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Unlocking the potential
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in Africa, the Caribbean and the Pacific



SUMMARY REPORT

Oyster value chain in Senegal

January 2023



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Abbreviations and acronyms

Note: The abbreviations and acronyms below are those used and referenced in the full analysis and upgrade report.

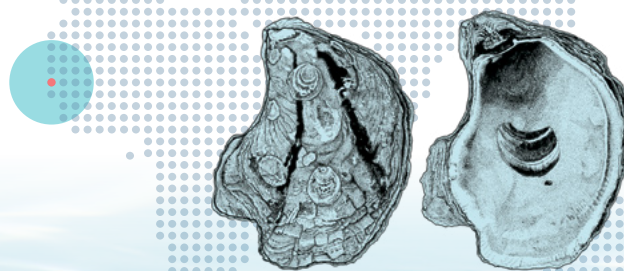
AFNOR	French Standards Association
ANA	National Aquaculture Agency
AOAC	Association of Official Analytical Chemists
APIX	Agency for the Promotion of Investments and Major Projects
ARD	Regional Development Agency
CIRAD	Centre for International Cooperation in Agricultural Research for Development
CRODT	Centre for Oceanographic Research of Dakar Thiaroye
DITP	Directorate for Fisheries Processing Industries
DPM	Directorate for Maritime Fisheries
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
FTE	Full-Time Equivalent (employment)
GIE	Economic Interest Groups
IRD	Research Institute for Development
ISRA	Senegalese Institute for Agricultural Research
ITA	Food Technology Institute
JICA	Japanese International Cooperation Agency
NGO	Non-Governmental Organization
OACPS	Organization of African, Caribbean and Pacific States
PSE	Emerging Senegal Plan
SMIG	Guaranteed minimum interprofessional wage
SPS	Sanitary and phytosanitary measures
STDF	Standards and Trade Development Fund
SWOT	Strengths, weaknesses, opportunities and threats (analysis)
USAID	United States Agency for International Development
USD	United States Dollar
VA	Value added
VC	Value chain
WFP	World Food Programme
WWF	World Wildlife Fund

1. Introduction

The FISH4ACP programme is an initiative of the Organization of African, Caribbean and Pacific States (OACPS) aimed at supporting the sustainable development of fisheries and aquaculture. FISH4ACP is a programme to develop value chains (VC) over a period of five years (2020 -2024). It is implemented by the Food and Agriculture Organization of the United Nations (FAO) and funded by the European Union and the German Federal Ministry for Economic Cooperation and Development.

The **oyster value chain in Senegal** is one of the 12 value chains to have been competitively selected among over 70 proposals to benefit from the support of the FISH4ACP programme. This document presents a summary of the results of the analytical work done in 2021. It contains the main findings of the functional and sustainability analysis of the value chain and presents the upgrading strategy to which the FISH4ACP programme will contribute from June 2022.

The methodology used by the FAO value chain analysis team and national partners to carry out this work included: the review of reports, publications and secondary databases; primary research and consultations with stakeholders using various methods (for example, discussion groups, observation visits, semi-structured interviews and surveys); a series of workshops with stakeholders, organized in 2021 and early 2022 to present the work, validate the emerging conclusions and agree on an upgrading strategy for the value chain. The methodology adopted a participatory approach including the private sector, Government, other donors, civil society and regional organizations. The team was assisted throughout its work by the Directorate for Fisheries Processing Industries (DITP), in collaboration with the National Aquaculture Agency (ANA) and the Maritime Fisheries Directorate (DPM). The structure of this report and the assessment and rating basis for the economic, social and environmental sustainability and resilience of the value chain are in accordance with the FISH4ACP methodology.



Mangrove oysters
(*Crassostrea gasar*)

2. Functional analysis

A functional analysis was done to assess the structure and dynamics of the oyster value chain in Senegal. The main points that emerge from the functional analysis are the following:

The oyster sector in Senegal consists of harvesting and oyster farming, processing (especially by boiling and drying) and the sale of mangrove oysters. It is vertically integrated, from production to processing, and mostly informal. Production is estimated at around **16 000 tonnes** in live weight equivalent¹, of which 15 600 tonnes come from **harvesting (97.5 percent) and 400 tonnes from oyster farming (2.5 percent)**. However, according to official data, only **300 tonnes come from harvesting and 400 tonnes from oyster farming**². This is **primarily a seasonal activity conducted from December to the end of May**, in line with the natural oyster reproduction cycle and the actors various activities (at the beginning of the year, since the climate is very dry in Senegal, market gardening activities conducted by the VC actors are not very developed, leaving more time for oyster-related activities).

There are two main sales channels: **processed oysters**, a traditional product with low added value, mainly consumed by Senegalese, and **fresh oysters**, sold at a higher price, mostly to a targeted clientele of tourists or expatriates (supermarkets, restaurants, and hotels).

Processed oysters account for the bulk of volumes sold (about 99 percent). The predominance of processed oysters is due to several reasons: i) cultural, ii) sanitary (processing improves product safety and life span) iii) logistical (ease of transport of the dried product compared to the fresh product), iv) lack of investment in the necessary equipment and v) market-related. Only 13 percent of oysters reach the minimum size of 7 cm so they can be sold fresh.

The demand for processed oysters exceeds supply on the national market, which leads to the importation of large informal and unquantified amounts from neighbouring countries (the Gambia, Guinea-Bissau, Guinea, and Sierra Leone). The processed products are mostly sold on weekly markets close to production areas (Passy, Sokone, Foundiougne) and in the major urban centres (Kaolack, Dakar).

The processing sector involves around **13 000 harvesters**, mainly **women from the regions of Sine Saloum and Casamance**, often **organized into informal groups of three to five people** mostly using **artisanal techniques inherited from their parents**. According to estimates, the quantity harvested is on average 1.2 tonnes/year per woman. The collection of oysters is done concurrently with market gardening, sale and harvesting of other shellfish. Oysters are their second source of protein after fish (7 percent of volumes are estimated to be self-consumed). The sector thus has **a strong social value** in brackish, sometimes landlocked areas and is still linked to **subsistence farming**.

Occasionally, the players are also organized into **more formal "groupements d'intérêt économique" (economic interest groups) (GIE)**. About **thirty** GIEs of varying sizes, comprising on average about forty people, are active in the oyster sector across the

¹ Shell included.

² Quantities declared are based on certificates of origin and health certificates which are required for processed products. However, these certificates are only available for products sold in regions other than their areas of production and are hardly used and controlled. The quantity produced is thus greatly underestimated and the figures are not considered reliable.

country. Historically, the GIEs were mainly involved in harvesting. However, oyster farming trials are beginning to surface (with 17 EIGs involved). This production method is relatively more complicated and requires higher financial and human investments but has higher economic returns and is less exacting in terms of working conditions. In general, oyster farming accounts for only 20 percent of the turnover of the GIEs.

Once the oysters have been harvested/produced and processed by the individual farmers and GIEs, most of the volumes move through **local wholesale vendors** (around 150 of them in the country), in direct contact with the women. They group the products, then move them to larger cities for sale to **larger but fewer wholesalers** (about ten in number), who process numerous products and resell the processed oysters to **retailers**, estimated to be around 1 300 throughout the country. The retailers meet the demand of consumers, some of which are informally exporting oysters to other countries in the region or abroad for consumption by the Senegalese diaspora (mainly in Europe and the United States).

The fresh oyster sector is being developed, particularly in the Sine Saloum region, where fresh oysters are sold to tourist hotels and resorts. **Two formal oyster companies** are promoting modern oyster farming practices, with the introduction of a foreign species, the *Crassostrea gigas*, without any specific control.

Traditional actors, particularly the GIEs, also set aside the best oysters of the local species *Crassostrea gasar*, often coming from oyster farming, to sell them fresh, at a higher price. Quantities sold fresh by these actors are still very limited (5 percent of the quantity produced by the GIEs), **the issue of sanitary standards being paramount and still poorly understood**³. **In fact**, the sale of fresh products requires an additional step, the disgorging, which must take place in specific pools, still rare in the country, as well as sanitary certificates. In terms of marketing, the actors involved in the sale of fresh oysters are usually integrated and sell directly to the final consumers, consisting of hotels, restaurants and end consumers.

The most advanced producers, i.e., formal oyster farms and some GIEs involved in oyster farming, could play a key role in the sector due to their potential for adoption and dissemination of innovation, and improved business models, and, in the future, possible links between promising markets and subcontractor producers.

Input and support services to the value chain

The value chain currently benefits from very few services and inputs. **The development of services could be a leverage point**, especially from the following actors:

- Suppliers of oyster farming **equipment** (overall inexistent at the national level at the moment);
- Providers of **financial services**, offering financial products that are accessible, sustainable and adapted to the oyster sector which would facilitate investments in producer's fixed assets, or financing the working capital of core actors in the value chain and the input providers listed below as well as the insurance industry;
- **Canoe operators**, to ensure more fluid movement of actors and products;
- **Laboratories**, in order to control and certify products in compliance with the regulatory framework, at a lower cost and in a more reasonable time frame;
- Providers of **training** services (for example, by learning and vocational training centres, Non-Governmental Organizations [NGOs] or international institutions), to train and raise

³ Actors are not yet able to meet the standards specified in Decree 69-132.

awareness on good hygiene practices, good manufacturing practices, management and mangrove reforestation, oyster farming, sanitary analysis of bivalve molluscs and financial management;

- Providers of **logistical services** and actors **within the cold chain** (transporters with refrigerated trucks and owners of cold storage warehouses), in order to maintain product safety and freshness.

Enabling environment

Despite the existence of several government institutions involved in the monitoring the sector (DITP, DPM, ANA) and the listing of aquaculture development among the 27 flagship projects of the “Emerging Senegal Plan” (ESP), the oyster value chain remains **on the periphery of the core missions** of the different institutions. In addition, due to its multiple nature (both aquaculture and capture fisheries), **there are difficulties in the coordination of interventions**.

