly influence consumption rates. At the regional level, the situation is further complicated by rapid population growth, which puts pressure on fish stocks, and widespread overfishing, which jeopardizes the sustainability of the marine ecosystem. Additional challenges include inadequacies in fishery governance that obstruct effective management and the expansion of fishmeal and fish oil industries that redirect considerable quantities of fish away from human consumption. Furthermore, climate change is altering marine habitats and species distribution patterns, impacting fish availability across the entire region.

The dynamics of fish consumption in various African countries exhibit significant peculiarities. Despite high levels of fishery production, some of the largest producers are not among the highest consumers regionally, a situation that may appear paradoxical. For instance, in Senegal, a substantial portion of fishery production, more than 60% or 280,000 tonnes out of 480,000 tonnes annually, is earmarked for export, reducing the

supply available to the local market. As a result, while production is over around 450,000 tonnes per year, the rise in exports has led to a decrease in local fish consumption. In Nigeria, both fishery and aquaculture production have doubled over the past ten years. However, per capita consumption has decreased by three kilograms during this period. This reduction is influenced by Nigeria's rapidly growing population, the highest in the region, and a reduction of more than 50% in fishery products imports due to the government's protectionist economic policy aimed at achieving self-sufficiency [43–47]. Furthermore, the Central Bank of Nigeria's restrictions on accessing foreign currencies for certain imports, including fishery products, have compounded the decrease in local consumption [48]. To mitigate this deficit, Nigeria established the "National Fisheries Development Fund" to bolster the fishing and aquaculture sectors. Contrasting with Nigeria and Senegal, Ghana has managed to maintain stable fish consumption at approximately 24 kg per person per year. This stability is partially attributed to dynamic aquaculture production and increasing imports of frozen fish to compensate for the national production gaps [49]. Côte d'Ivoire presents an interesting case: low production does not necessarily equate to low consumption. Even though its production is five times less than Senegal's and it has a larger population, Ivorian fish consumption surpasses that of Senegal by six kilograms per person. This higher consumption is supported by a 60% increase in imports of fishery products over the last decade. However, such dependency on imports carries risks, especially with Europe and China increasingly focusing their fishery production on domestic needs, which could reduce the volume available for export [11,34]. Additionally, Mauritania and Senegal, major suppliers for Côte d'Ivoire, are shifting focus towards the production of fishmeal and fish oil, requiring large quantities of fish previously available for export [29]. Fish consumption in the landlocked countries of West Africa is among the lowest in the region, varying between 4 and 6 kg per person per year. The absence of coastlines restricts direct access to fishery resources and increases the costs associated with transporting and preserving marine products. Logistical challenges, particularly maintaining the cold chain, exacerbate this situation [50]. The case of Mauritania is also noteworthy. The increase in fish consumption, from less than 13 to nearly 20 kg per person per year, is partly due to the pastoral crises that have affected the country. Issues in the livestock sector, such as drought, livestock diseases, and conflicts over access to pastures, have decreased the availability of meat, traditionally a significant component of the Mauritanian diet [51,52]. Consequently, fish has become a more affordable and accessible protein alternative. Overall, fish consumption across West African countries is a complex issue, heavily influenced by varied national policies, the evolution of fishery and aquaculture production, and international market dynamics. Alongside these country-specific issues, the ECOWAS region and Mauritania face common challenges that negatively impact fish consumption. These include significant demography, overfishing, poor governance, and climate change.