The national and local authorities and the regional development agencies (RDAs) for their potential to interact with the GIEs, businesses, harvesters and projects on the ground represent a leverage point for the value chain. Their role is crucial to implement sustainable stock management plans, and to target and coordinate the activities of the different projects involved in the oyster value chain (including those of the Government, NGOs and development partners) in order to improve the efficiency and the dissemination of training programmes (especially in food safety, hygiene, manufacturing and natural resource management practices), and to ensure effective coordination between the stakeholders and involve the most vulnerable individual harvesters.

The regulatory framework, the compliance with food safety standards and the infrastructure needed to meet these standards must be improved to ensure the development of the value chain. It is appropriate to: i) conduct a mapping of the quality of the waters and the potential types of pollution, which could help to recommend the appropriate treatment to ensure a safe product, regardless of pre-market processing; ii) identify the needs and food-safety challenges across the value chain of bivalve molluscs, which would also help to identify the required infrastructure (for example **depuration basins** and **cold chain facilities**); iii) identify the weaknesses in the legislative framework (for example, food safety standards, the allocation of land concessions, the management of introduced species and the allocation of responsibilities between different Ministries) and provide adequate systems; iv) develop a national food safety surveillance programme and define quality controls (which should be undertaken by the FAO project “Strengthening the shellfish industry in Senegal through the implementation of sanitary and phytosanitary standards [SPS]” started in 2022).

The existence of many mangrove-lined channels («bolongs») over vast areas is a significant plus for the abundance of oysters in Senegal, particularly in Saloum and in Casamance. However, the enclavement of these areas makes travel difficult. The **drought** in recent years has also greatly increased salinity and affected the mangroves. Finally, the overexploitation of oysters, in the absence of a stock management plan, evidenced by the declining average size of harvested oysters, lowers yields and increases remoteness of harvesting areas, and constitutes a threat to the value chain.

In recent decades, however, the **considerable efforts made in conservation and restoration have contributed to mangrove regeneration**.

Market

The domestic market remains the most promising market for the moment and could be developed by striking a **balance between two options**, one more oriented towards **quantity**, to ensure food security (55 percent of consumers surveyed by FAO indicate that oysters are not always available, partly due to population growth which increases demand, and the decline in supply because of overfishing) and the other oriented towards **quality**, especially for the sale of fresh oysters which is more profitable (in terms of size and health quality).

International markets are still out of reach for the Senegalese oyster value chain, due to food safety standards which require investments in infrastructure, certification and labelling and extensive water management, and an uncertain market potential (competition from other already established products and unconfirmed demand). The neighbouring African countries and Senegalese diaspora, with already consolidated channels and more easily achievable food safety standards, could be priority markets for Senegalese exports of processed oysters. That would be an opportunity to improve the actors' understanding of the registration, certification and production planning and increasingly demanding food safety standards.

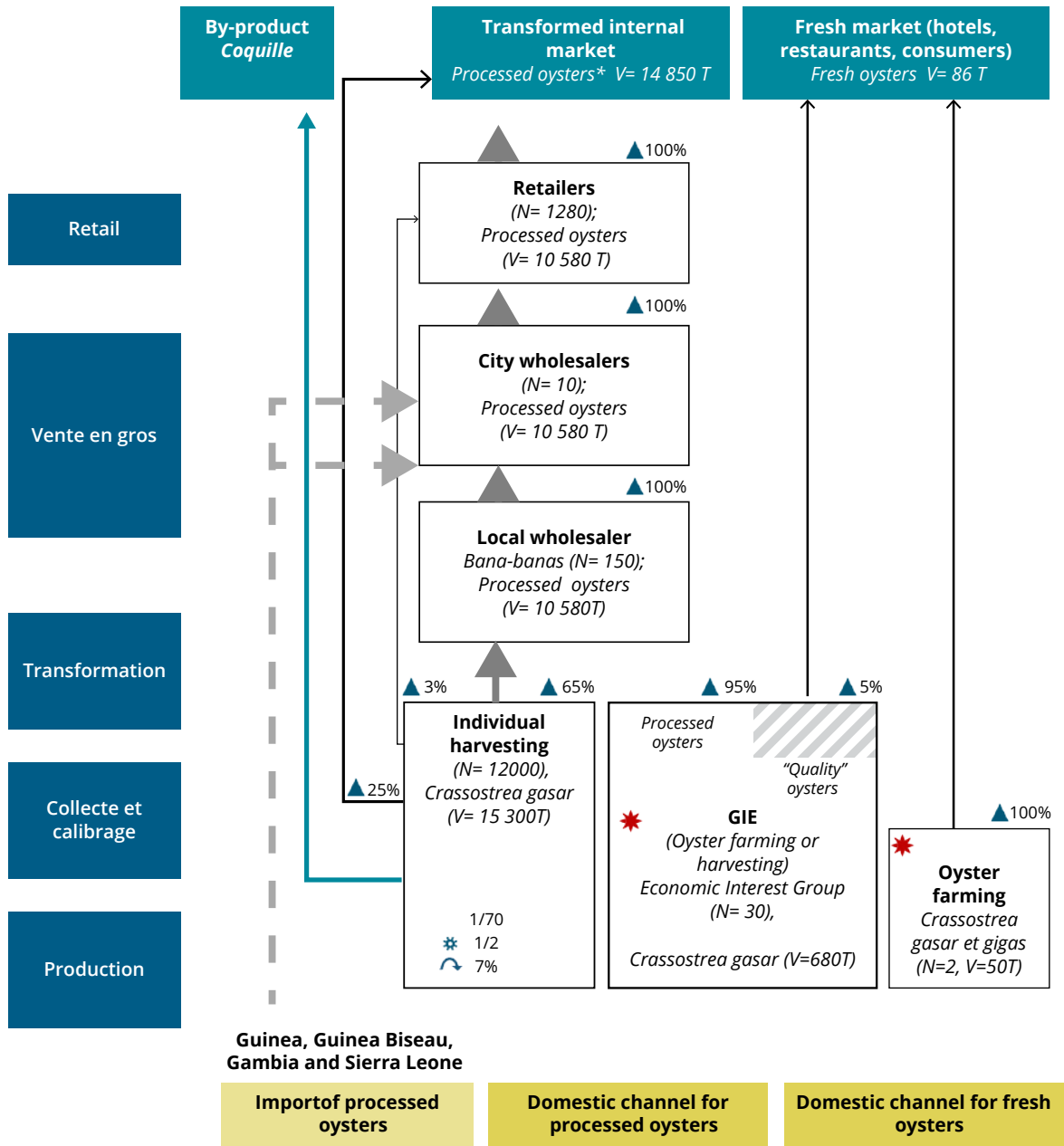
Leverage points

Leverage points are areas in the value chain where an upgrading activity would have the greatest impact and contribute to reducing identified constraints and to the overall development of the chain. Several leverage points have been identified in the Senegalese oyster value chain:

- Stakeholders involved in **oyster farming**;
- **GIEs** regrouping several actors, relatively few in number, which can interact with more advanced producers and could provide employment to several women harvesters in the future;
- Local authorities involved in the coordination, organization and cooperation within the sector;
- Development of appropriate **services** available to stakeholders;
- Improvement of the regulatory framework, infrastructure and compliance with food safety standards.

The functional analysis has helped to develop the map of the value chain presented below (Figure 1).

Figure 1: Map of the oyster value chain in Senegal



Legend			
Ratios and percentages:	Quantities and volumes:	Flows and interactions	Abbreviations
▲ Sold (%)	N Number of actors	→ Sale	* The processed oysters are
↻ Self-consumed (%)	V Volume in metric tonnes (MT)	→ Foreign flow	• boiled and dried (1/70)
* Conversion ratio	★ Leverage point	-> Sale of by-product	• or grilled, boiled, fermented or smoked (1/2)
		▨ VC function skipped	

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.



3. Sustainability analysis

This section examines the economic, social and environmental impacts of the value chain as well as its resilience. For these four dimensions of sustainability, various indicators have been analysed and have helped to develop spider-diagrams (Figure 2, Figure 3 and Figure 4) reflecting the performance of the value chain in the areas established by the FISH4ACP methodology, on the scale of 1 to 3 or 1 to 5. A more general performance score from 0 to 100 percent (100 percent being the maximum performance) is also associated with each sustainability dimension. Finally, a value chain heatmap

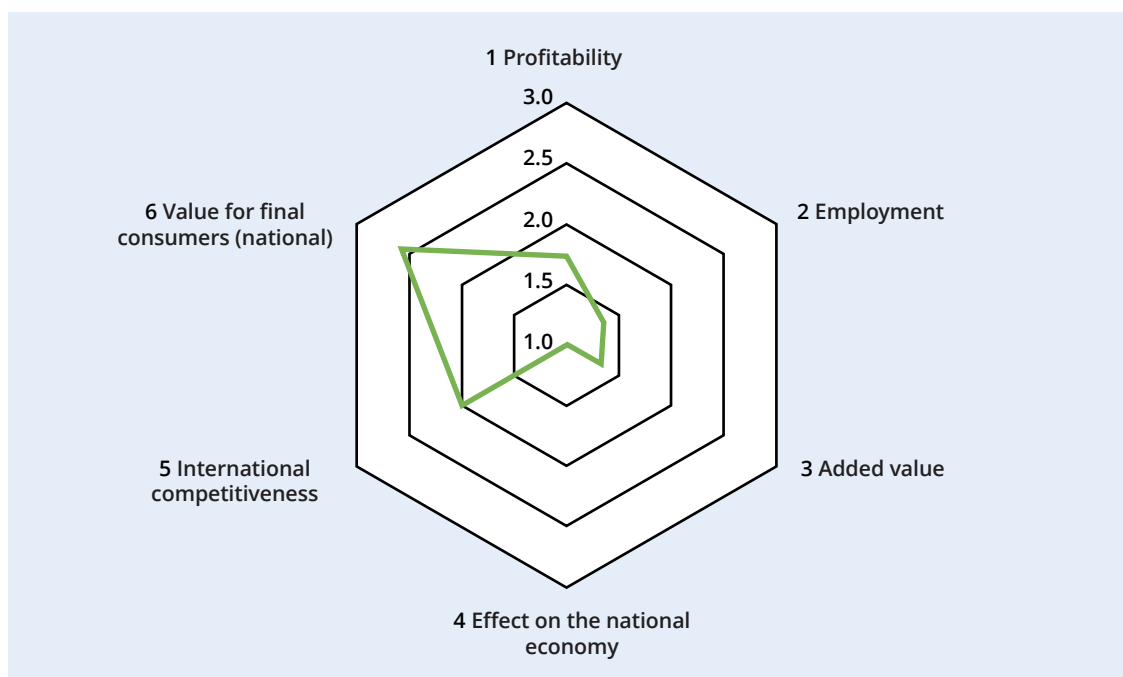
(Table 1) provides an overview of the sustainability performance of the value chain and helps to inform the upgrading strategy presented in Section 4.

Economic sustainability

Economic sustainability remains weak, with a score of 35 percent. Net revenue is close to **subsistence** levels for most stakeholders, particularly for individual female harvesters. It tends to **diminish due to the overexploitation of stocks**. The sector generates **an extremely low number of salaried jobs**, found almost exclusively in oyster farms with an average wage close to the Guaranteed Minimum Inter-Professional Wage (SMIG). That being said, it offers an **opportunity for self-employment for people in estuarine areas** (approximately 13 000 people, including traders). **Indirect value added is extremely low**, due to the low added value of local goods (furniture, tools), importation of more modern tools and the limited services used by the chain or their low added value (non-refrigerated transport, weighing). Exports are low and unofficial, carried out by Senegalese nationals returning to Europe, and **the trade balance is rather negative** due to the unofficial imports of processed oysters from neighbouring countries, valued at approximately USD 0.5 million a year, that needs to be better quantified (the value of domestic production is estimated at USD 1.7 million). **Government revenue is also extremely low**, limited to municipal levies and fees from food safety services. The only actors that pay taxes are the modern oyster producers. **Finally, the total investment by the stakeholders in this sector is only about USD 700 000** (in comparison, the total amount invested by the non-financial companies in Senegal was USD 1.3 billion in 2007).

One of the objectives would therefore be **to raise the level of remuneration of individual harvesters, by bringing it closer to SMIG through their inclusion in better organized production systems**. Another would be to increase in a flexible way the production of fresh oysters, especially during festive periods.

Figure 2. Performance scores of the value chain in terms of economic sustainability

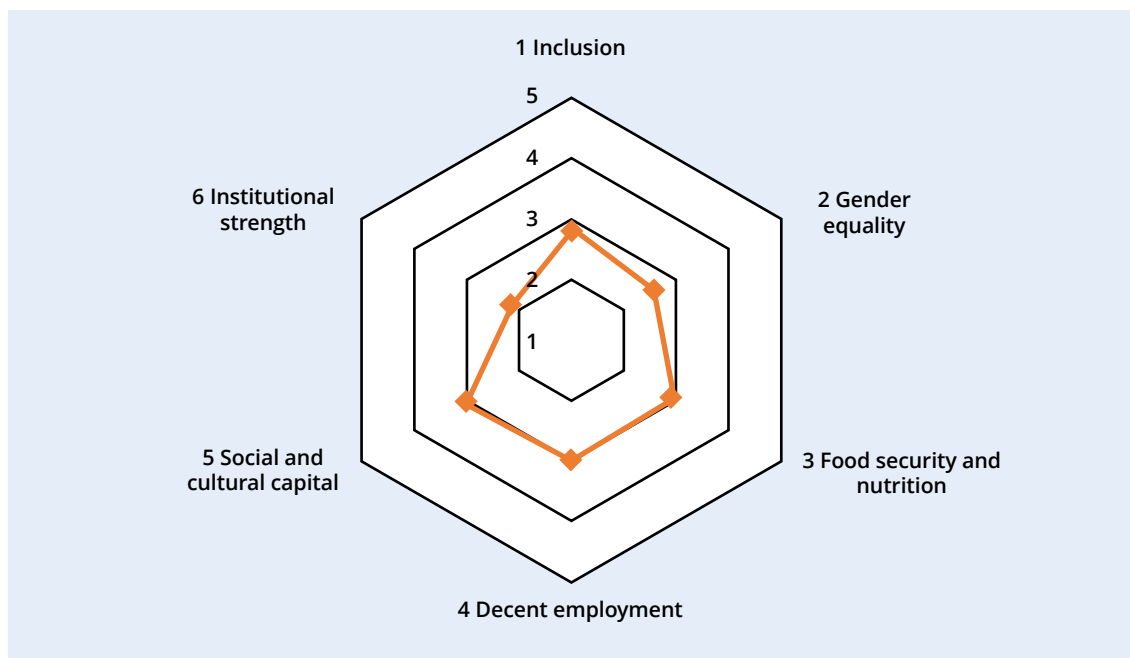


Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

Social sustainability

The **social sustainability** of the value chain is also low, with a score of 40 percent. Although the market demand for oysters is strong, this only seems to benefit certain people, in particular the wholesalers who are mostly men. There is an **uneven distribution of value added between the actors**. Women, who are the main actors in the value chain, are faced with a lack of resources as well as **relative independence and low decision-making power compared to men**. They remain dependent on the harvesting of oysters, in a context where the amount of oysters obtained from mangroves is becoming increasingly smaller leading to a decline in their earnings and more difficult living conditions. **There is rising food and nutritional insecurity for these women, more broadly for oyster consuming populations**, with stocks being overexploited. Finally, at **institutional level**, most of the stakeholders in the value chain undertake informal activities which are not declared. Only a few GIEs busy in oyster production receive support from the ANA whose **actions are considered inadequate** by the actors. **Access to funding** remains very limited, due to restrictive conditions of access (guarantees, clear operating accounts, etc.), just like **access to information** (for access to markets, technologies, funding), mainly conveyed by neighbours, customers and suppliers.

Figure 3. Performance scores of the value chain in terms of social sustainability



Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. Oyster value chain in *Senegal: Summary report*. Rome, FAO.

Environmental sustainability

The environmental sustainability score in the value chain is 50 percent. Due to the **very selective nature of harvesting procedures** and **awareness campaigns in recent years** against indiscriminate cutting of mangroves, the value chain now guarantees the integrity of vulnerable mangrove ecosystems. The **still artisanal nature** of the value chain has a relatively limited impact on the climate, given that **few inputs are used**. The losses and wastage of oysters, **a subsistence food**, are rare and many precautions are taken to limit them.

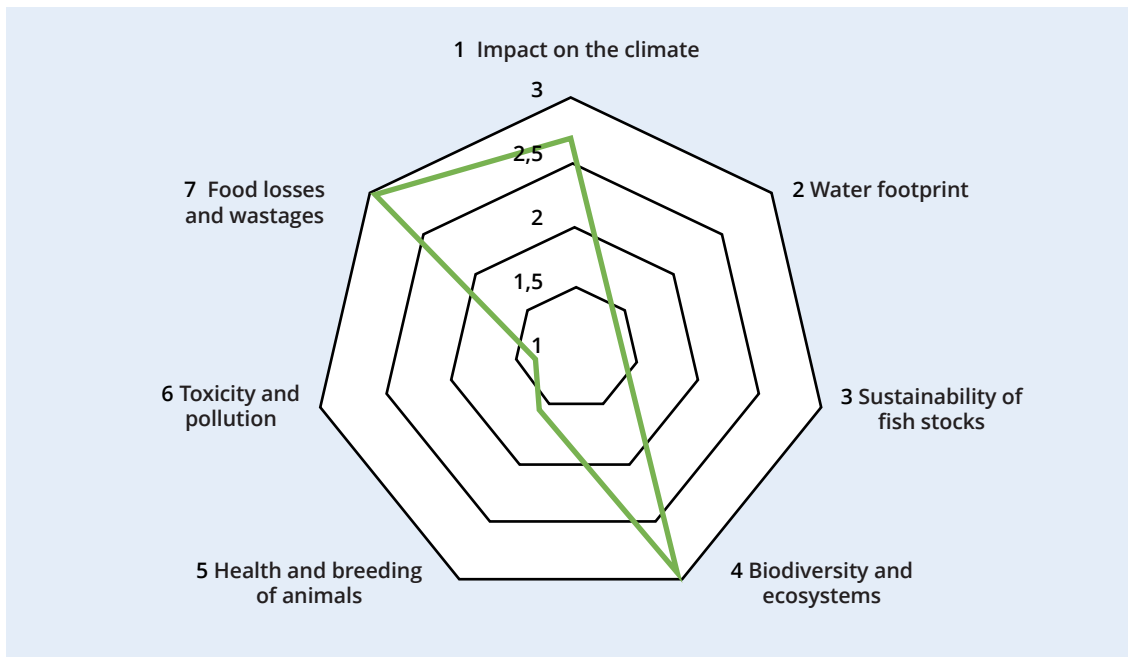
There is however **strong pressure on natural stocks** due to the harvesting of oysters which, in many parts of Saloum and Casamance, is done by almost all the women (around 12 000) during the production season.

Concerning the safety of oysters, measures such as **disease prevention and outbreak response plans and strategies are largely absent**, and new species are introduced without any control. **High seed mortalities in oyster farms** (between 30 and 50 percent of the seed purchased) are neither controlled nor monitored. This presents a high risk of introduction of new pathogens for the mangrove oyster.

The different functions of the value chain also emit various **gaseous and solid pollutants (including oyster shells)**, and there is a clear lack of specific regulations, appropriate operational measures and storage infrastructure and **waste treatment plants** to reduce **air and soil pollution**. For fresh water, on top of the problem of sustainability of water supply in many areas, it's again **the lack of appropriate measures to avoid water pollution** which is a major deficiency⁴.

⁴ Particularly non-purified urban effluents, whose concentration changes depending on the rainfall pattern, and possible heavy metals.

Figure 4. Performance scores of the value chain in terms of environmental sustainability



Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

Resilience

The performance of the value chain is very poor with regard to resilience (8 percent). **Excess capacity** in terms of infrastructure, financial capacity and actors involved in oyster farming is rare and **connectivity**, both at the level of the physical infrastructure used by the value chain and links with external markets is poor, particularly with enclaved production areas. Despite their involvement in the reforestation of mangroves, **the majority of stakeholders does not prepare for possible shocks**, mainly because of their limited financial capacity and the subsistence nature of the value chain. Finally, there are very few monitoring systems in place, and the collaboration and coordination at the level of the Ministries and Directorates, divided between fisheries and aquaculture, needs to be improved.