Demographically, West Africa exhibits the highest fertility rate globally, averaging 5.2 children per woman in recent years. By 2030, the population is projected to increase by one-third to 500 million and double by 2050, reaching 800 million [3]. This rapid population growth poses significant challenges to nutritional security in the region [43]. The reliance on fish as a primary source of animal protein has placed considerable pressure on fish stocks in recent years, leading to their depletion [19,39]. Consequently, the primary driver of declining fish consumption in the ECOWAS region and Mauritania is demographic pressure. Currently, fish production at the regional level is significantly deficit, necessitating substantial imports by ECOWAS countries. For instance, in 2017, the region imported fish and fishery products worth an estimated USD 4.8 billion [28]. Going forward, the demand for fish in the ECOWAS region and Mauritania will continue to be driven by demographic factors, alongside an increase in the affluent middle class and a growing preference for fish as the healthier dietary option [53,54]. One of the most pressing challenges now facing the coastal states of ECOWAS and Mauritania is the inability to produce sufficient fish to meet regional needs. The current indicators show us that it is improbable to increase production sufficiently to bridge the supply gap. The region is grappling with overexploitation of

fishery resources, degradation of ecosystems, the proliferation of fishmeal industries, and inadequate fisheries governance, all of which compound the challenge of sustaining fish stocks and meeting the burgeoning demand.

The ECOWAS countries and Mauritania have areas of seagrass beds, mangroves (mangrove species found in West Africa are Avicenniaceae (*Avicennia germinans* or white mangrove), Combretaceae (*Laguncularia racemosa* and *Conocarpus erectus*), and Rhizophoraceae (*Rhizophora harrisonii*, *R. mangle*, *R. racemosa*, which are called red mangroves), shallow rocky reefs and other habitats suitable for the life cycle of many marine species, including some small pelagic fish species [28]. These ecosystems are breeding and nursery areas for many marine species [55]. These ecosystems are found in the western Atlantic coastline (from Mauritania to Senegal in the Saloum Delta, South Casamance, Bijagos in Guinea-Bissau and South Guinea) [28]. In the Gulf of Guinea, seagrass beds and mangroves extend from the coasts of Nigeria to those of Angola. Nigeria has the largest mangroves in Africa, located in the Niger Delta, where they cover 0.8 million hectares. These important ecosystems serve as a resource pool for West African populations [28]. However, the systems for preserving these ecosystems are very ineffective, resulting in significant area losses in recent years [56]. Over the last twenty years, West Africa has lost 20% of its mangrove area, estimated at 1.5 million hectares [41]. The area of seagrass beds (studies of localized areas show areas of 67 km² in Senegal, 2 km² in Guinea-Bissau, and 0.2 km² in Cabo Verde) on a regional scale is not known. The seagrass beds are very little investigated. It has been shown that the area of seagrass beds in West Africa is rapidly disappearing [41]. The causes of these losses of seagrass and mangrove areas are pollution, destructive fishing techniques, and anthropogenic factors. Overall, decades of ecosystem degradation have led to a precipitous decline in the main fish stocks in West Africa. This decline has been aggravated by the overexploitation of fisheries resources. Indeed, recent work by CECAF (FAO–CECAF–WG 2022) has shown that most fish stocks in West Africa are in a critical situation. Five out of ten stocks assessed are in an overexploited situation. The five overexploited species are the most consumed in the region: round sardinella (*Sardinella aurita*), flat sardinella (*S. maderensis*), *Sardinella* spp., black scads (*Trachurus trecae*), and bonga (*Ethmalosa fimbriata*). The total catches of these species decreased by 10% between 2020 and 2021. This situation of overexploitation of pelagic fish is linked to the emergence of fish meal industries in Mauritania, Senegal, and Gambia. The quantity of pelagic fish destined to produce fishmeal unfit for human consumption has almost tripled over a decade, going from less than 150,000 tonnes in 2013 to more than 500,000 tonnes in 2023. The consequences are a strong increase in fishing efforts (especially on pelagic fish), a decrease in raw materials for the artisanal processing segment, and a decrease in fish consumption at the regional level. Thus, the fishmeal industry in the ECOWAS region and Mauritania poses a serious threat to food security, particularly concerning overexploited fish stocks.