For each of the sustainability analyses, a number of indicators have been calculated in line with the FISH4ACP methodology. A map of risk elements, presented in Table 1 below, summarizes the assessment of the economic, social and environmental sustainability and analysis of the resilience of the value chain.

Table 1. Hotspot map of the oyster value chain in Senegal

Economic sustainability	Social sustainability	Environmental sustainability
Net income	Wages and employment distribution	Electricity use
Trend net income	Value added distribution	Fuel consumption
Return on sales	Poverty and vulnerability	Carbon footprint
Return on investment	Discrimination	Use of renewable and clean energy
Number of jobs expressed in full-time equivalent (FTE)	Women's economic involvement	Water and ice consumption
Number of part-time jobs	Gendered division of labour	Water pollution and waste water treatment
Number of wage labour jobs	Access to productive resources	Stock status and dynamics
Number of family/self-employed jobs	Women's decision-making power and leadership	Fishing pressure
Average wage for hired workers	Food availability	Associated species
Average wage of workers	Access to food	Vulnerable ecosystems
Total value of net wages	Use of food (nutrition)	Endangered, threatened or protected species
Direct value added at value chain level	Stable supply of food	Aquatic, genetic resources
Indirect added value at value chain level	Respect for labour rights	Implementation of biosecurity measures
Total value added	Child labour and forced labour	Appropriate breeding and handling of animals
Contribution to gross domestic product	Job security and workplace safety	Responsible use of food
Contribution to trade balance	Employment Attractiveness	Responsible use of drugs and chemicals
Impact on public finances	Collective action	Air pollution
Contribution to investment	Coordination of transactions	Waste pollution
Nominal protection Coefficient	Social cohesion	Pollution by organic waste
Domestic resource cost ratio	Cultural traditions	Food loss

(cont.)

Economic sustainability	Social sustainability	Environmental sustainability
Consumer surplus	Policies, regulations and standards	Food waste
Food security	Access to finance	
Consumer evaluation	Access to natural resources	
Consumer preference	Access to information	
Prices relative to substitutes		
Resilience		
Redundancy	Diversity	Connectivity
Collaboration	Learning and adaptation	Participation

■ Not concerning	■ Concerning	■ Highly concerning	■ Not calculated
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Economic sustainability score⁵	35 %
Social sustainability score	40 %
Environmental sustainability score	55 %
Resilience score	08 %
Overall sustainability score	40 %
Number of hotspots of high concern (red)	29

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

⁵ According to the FISH4ACP methodology, "the indices (sustainability scores) are calculated by adding up all sub-domains (1 for green, 0.5 for yellow, 0 for red) and dividing this result by the number of sub-domains, expressed as a percentage"



4. Upgrading strategy

Analysis of strengths, weaknesses, opportunities and threats (SWOT)

The analysis of strengths, weaknesses, opportunities and threats (SWOT) of the value chain provided in Table 2 below has helped to move from analytical complexity to strategic simplicity and to inform the development of the upgrading strategy.

The main strength of the value chain lies in its high production potential. The size of the mangrove areas in Senegal, which are conducive to the reproduction and growth of oysters, the number of actors involved and the presence of some more advanced actors are assets on which the development of the chain can be based. Some technical features of oyster farming are another strong point for the value chain: oyster juveniles' catchment allows to increase the stock by lifting the limitations of the available surfaces. Furthermore, the species exploited in Senegal (*Crassostrea gasar*) is different from the dominant species on the world market (*Crassostrea gigas*), which could represent a source of product differentiation. Finally, there is a growing awareness among stakeholders of environmental issues leading to the decline of wild mangrove cuts, which is encouraging for the future development of the value chain.

Despite the favourable natural environment and the other favourable factors mentioned above, the societal **environment** remains a weakness for the development of the value chain. The lack of clear knowledge of the most suitable areas for oyster farming and on the growth and breeding characteristics of *C. gasar*, the lack of adequate sanitation facilities for the treatment of shellfish, the lack of resources and overlapping responsibilities between state agencies, uncertain land tenure and the absence of oyster concessions makes it difficult for any private individual initiative to emerge and or succeed. Stakeholders do not have access to the knowledge needed to undertake oyster farming and/or improved processing methods, and returns on investment in equipment and infrastructure (such as depuration centres) are not guaranteed. All these factors, combined with an unreliable governance of GIEs, contribute to a sort of "tragedy of the commons": personal investments remain limited in oyster farming, because profit sharing is not remunerative enough and income is only seasonal.

The **lack of access to finance** remains a major obstacle for actors involved in the chain. Because of lack of resources, the actors do not invest in new production and processing techniques.

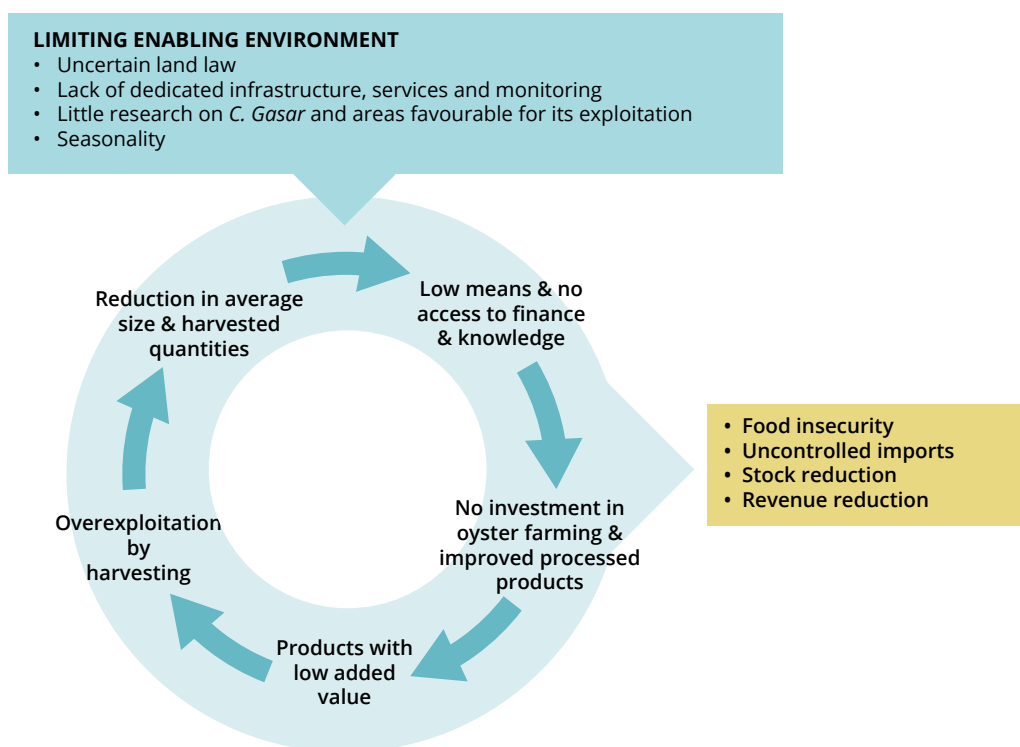
The products obtained (dried oysters) are of low added value (the final price of dried oysters, at USD 0.13/kg live weight equivalent, is lower than that of fresh oysters, which is USD 7/kg), which encourages players to gather more (quality replaced by quantity), leading to overexploitation of production area, reduction in the size of the oysters and quantities harvested, and *ultimately*, the reduction in the incomes of actors. Yet, the dried oyster is a remarkable innovation to reduce food safety risks and transportation costs. The juveniles' catchment period, which is not remunerative, also **competes** with other agricultural activities, and remains under-exploited, while the **enclaved nature of the areas** makes it difficult to trade at all levels of the value chain (especially for the sale of products from producers to consumers, but also to benefit from services and monitoring of activities).

Table 2. Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis

<p>Strengths</p> <ul style="list-style-type: none"> • Production potential: <ul style="list-style-type: none"> • Size of mangrove areas • Number of harvesters and inclusive nature of harvesting for the most disadvantaged actors • Two oyster farms with more developed production techniques; about fifteen traditional oyster GIEs • Presence of professional services (but rather centralized and inaccessible): <ul style="list-style-type: none"> • Several laboratories for microbiological analysis and heavy metals, some not accredited • Presence of national experts and researchers specialized in production and processing • Product differentiation: Local species (<i>Crassostrea gasar</i>) different than the dominant species on the world market (<i>Crassostrea gigas</i>) • Increasing awareness among stakeholders of environmental issues (decreasing mangroves logging) 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Subsistence activity: Use of natural resources for almost no cost and informal activity (no professionalization or specialization of actors) • Limited stakeholders' financial resources • Non-profitable GIE governance structure and limited representativeness leading to discouragement, disinvestment in more modern and collective activities, a fragmentation of actors, reduced economies of scale and lack of organisation • Low added value of processed products and very high (70:1 fresh to dried) • No compliance with food safety standards <ul style="list-style-type: none"> • Lack of micro-bacterial surveillance and testing for heavy metals presence in water • No cold chain and storage • Lack of means of transportation (canoe and roads) in enclaved areas • Weak system of certification of origin and product safety • Lack of modern production equipment • Little research on the <i>C. gasar</i> species and its oyster farming potential • Institutional weakness: lack of exchange of data and coordination between departments, lack of a reliable data tracking system • No stock management plan, fragmented governance of local actors and uncertain land tenure law • Competition with other agricultural activities
<p>Opportunities</p> <ul style="list-style-type: none"> • Growth market <ul style="list-style-type: none"> • Traditional product very well established on the domestic market • Market demand higher than supply • Rising demand through population growth (for processed oysters) • A growing urban middle-class with purchasing power, potentially interested in high added-value products, but attentive to food safety issues (fresh oysters) • Senegalese diaspora market (processed oysters) • Potential for organized production through more intensive modern oyster farming technologies and techniques • Interest of the administration in aquaculture (Emerging Senegal Plan, ANA, CRODT) and presence of several development partners and donors 	<p>Threats</p> <ul style="list-style-type: none"> • Overexploitation of production areas • Climate change: rising temperatures and impact of drought on the ecosystem (increased salinity) • External pollution: Urban effluents and industries • Competition from informally imported products • Threat of introduction of new pathogens linked to the introduction of alien species (<i>C. gigas</i>) without prior studies

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

Figure 5. Negative circle of added value



Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

All these factors contribute to a kind of negative circle of added value, reflected in Figure 5 above, and prevent actors to move away from the **subsistence-only model that currently prevails in the value chain. This downward spiral should be broken by a sustainable increase in incomes and added value.**

The promising oyster market, at the national level but also in the longer term in the sub-region, is one of the main **potential opportunities for the value chain**. Processed oysters are deeply established and rooted in national culinary traditions⁶ and demand for oysters is unmet, as evidenced by the import of oysters from neighbouring countries, valued at 20 percent of supply. The fresh market, which is growing and still to be explored, as well as more intensive technologies and techniques of modern oyster farming, still not exploited, both represent other opportunities that the chain could exploit to its advantage. Finally, the administration’s interest in aquaculture (Emerging Senegal Plan, ANA, and CRODT) and the opportunities offered by the projects of several development partners and donors are also to be exploited.

For the future, it is important to take into account **the threats to the value chain**. These include the overexploitation of production areas caused by the free access to the resource and associated with a significant product transformation coefficient. External pollution (oil and petrochemical industries and urban effluents), and climate change, with rising temperatures, a reduction in rainfall and consequent increase in water salinity (which is harmful for oysters), reduce production areas. The introduction of the alien species *Crassostrea gigas*, could also contribute to the spread of pathogens in the Senegalese environment and affect the oyster *Crassostrea gasar*. These

⁶ For example, present in the traditional dish *thiébou diola*, now known as “*c'est bon*”.

threats constrain the future development of the entire chain and should be addressed in order to avoid, in the short or medium term, a decline in the incomes of the actors involved in subsistence harvesting and the reduction of Senegal's food security.

The main strategic pathways that emerge from the SWOT analysis and that focus on opportunities and threats are listed below:

- Take advantage of the growing national market by producing larger quantities of oysters, without overexploiting production areas, through migration to oyster farming.
- Scientifically assess the risks of epizootics and contamination and pass appropriate legislations and measures to mitigate the risks of spreading diseases and pollution.
- Create a supportive societal environment for the development of oyster farming and the fresh market. More precisely:
 - Streamline the responsibilities of the various public services (ANA, DPM and DITP) which are currently involved in oyster farming and/or harvesting and ensure the availability of reliable statistics;
 - Classify harvesting and farming areas and improve the scientific knowledge on the species *C. gasar*, its exploitation potential and key determinants of its the capture phase;
 - Establish an appropriate legislative framework for the development of oyster farming and management of land concessions;
 - Create oyster land concessions along the bolongs for a total national area of between 60 ha and 120 ha, depending on the intensity of breeding;
 - Establish an effective food safety surveillance framework.
- Take advantage of the favourable natural environment and the presence of many players to develop and popularize oyster farming. This will require:
 - adapting locally accessible materials and equipment to enable rapid and cost-effective dissemination of world-renowned oyster farming techniques;
 - improving and adapting the techniques to capture and harvest oyster juveniles. Those techniques, by increasing the areas available for the attachment of oysters, make it possible to increase the number of available juveniles and raise production levels without harming stocks;
 - training production actors in the value chain in these new harvesting and farming techniques based on low-cost local materials and locally constructed structures.
- Take actors out of subsistence models and initiate greater specialization and an increase and extension of their income by encouraging the establishment of better structured GIE groups. These would facilitate access to finance and the development of longer lifespan, higher added value processed products that meet food safety standards.

Vision, targets and strategy

Based on the SWOT analysis, the sustainability assessments and the value chain map, a shared and consensual vision for the oyster value chain in Senegal, considered feasible and realistic, was developed with stakeholders through multi-stakeholder workshops. This vision is as follows:

“Make the oyster value chain a lever for economic and social development, based on sustainable and equitable exploitation, which contributes to the empowerment of women.”

The strategy adopted will therefore aim to bring greater profitability (economic development), inclusion (social development), sustainable management of oyster and mangrove stocks

(sustainable exploitation), sharing of added value among stakeholders (fair exploitation), income continuity and workplace safety (empowerment).

The value chain will achieve the following SMART targets by 2031:

- National production of 21 000 tonnes (+30 percent);
- 84 percent of domestic demand met by domestic production (stable);
- 24 percent of national production met by oyster farming (+1 400 percent);
- Controlled imports at 4 000 tonnes (+30 percent);
- Increase in direct added value from the current USD 4.6 million to USD 12.6 million (+175 percent);
- Increase in the number of formal oyster operators, GIE (+300 percent) and farms (+150 percent);
- Increased employment (in full-time equivalent [FTE]) in the core value chain (+60 percent);
- Improved environmental impact by reducing harvest pressure on production areas by 12 percent through the transition of 1 400 women harvesters (12 percent of women harvesters) to oyster farming.

These objectives rely on a preliminary calculation based on the data collected during the economic analysis of the value chain and on various assumptions indicated in Table 3 below and discussed with all stakeholders (Government, the actors of the value chain and the development partners) during a planning workshop held in February 2022.

Table 3. Development targets

	2019 – reference situation	2031
Market demand	19 000 tonnes	25 000 tonnes (+30 %)
Domestic production	16 000 tonnes	21 000 tonnes (+30 %)
Share of national demand filled by national production	84 %	84 %
Share of national demand filled by oyster farming	2.5 %	24 %
	400 tonnes	(5 900 tonnes, +1 400 %)
Share of national demand filled by imports	16 %	16 %
	(3 000 tonnes)	(4 000 tonnes, +30 %)
Number of formal oyster actors (GIEs and farms)	EIG: 30	EIG: 120 (+300 %)
	Farms: 2	Farms: 5 (+150 %)
Number of harvesters	12 000	10 600 (-12 %)

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

A 10-year period (2031) was chosen by stakeholders during the validation workshop.

The narrative part of Senegal’s oyster value chain upgrading strategy, presented below, reflects an integrated approach to achieve the value chain vision.

Oyster harvesters are currently trapped in a subsistence harvesting model and modern oyster farmers are still rare for three main reasons: i) the lack of access to finance, which makes access to improved equipment impossible, also not available locally; ii) the lack of training (on production and processing techniques, sanitary measures, finance and management); iii) current governance structure and lack of grouping among actors.

The removal of these constraints, through: i) a matching grants facility; ii) mobile units for training and processing and increased exchanges between actors to stimulate emulation; and iii) the promotion and dissemination of improved GIE structuring could enable migration and expansion to commercial oyster farming business models.

These business models will increase efficiency and production, which can be absorbed on the one hand by the growing fresh market, and on the other hand by a significant demand for dried oysters driven by Senegalese population growth.

The double migration from 1. harvesting to oyster farming and 2. to products with higher added value will, in addition to improving the conditions of the actors (especially women), ensure a better management of oyster stocks, satisfy the demand of the Senegalese population (contributing to food security), and contribute to the creation of jobs and tax revenues for Senegal through more formal business models.

In parallel, results related to the enabling environment such as the identification of areas more conducive to oyster farming, access to specific training, the establishment of a food safety monitoring system, the implementation of participatory mangrove management plans and the establishment of land concessions or authorizations for oyster farming along the bolongs will allow the actors to flourish in a favourable societal environment and will ensure the development of modern oyster farming.

The various activities of the upgrading strategy, such as comprehensive studies, detailed environmental analysis and the development of improved processing methods, will ensure that economic, environmental, social and resilience hotspots are taken into account, such as the state of stocks, environmental pollution or the fair division of labour.

This narrative section is articulated around five main axes:

1. The controlled and sustainable exploitation of the Senegalese territory and the inventory and knowledge of areas and species with potential for oyster farming.

In 2031, the technical and social structural conditions necessary for the implementation of sustainable harvesting practices and the wider development of oyster farming in Senegal will be met. **The strengthening of Senegalese scientific knowledge around the *C. gasar* oyster, as well as the associated oyster material and practices** will help achieve higher oyster yields and a better profitability of national oyster farming activities. The **potential of the Senegalese territory will have been scientifically documented** and the inventory carried out will help to clearly identify areas conducive to oyster harvesting and farming. Coastal bands will be identified by local authorities and communities to award land concessions for oyster farming facilities. **A participatory management plan for these areas** will have been put in place with harmonized rules. Monitoring by the departments of the ANA, DPM and DITP, whose responsibilities will be streamlined, will help to avoid overfishing of mangrove areas.

2. Implementation of a food safety monitoring and surveillance system

At the same time, food safety and environmental monitoring, both at the level of production areas and of processed products, will have been set up to ensure the transformation of the sector.

3. Gradual migration to modern oyster farming through mobile service units, a matching grants fund supporting oyster farming and better governance of GIEs.

Through the creation of favourable conditions in the enabling environment, Senegalese stakeholders will be able to initiate a **gradual migration towards modern oyster farming**. This will be facilitated by the availability of financial products and the presence of mobile service units,⁷ equipped with processing material. The mobile service units will disseminate new production and processing techniques and good governance practices. The migration to modern oyster farming will help to meet strong market demand, despite the reduction in harvesting associated with the adoption of more sustainable practices.

4. The dissemination and adoption of products with higher added value and extended lifespan. The development and dissemination of processed products, less demanding in quantity, with higher added value and extended lifespan, will further contribute to **women's economic empowerment, free them from seasonality constraints, give them control over the sanitary and nutritional quality of products** and improve food security.

5. Monitoring the upgrading strategy and the results achieved within its framework

A transversal result will ensure that the project is properly monitored, and that the measures put in place are sustainable (Outcome 5).