The growth in fishery products production in West Africa is compromised by population growth, ecosystem degradation, overexploitation of fishery resources, and the emergence of fish meal and fish oil industries, as well as other factors such as post-catch losses and climate change [3,11,23]. In West Africa, slightly more than a quarter of the fish harvested are lost. FAO studies have found that 65% of post-harvest fish losses are due to fish handling and technology problems [42,43]. This is especially true in the regions where cold chains are underdeveloped. Climate change also has negative impacts on production [11]. Work has shown that changes in ocean current patterns, sea level rise, increased ocean temperature, and increasing acidification will have significant impacts on the abundance, composition, distribution, and availability of fish stocks [38,39]. Despite these potentials, many of the ecological and economic factors discussed here point to a bleak future for fisheries production in West Africa. The work of Failler et al., 2022, showed that with the lifting of these ecological and economic constraints and support for aquaculture, an additional production of seven tonnes could be expected (Figure 11). This would make it possible to maintain the current level of per capita consumption. Radical

changes are needed to bring the supply and demand of fish into line in the ECOWAS region and Mauritania. In West Africa, the biggest task will be to restore the health of ecosystems such as mangroves and seagrass beds [40]. It is necessary to continue setting up marine protected areas and reforestation of mangroves to achieve the Aichi target 11 in the region. The strategic plan for the conservation of seagrass beds of the West African Marine Protected Areas Network (RAMPAO) must be further implemented.