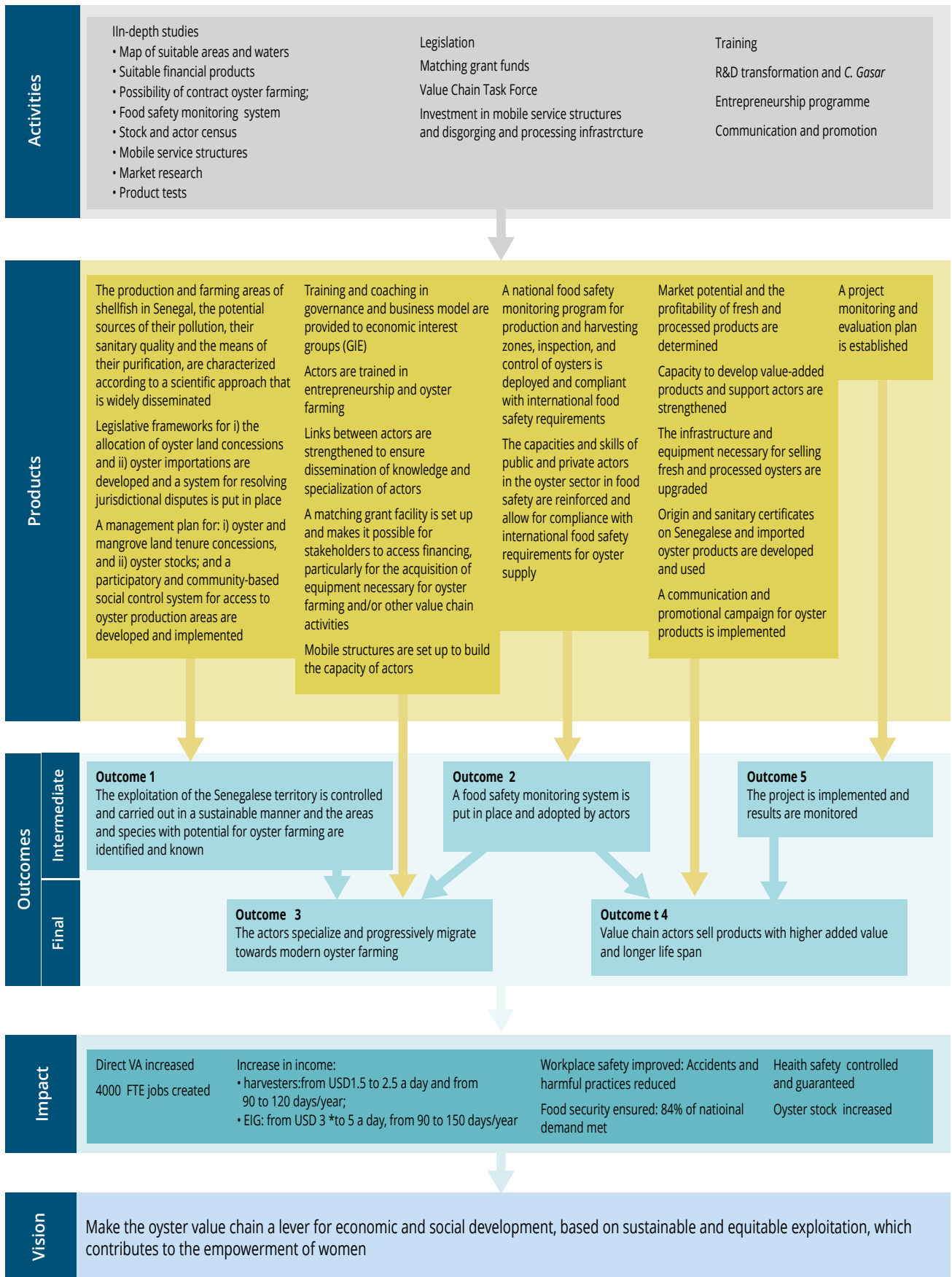
Efforts towards the realization of Axes 1 and 2 will have to start immediately, to allow the actors to evolve in a favorable environment. At the level of core value chain actors, work on Axis 3 will also start immediately, to increase the volumes produced as quickly as possible. Axis 4 will take longer, given the time needed to identify the processed products the most profitable and with the greatest market potential. The new products will be designed to meet consumer needs, and, at the same time, the market will have to get used to these new products.

Theory of change

The theory of change underlying this strategy is presented in Figure 6 below. It covers the entire upgrading strategy (the implementation of which may exceed the scope and duration of the FISH4ACP project) rather than being specific to the project. A series of activities (for example, studies, and training) and investments undertaken by different stakeholders, including the Government, the private sector (actors of the value chain and providers of services and inputs), the FISH4ACP project and other donors will lead to the development of several products. These products will in turn deliver outcomes in support of the vision.

⁷ These mobile structures will also play a crucial role in scientific research, since they will enable regular collection of water samples and contribute to research on the Gasar species.

Figure 6. Theory of change of the Senegalese oyster value chain upgrading strategy



The main indicators of economic, social and environmental performance of the current and improved practices, aggregated at the value chain level, are provided in Table 4 (on an annual basis).

Table 4. improved performances of the value chain

Economic indicators	Current situation (2019)	by 2031
Direct value added (in millions of USD)	4,6	12,0
Number of local jobs (in FTE)	6 500	10 500
	USD 1.5/day over	USD 2.5/day
Average earnings and working hours for oysters harvesters and GIEs	90 days/year	over 120 days/year
	USD 3/day	USD 5/day
	over 90 days/year	over 150 days/year
Social indicators	Current situation (2019)	by 2031
Share of national demand met by national production	84 %	84 %
	Heavy metals: no measures	
Share of national demand met by national production metals and microbiological load	Microbiology: 0 %: harvesters, Wholesalers and retailers;	50 %: harvesters, Local wholesalers, retailers;
	3 % (1/30):EIG; 100 % (2/2): farms	100 %: EIGs, farms, National wholesalers
Percentage of actors whose value chain activities are reported	15 % ⁸	80 %
Pourcentage d'acteurs finançant les activités de la CdV grâce au crédit et aux prêts du secteur formel	10 % ⁹	40 % ¹⁰
Percentage of actors funding value chain activities through credit and formal sector loans	15 % ¹¹	5 %
Environmental indicators	Situation actuelle (2019)	by 2031
Augmentation du stock d'huîtres	0 %	12 %
Production ostréicole annuelle	400 tonnes	5 900 tonnes

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

⁸ Sample of 20 people, FISH4ACP social survey.

⁹ Sample of 29 people, FISH4ACP functional survey.

¹⁰ 10 % of the situation in 2019 + 20 % of actors benefiting from counterpart funds + 10 % of actors resorting to private banks, by ripple effect.

¹¹ Sample of 20 people, FISH4ACP social survey.

5. Upgrading strategy implementation plan

Improving performance and achieving the five outcomes of the upgrading strategy will require funding and implementation of many activities. **FISH4ACP, the Government, the private sector and other donors** will all have a key role to play in financing and implementing these activities, in order to ensure a more prosperous future for those involved in this sector.

The Table below (Table 5) provides a summary of the activities supporting the various outcomes and estimates the costs associated with these activities. Some of the costs included in the Table will need to be revised based on studies examining in more detail the feasibility and the necessity and magnitude of the required investments. These are also indicative figures based on estimates. These figures and commitments will have to be confirmed during the implementation of the strategy.

The comprehensive analysis and design report provides a detailed description of each activity of the upgrading strategy in order to facilitate its implementation, and includes information on indicative timelines, funding sources, and types of investment.

The business and investment plans cover the entire upgrading strategy and are not specific to FISH4ACP.

Table 5. Upgrading activities

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Outcome 1 - The exploitation of the Senegalese territory is controlled and carried out in a sustainable manner and the areas and species with potential for oyster farming are identified and known				
Output 1.1 - The production and farming areas of shellfish in Senegal, the potential sources of their pollution, their sanitary quality and the means of their purification, are characterized according to a scientific approach that is widely disseminated				
Activity 1.1.1 - Conduct: a) a scientific evaluation of oyster production and breeding areas in Senegal, their level of contamination, and pollution sources through 25 pilot sites; b) a scientific study on the sanitary quality of oysters harvested and commercialized in Senegal. Disseminate the results of both studies after their validation	FISH4ACP/STDF	Study/Legislation	2023	129 000
Activity 1.1.2 - Fund a scientific research program on the characteristics of <i>C. gasar</i> (determinism of its reproduction, growth, and quality)	FISH4ACP/Gouvernement	Study/Legislation	2031	86 000

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Activity 1.1.3 - Conduct a scientific study on the environmental impact of imported <i>C. gigas</i> and develop recommendations on its import regulation	FISH4ACP	Study/Legislation	2022	12 000
Activity 1.1.4 - Summarise the results of the pilot tests (activity 1.1.1) and disseminate technical and material innovations during the National Oyster Day	FISH4ACP/private sector	Workshops, capacity building and extension materials	2031	9 000
Output 1.2 - Legislative frameworks for i) the allocation of oyster land concessions and ii) oyster importations are developed and a system for resolving jurisdictional disputes is put in place				
Activity 1.2.1 - Conduct a comprehensive study of the current land legislation and social systems for the allocation of production areas and proposal of legislation for oyster concessions	FISH4ACP	Study/Legislation	2023	7 900
Activity 1.2.2 - Study and proposal to improve and strengthen relationships between the currently involved ministries in the value chain and address potential challenges	FISH4ACP/VC-TF ¹² /Gouvernement	Mediation, monitoring and coaching	2023	10 100
Activity 1.2.3 - Study of the current import control system and proposal of an improved legislative framework and surveillance of imports.	Donor	Study/Legislation	2023	10 000
Output 1.3 - A management plan for: i) oyster and mangrove land tenure concessions, and ii) oyster stocks; and a participatory and community-based social control system for access to oyster production areas are developed and implemented				
Activity 1.3.1 - An exhaustive census of the actors of the oyster sector in Senegal is carried out	Gouvernement	Study/Legislation	2022	7 500
Activity 1.3.2 - Conduct a scientific evaluation of oyster stocks and harvesting effort	Donor	Study/Legislation	2023	10 000
Activity 1.3.3 - Develop a new monitoring and data collection plan for the sector	FISH4ACP	Study/Legislation	2023	10 500
Activity 1.3.4 - Train and build capacities of field agents responsible for monitoring the sector	FISH4ACP	Study/Legislation	2025	20 300

(cont.)

¹² VC-TF: Value Chain Task Force

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Activity 1.3.5 - Implement the new data collection and monitoring plan for the sector and release the necessary investments in equipment and personnel	Government	Mediation, monitoring and coaching	2031	486 000
Résultat 2 - A food safety monitoring system is put in place and adopted by actors				
Produit 2.1 - A national food safety monitoring program for production and harvesting zones, inspection, and control of oysters is deployed and compliant with international food safety requirements				
Activité 2.1.1 - In-depth study of the current Senegalese food safety system	STDF	Study/Legislation	2023	9 000
Activité 2.1.2 - Definition and development of an improved food safety legislative framework	STDF	Study/Legislation	2024	9 000
Activité 2.1.3 - Implementation of the new national food safety monitoring program	STDF	Study/Legislation	2024	18 000
Activité 2.1.4 - Develop of a manual for food safety monitoring procedures for production and farming zones and oyster inspection and control procedures	STDF	Workshops, capacity building and extension materials	2025	25 000
Activité 2.1.5 - Develop an action plan for recognition of the oyster food safety monitoring and control system by ECOWAS and the European Union	STDF	Study/Legislation	2025	9 000
Produit 2.2 - The capacities and skills of public and private actors in the oyster sector in food safety are reinforced and allow for compliance with international food safety requirements for oyster supply				
Activité 2.2.1 - Organize a training workshop on oyster sanitation	STDF	Workshops, capacity building and extension materials	2024	40 000
Activité 2.2.2 - Develop a guide on good food safety practices	STDF	Workshops, capacity building and extension materials	2024	15 000
Activité 2.2.3 - Train public officials and private trainers on food safety handling and transformation practices	STDF	Workshops, capacity building and extension materials	2025	60 000
Activité 2.2.4 - Organie training sessions to enhance capacities for pathogen, biotoxin, chemical contaminants and/or radionuclide analysis	STDF	Workshops, capacity building and extension materials	2025	80 000

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Activité 2.2.5 – Study trip for officials on food safety practices	STDF	Workshops, capacity building and extension materials	2025	60 000
Activité 2.2.6 – Acquisition of adapted equipment for food safety controls	Gouvernement	Equipment/ Material/Input	2031	à déterminer
Outcome 3 – The actors specialize and progressively migrate towards modern oyster farming				
Output 3.1 – Training and coaching in governance and business model are provided to economic interest groups (GIE)				
Activity 3.1.1 - In-depth study of the governance structures of GIEs and proposal of a monitoring and capacity building program	FISH4ACP	Study/Legislation	2023	20 800
Activity 3.1.2 - Dissemination and promotion of GIE installation and mutualization of investments in equipment, inputs, and services	FISH4ACP/Gouvernement	Workshops, capacity building and extension materials	2031	100 000
Product 3.2 - Actors are trained in entrepreneurship and oyster farming				
Activity 3.2.1 - Adaptation and financing of oyster farming courses within Senegal's higher education system	Gouvernement	Workshops, capacity building and extension materials	2031	265 000
Activity 3.2.2 - Establishment of an incubation and support program for oyster farming installation and “consolidation” (community oyster farming)	Gouvernement	Workshops, capacity building and extension materials	2031	360 000
Output 3.3 - Linkages between actors are strengthened to enable knowledge dissemination and specialization of actors				
Activity 3.3.1 - Establishment of a value chain task force and relevant working groups for the various areas of work	FISH4ACP/VC-TF	Mediation, monitoring and coaching	2031	100 000
Activity 3.3.2 - Setting up of exchange trips between actors	FISH4ACP/Private sector	Workshops, capacity building and extension materials	2031	100 000
Activity 3.3.3 - In-depth study on the possibilities and feasibility of contract farming for the Senegalese oyster value chain.	FISH4ACP	Study/Legislation	2023	2 600
Produit 3.4 - A matching grant facility is set up and makes it possible for stakeholders to access financing, particularly for the acquisition of equipment necessary for oyster farming and/or other value chain activities				
Activity 3.4.1 - Develop matching fund operationalization manual	FISH4ACP	Study/Legislation	2022	4 500

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Activity 3.4.2 - Implement the matching fund and launch its first funding cycle	FISH4ACP	Infrastructure/ service	2025	352 000
Activity 3.4.3 - Synthesis of results obtained through the matching fund and development and launch of subsequent cycles through a transfer of responsibilities	FISH4ACP/Donnor	Mediation, monitoring and coaching Infrastructure/ service	2031	564 000
Produit 3.5 - Mobile structures are set up to build the capacity of actors				
Activity 3.5.1 - In-depth study for the creation of mobile training and technical monitoring structures	FISH4ACP	Study/Legislation	2022	13 700
Activity 3.5.2 - Establishment of mobile training, service, and technical monitoring structures	FISH4ACP/Public sector	Infrastructure/ service	2031	438 000
Activity 3.5.3 - Training of mobile structures staff	FISH4ACP	Workshops, capacity building and extension materials	2023	45 500
Activity 3.5.4 - Training of actors in production, processing, commercialization, governance and finance through the mobile structures	FISH4ACP/Private sector	Workshops, capacity building and extension materials	2031	94 300
Activity 3.5.5 - Develop oyster-related equipment based on materials and technologies available in Senegal	Private sector	Equipment/ Material/Input	2026	50 000
Outcome 4 - Value chain actors sell products with higher added value and longer life span				
Product 4.1 - Market potential and profitability of fresh and processed products are determined				
Activity 4.1.1 - Market study on the potential of oyster-based products and by-products in Senegal and abroad	FISH4ACP/STDF	Study/Legislation	2023	12 000
Activity 4.1.2 - Development of a plan for accessing international markets	STDF	Study/Legislation	2024	9 000
Activity 4.1.3 - Techno-economic feasibility study of consumable products	Donor	Study/Legislation	2024	20 000
Activity 4.1.4 - Techno-economic feasibility study of products made of shell	Donor	Study/Legislation	2024	20 000
Product 4.2 - The capabilities to develop value-added products and support actors are strengthened				
Activity 4.2.1 - Support and strengthening of the financial, material, and human resources of the structures in charge of oyster processing	Gouvernement	Equipment/ Material/Input	2031	240 000

Outcomes, outputs and activities	Lead	Type of cost	By when (year)	Total cost (USD)
Activity 4.2.2 - Establishment of training for trainers for improved processing and valorization	Donor	Workshops, capacity building and extension materials	2023	40 000
Output 4.3 - The infrastructure and equipment necessary for selling fresh and processed oysters are upgraded				
Activity 4.3.1 - Feasibility study and implementation of degorging and processing centers	FISH4ACP	Study/Legislation	2022	12 000
Activity 4.3.2 - Renovation and creation of infrastructures	FISH4ACP/Donor	Infrastructure/ service	2031	280 000
Product 4.4 - Origin and sanitary certificates on Senegalese and imported oyster products are developed and used				
Activity 4.4.1 - In-depth study on the feasibility of implementing labeling on food safety and origin certificates. Benchmarking of global certificates	Donor	Study/Legislation	2024	10 000
Activity 4.4.2 - Pilot testing of origin and sanitation certificates	Donor	Infrastructure/ service	2025	38 000
Product 4.5 - A communication and promotional campaign for oyster products is implemented				
Activity 4.5.1 - Annual organization of the National Oyster Day	FISH4ACP/Government	Communication	2031	180 000
Activity 4.5.2 - Development and dissemination of communication materials to promote oyster products.	Private sector	Communication	2031	100 000
Result 5 - The project is implemented and its results are monitored				
Product 5.1 - A project monitoring and evaluation plan is established				
Activity 5.1.1 - A project monitoring and evaluation plan is established	FISH4ACP/VC-TF	Mediation, monitoring and coaching	2031	To determine

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

Activities to be financed by:		
<input type="checkbox"/> FISH4ACP	<input type="checkbox"/> Private sector	<input type="checkbox"/> Government
<input type="checkbox"/> Mixed sources	<input type="checkbox"/> Donors (including the Standards and Trade Development Facility [STDF])	

Based on the information provided above, the Investment Table (Table 6) provides an overview of the investments required to achieve the vision and how these investments should be funded. The Table also illustrates how co-funding by different actors can be applied to finance the investment in the upgrading of the value chain.

To achieve the vision by 2031, it is estimated that **USD 6.9 million** will be needed for various services and infrastructure; training and extension materials; mediation, monitoring and counselling; in-depth studies; equipment, materials and inputs and communication. This provisional budget also contains an estimate of the sums to be released for the upgrading of business models, through bank credit or with own funds. **Some costs are not quantified** and will need to be determined through in-depth studies (for example, suitable equipment for sanitary controls, or the cost of additional processing, depuration and cold chain infrastructure)¹³. Excluding investments in private business models (USD 2.3 million), Strategy Outcome 1 costs represent 17 percent of total costs; Outcome 2 costs represent 7 percent of total costs; Outcome 3 costs represent 55 percent of total costs; and Outcome 4, 21 percent of total costs. The cost of strategy monitoring (Outcome 5) is not yet quantified.

Table 6. Investments necessary for the upgrading strategy

Type investment	Sources of financing (in USD)				Total	
	Donors	FISH4ACP	Government Public sector	Private sector	Total by type (USD)	Total by type (%)
Communication	-	50 000	130 000	100 000	280 000	4 %
Equipment/ Materials/Inputs	-	-	240 000	50 000	290 000	4 %
Study/Legislation	124 000	271 100	67 700	-	462 800	7 %
Infrastructure/ service	760 000	551 500	308 500	-	1 620 000	24 %
Mediation, monitoring and advice	42 300	53 500	486 000	66 300	648 100	9 %
Workshops, training and extension materials	320 000	106 400	705 000	162 400	1 293 800	19 %
Investments using own funds for improvement of business models	-	-	-	2 295 500	2 295 500	33 %
Totaux par source	1 246 300	1 032 500	1 937 200	2 674 200	6 890 200	100 %

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

Table 7 summarizes the key stakeholders involved in the five outcomes of the upgrading strategy. The identification of partners for the implementation of the strategy is still ongoing and this Table is subject to change. It will be crucial to find additional resource partners and secure everyone's commitment to achieve the ambitions of the Programme.