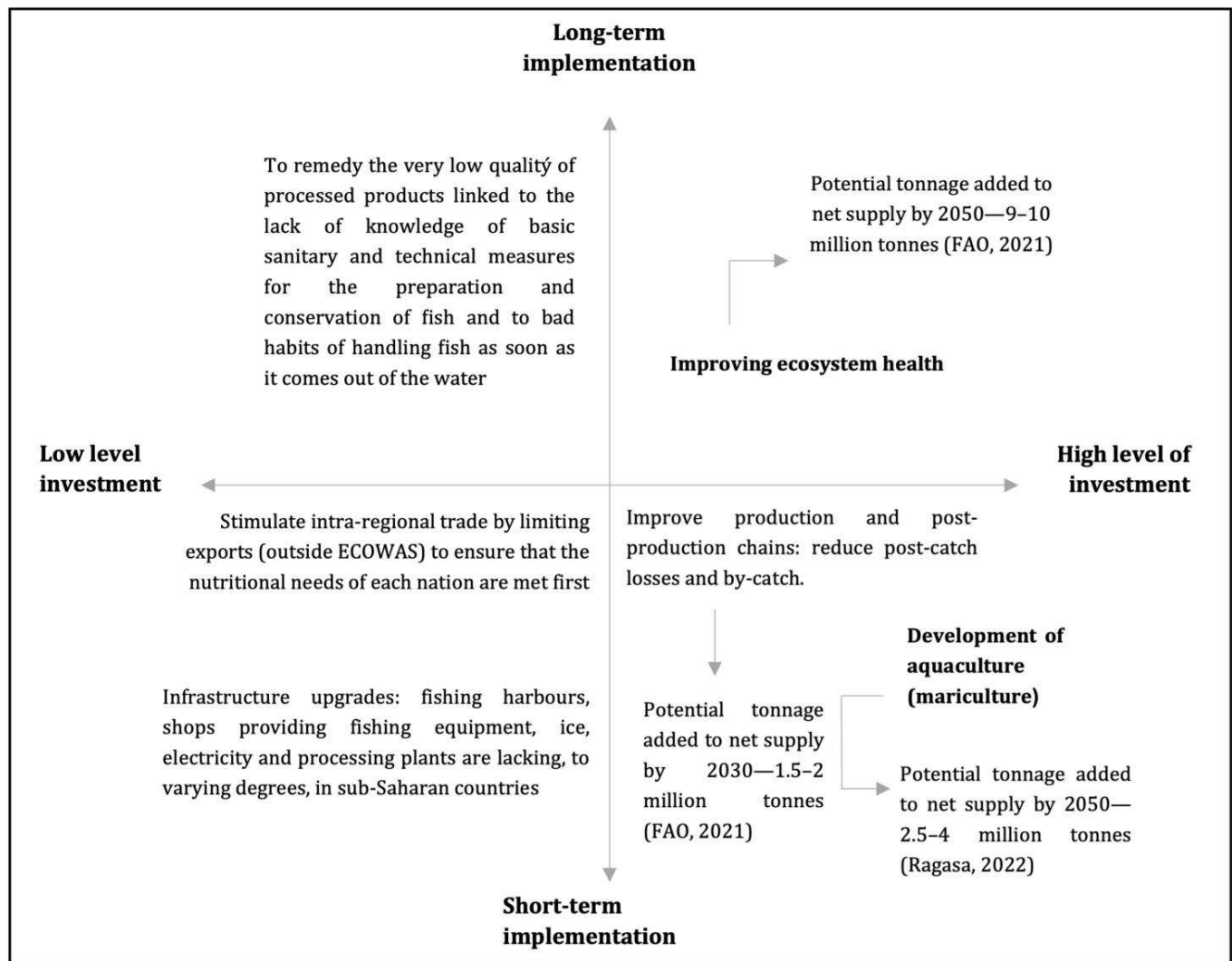


Figure 11. Recommendations for improving the availability of fishery products on the West African market and food security [47,57].

The second lever for improving fish consumption is to technically strengthen the production chains by reducing post-capture losses and by-catches. This will mainly involve upgrading the infrastructure (fishing ports, fishing equipment, ice, electricity). The third lever is to stimulate intra-regional trade to ensure that the nutritional needs of each nation are met first. The last lever is to develop aquaculture and drastically limit the quantities of fish destined for the fishmeal industry. A special effort should be made to implement actions in the field of aquaculture based on a transfer of skills from Nigeria and Ghana to the other ECOWAS countries. In this field, private entrepreneurship must be encouraged and supervised in order to create conditions that are conducive to the development of the production tool, in particular, a clear legal framework with an aquaculture investment code, as well as sufficient resources in terms of water, feed, and fry. The use of land unsuitable for agriculture will make it possible to make the most of existing resources. The rapid growth

rate and lower cost compared with fish caught at sea will enable production to be increased. In addition, research should intensify its consideration of alternatives to fishmeal as the main source of feed for aquaculture fish; fly meal, in particular, that produced from the black soldier fly (*Hermetia illucens*), appears to be an exploitable option in West Africa. A production potential of around 2 million tonnes by 2050 in the ECOWAS region is, therefore, entirely conceivable (Figure 11).

5. Conclusions

This study on the challenges of fish consumption in the ECOWAS region and Mauritania shows the opportunities, constraints, and challenges of the region in meeting the current and future demand for fishery products. Despite the significant potential in fishery resources, the region is unable to meet its animal protein needs. Climate change, ecosystem degradation, and population explosion are distinct and major threats that constitute obstacles to the growth of fisheries production. However, it has been established that the restoration of ecosystem health will allow the development of significant opportunities and promising prospects for the future of fishing.

The preservation of ecosystems will enable the West African region to boost production and make up for the current and future production deficit, which will persist by 2030 if no transformative measures are taken. Thus, any regional initiative in favor of fisheries and fish consumption should make it a priority to place the preservation of ecosystems and the sustainable exploitation of resources at the forefront of decisions. Secondly, ECOWAS, as a regional integration institution, should emphasize integrated management measures to ensure that the benefits of the region's wealth of resources, particularly in fisheries, accrue primarily to the West African population. This means prioritizing West African agendas and ensuring that the basic food security and livelihood requirements of the populations of all ECOWAS countries and Mauritania are met first. It is important to boost aquaculture in West Africa, and a transfer of skills between countries is crucial, along with support for private entrepreneurship and innovation, such as the use of fly meal instead of fish meal, which promises significant production potential by 2050. By doing so, supply could exceed demand, resulting in lower fish prices in the local market, and the value added will be concentrated in the coastal countries and not exported.

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