¹³ Some costs related to the cold chain or the depuration/processing infrastructure are included in Activity 4.3.2 and in the forecast amounts of the counterpart fund (Activity 3.3.3)

Table 7. Stakeholders involved by outcome

Outcome of the upgrading strategy	Key stakeholders involved
<p>Outcome 1 The exploitation of the Senegalese territory is controlled and carried out in a sustainable manner and the areas and species with potential for oyster farming are identified and known</p>	<p>FISH4ACP and STDF</p> <ul style="list-style-type: none"> • Develop extensive scientific studies to determine the impact of <i>C. gigas</i>, the sanitary quality of oysters, the most favorable production areas and their level of contamination, as well as the current state of stocks and harvesting efforts • Promote technical innovations developed under the project • Train and reinforce field staff for a better monitoring of the sector • Propose a monitoring and data collection plan for the sector <p>Government</p> <ul style="list-style-type: none"> • Fund research on <i>C. Gasar</i>, through a phd scholarship • Conduct a comprehensive census of actors in the sector • Allocate oyster concessions to actors • Implement a new data collection and monitoring plan for the sector • Clarify the mandates of the different departments involved in monitoring the sector <p>Private sector</p> <ul style="list-style-type: none"> • Adopt and disseminate technical and material innovations in oyster farming <p>Other Donor</p> <ul style="list-style-type: none"> • Conduct an in-depth study on informal oyster imports • Scientifically asses oyster stocks and fishing pressure
<p>Outcome 2 An oyster safety surveillance system is put in place and adopted by the actors.</p>	<p>STDF (to be confirmed)</p> <ul style="list-style-type: none"> • In-depth study on the Senegalese health system, definition of an improved food safety legislative framework, development of a new national health surveillance programme and a plan of action for the recognition of the surveillance and food safety control system by ECOWAS and the European Union • Develop a manual on surveillance procedures for production areas and food safety inspection procedures • Organise trainings and travels and develop extension guide on the sanitation of oysters and good food safety practices <p>Gouvernement</p> <ul style="list-style-type: none"> • Implement the new food safety surveillance programme • Acquire material and equipment suitable for food safety checks

(cont.)

Outcome of the upgrading strategy	Key stakeholders involved
<p>Outcome 3 The actors specialize and progressively migrate towards modern oyster farming</p>	<p>FISH4ACP</p> <ul style="list-style-type: none"> • Develop a comprehensive study on the GIE organisation, provide recommendations for improvements, and organise capacity building workshops • Carry out an in-depth study on the opportunities for oyster farming and contract farming • Carry out an in-depth study for the creation of a matching grant facility adapted to the sector and set up this facility • Develop an in-depth study for the creation of mobile training units, set up the units, train their staff and provide training and services to value chain stakeholders <p>Gouvernement</p> <ul style="list-style-type: none"> • Fund a curriculum on oyster training and entrepreneurship, both theoretical and practical • Manage the mobile service and training units <p>Private Sector</p> <ul style="list-style-type: none"> • Establish harvesting and oyster farming contracts between actors • Participate in the financing mechanism and invest in new business models to migrate to oyster farming • Manage the matching grant facility post project • Develop local equipment for oyster production and processing <p>Other donor</p> <ul style="list-style-type: none"> • Top up the matching grant facility <p>All</p> <ul style="list-style-type: none"> • Set up a multi-stakeholder partnership and organize exchange trips between value chain actors
<p>Outcome 4 Value chain actors sell products with higher added value and longer life span</p>	<p>FISH4ACP</p> <ul style="list-style-type: none"> • Carry out a study on the feasibility and setting up of depuration and processing centres and renovate infrastructure • Organize the National Oyster Day <p>STDF and/or another donor</p> <ul style="list-style-type: none"> • Conduct market study on oyster products, in Senegal and abroad and develop an access plan to identified markets • Conduct a technical and economic feasibility study of oyster-based products • Build capacities of the Food Technology Institute (ITA) • Renovate infrastructure • Conduct an in-depth study on the introduction of labelling and certificates of origin and pilot test identified certificates <p>Gouvernement</p> <ul style="list-style-type: none"> • Fund the ITA • Organise the National Oyster Day post project <p>Private sector</p> <ul style="list-style-type: none"> • Organise a communication campaign to promote oyster products • Adopt and disseminate new oyster products and associated certificates of origin

(cont.)

Outcome of the upgrading strategy	Key stakeholders involved
<p>Outcome 5 The project is implemented and its results are monitored</p>	<p>FISH4ACP and Value Chain Task Force</p> <ul style="list-style-type: none"> • Monitor and evaluate the upgrading strategy activities and results

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

The FISH4ACP project aims to maintain the momentum of its activities in Senegal during the transition from the design and analysis phase (2020-2022) to the implementation of upgrading efforts starting in June 2022. To ensure the success of the upgrading strategy, discussions will be held with all partners involved in its implementation to secure their commitment. This commitment will be formalized during the upgrading strategy launch ceremony. At this event, partners will have the opportunity to sign a declaration of support for the strategy.

The project's main implementation phase is scheduled to start in **June 2022** and conclude in **February 2025**, at the end of the FISH4ACP program. The project will kick off with a crucial initial phase from June to September 2022, during which additional planning and stakeholder engagement will take place before the implementation of upgrading strategy activities.

Several risks that may affect the implementation of the upgrading strategy and hinder the achievement of its objectives have been identified and outlined in Table 8. These include organizational, environmental, and economic risks, to name but a few. To minimize the impact of these risks on the success of the strategy, mitigation measures have been identified and suggested.

Table 8. Risks in the implementation of the upgrading strategy

Risk description	Probability (1-5)	Impact (1-5)	Overall risk (1-25)	Mitigation measures
The actors remain in a subsistence mindset and do not adopt improved business models and upgrading strategy.	4	4	16	Use of the FISH4ACP inclusive and participatory methodology (continuous exchanges with actors through three workshops and discussion meetings on involvement in the project with each stakeholder) Development of oyster farming and entrepreneurship training, establishment of a financial mechanism to stimulate investments and formation of exchange groups (within the value chain task force) and exchange trips to promote emulation among actors

(cont.)

Risk description	Probability (1-5)	Impact (1-5)	Overall risk (1-25)	Mitigation measures
Spread of diseases introduced by imported <i>C. gigas</i>	3	5	15	Impact study of the importation of <i>C. gigas</i> and implementation of a monitoring and control plan, notably for production areas
Sanitation quality analyses exclude certain areas from commercialization or fresh value-addition	3	4	12	Strengthened links with the STDF project that addresses this issue, and detailed study that foresees the identification of contamination sources and the proposal of solutions to improve water quality.
Climate change negatively impacts capture, production, and/or harvesting zones	2	5	10	Scientific study of the most suitable areas for production, study of stocks and harvesting efforts and increased monitoring of the value chain.
Project-made infrastructures are not functional or not maintained afterwards	3	3	9	Development of a monitoring plan for the upgrading strategy and development of business models for each infrastructure.
Government funding is not mobilized	3	3	9	FISH4ACP catalyst role to mobilize the private sector and create synergies with other stakeholders.
Access problems to enclaves and low profitability of mobile service and training structures	2	4	8	Feasibility study and development of a business model for mobile structures, prior to their implementation
Economic changes alter the profitability and market conditions of oyster production	2	3	6	Possibility to adapt measures based on the new economic situation and project monitoring based on Collaborating, Learning, and Adapting (CLA) principles
Access conditions to the matching funds are poorly calibrated and not successful.	2	3	6	Detailed study of the financing mechanisms to be put in place prior to the implementation of the mechanism and annual monitoring of the platform to be put in place, to allow adjustments to access conditions during the project.

Source: Kourgansky, A., Drago, N., Thiao, D., Mbaye, A., Bernard, I., Le Bihan, E. 2023. *Oyster value chain in Senegal: Summary report*. Rome, FAO.

The proposed mitigation measures are designed to anticipate problems, whether they originate within or outside the value chain. This is achieved through i) specific studies (such as the study on the importation of oyster *C. gigas*), ii) involvement all stakeholders throughout the project, and iii) actively seeking synergies. Regular monitoring of the project is also critical to identifying any suboptimal strategy choices as early as possible.

Summary

The analysis revealed that the current oyster value chain struggles with low economic sustainability, scoring 35%, and moderate social and environmental sustainability, at 40% and 55%, respectively. Resilience is also low, at 8%, due to a lack of connectivity among actors. However, the SWOT analysis suggests that the value chain holds significant potential, with a well-known traditional product, dried oysters, benefiting from a strong potential market and ample mangrove areas for production. To leverage this potential, the FISH4ACP project, in close collaboration with the value chain actors, developed a common vision for the chain: **“Make the oyster value chain a lever for economic and social development, based on sustainable and equitable exploitation, which contributes to the empowerment of women”**.

Its objectives are to enhance business model profitability, improve natural resource management, increase equity between value chain actors, and ensure income continuity and security within the value chain.

To accomplish these objectives, the program proposes five key areas of focus: 1) controlled and sustainable exploitation of the Senegalese territory and identification of areas and species with potential for oyster farming; 2) establishment of a sanitary monitoring and surveillance system; 3) gradual migration of actors towards modern oyster farming methods; 4) dissemination and adoption of products with higher added value and extended lifespan; 5) monitoring of the upgrading strategy and its results. The identified activities aim to create a favorable environment for upgrading the value chain by eliminating remaining uncertainties through specific studies, researching the local oyster *C. gasar*, improving production sanitation, implementing a system of land concessions, promoting *C. gasar* oyster harvesting and farming, and developing new, more profitable products. This work includes setting up a matching grant fund, mobile service and training units, demonstration and dissemination of oyster farming techniques, and study and exchange trips. The risk analysis of the project indicates that seeking synergies and regularly evaluating strategy choices will be crucial to increasing the chances of success.

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Note: The references below are those used and referenced in the full analysis and upgrade report.

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This report presents the results of the oyster value chain in Senegal conducted from 2021-2022 by the value chain development programme FISH4ACP. This report contains a functional analysis of the value chain, assesses its sustainability and resilience, develops an upgrading strategy and an implementation plan to which FISH4ACP will contribute.

FISH4ACP is an initiative of the Organisation of African, Caribbean and Pacific States (OACPS) aimed at making fisheries and aquaculture value chains in twelve OACPS member countries more sustainable. It contributes to food and nutrition security, economic prosperity and job creation by ensuring the economic, social and environmental sustainability of fisheries and aquaculture in Africa, the Caribbean and the Pacific.

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