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**FISH4ACP**

Unlocking the potential  
of sustainable fisheries and aquaculture  
in Africa, the Caribbean and the Pacific

SUMMARY REPORT

# The mangrove oyster value chain in the Gambia

June 2023





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**Graeme Macfadyen**

Poseidon Aquatic Resource  
Management Limited

**Bernal Vilela López**

FAO consultant

**Djiga Thiao**

FAO consultant

**Ansen Ward**

FAO consultant

Food and Agriculture Organization of the United Nations  
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# Contents

Background and rationale	v
Acknowledgements	v
Disclaimer	v
Acronyms	vi
Glossary of terms	vii
<b>1. Introduction</b>	<b>1</b>
<b>2. Functional analysis</b>	<b>3</b>
<b>3. Sustainability and resilience assessment</b>	<b>10</b>
<b>4. Upgrading strategy</b>	<b>20</b>
<b>5. Implementation plan</b>	<b>28</b>
<b>6. Bibliography</b>	<b>37</b>

## LIST OF FIGURES

Figure 1: Mangrove oyster and dugout canoes used for collection	3
Figure 2: Mangrove oyster value chain map, 2022 (the Gambia)	5
Figure 3: Drum and blanket used for boiling/steaming oysters over wood fire (Bullock, West Coast Region)	6
Figure 4: Oyster shucking after boiling (Sutu Sinjang, West Coast Region)	6
Figure 5: Retail sales (Serrakunda market, Banjul)	7
Figure 6: 'Cups' used to measure retail sales of oysters	7
Figure 7: Oyster farm (Lamin)	7
Figure 8. Economic sustainability performance scores for the value chain	11
Figure 9. Social sustainability performance scores for the value chain	13
Figure 10. Environmental sustainability performance scores for the value chain	15
Figure 11. The Gambia mangrove oyster value chain sustainability and resilience heat map	17
Figure 12: SWOT analysis of the mangrove oyster value chain in the Gambia	20
Figure 13: Theory of Change for the overall upgrading strategy of the oyster value chain in the Gambia	25

## LIST OF TABLES

Table 1: Key economic, social and environmental performance indicators under current and upgraded practices (aggregated at VC level)	24
Table 2: Summary of upgrading activities and investments (in USD)	28
Table 3: Value chain upgrading investment table (in USD)	33
Table 4. Key stakeholders and catalysts involved in the upgrading strategy and its four elements	33
Table 5: Summary risk analysis table	35



# Background and rationale

FISH4ACP is an initiative of the Organization of African, Caribbean and Pacific States (OACPS) contributing to food and nutrition security, economic prosperity and job creation by ensuring the economic, social and environmental sustainability of fisheries and aquaculture value chains in Africa, the Caribbean and the Pacific. FISH4ACP is implemented by the Food and Agriculture Organization of the United Nations (FAO) and partners with funding from the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ). FISH4ACP seeks to enhance the productivity and competitiveness of twelve fisheries and aquaculture value chains in twelve OACPS member countries, making sure that economic improvements go hand in hand with environmental sustainability and social inclusiveness. It pays special attention to small and medium-sized businesses, because of their potential to deliver economic and social benefits, particularly for women and young people.

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# Acronyms

AFD	French Development Agency
BMZ	Federal Ministry for Economic Cooperation and Development (of Germany)
CO2	carbon dioxide
FAO	Food and Agriculture Organization (of the United Nations)
FSQA	Food Safety and Quality Authority (of the Gambia)
FTE	full-time employment
GDP	gross domestic product
GMD	Gambia dilasi
ISRAD	Institute of Social Research and Development
Kg	kilogrammes
LRR	Low River Region
m	metres
MoFWRAM	Ministry of Fisheries, Water Resources and National Assembly Matters (of the Gambia)
MSY	maximum sustainable yield
NBR	North Bank Region
NPO	national professional officer
OACPS	Organization of African, Caribbean and Pacific States
PPE	personal protective equipment
SFVC	sustainable food value chain
SPS	sanitary and phytosanitary
TWNP	Tanbi Wetlands National Park
URI	University of Rhode Island
USD	United States dollar
VC	value chain
VCA	value chain analysis
VCA4D	value chain analysis for development
WCR	West Coast Region

## Exchange rates

USD 1: GMD 59.62 (December 2022)



# Glossary of terms

<b>Aquaculture</b>	Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. <a href="#">Definition</a>
<b>'Tin' or 'Cup'</b>	Traditional unit of measurement for selling oysters. Empty condensed milk tin, which contains about 125 grams of shucked oyster meat.
<b>Biosecurity</b>	Biosecurity refers to measures aiming to prevent the introduction and/or spread of harmful organisms and/or harmful biological or biochemical substances.
<b>Carbon footprint</b>	Calculated as the kg CO <sub>2</sub> /year at actor level, functional level, core VC level, and per kg of end product.
<b>Contribution to GDP (of VC)</b>	$100 * (\text{total value added over gross domestic product, GDP}),$ expressed as a percentage (%)
<b>Depuration</b>	Placing shellfish in tanks of seawater for a minimum of 42 hours to purge any microbiological contamination they may have bio-accumulated while in the environment.
<b>Direct value added</b>	The sum of net profits (after taxes) for the companies, net wages for their workers, and government revenue in the form of taxes and fees.
<b>Electricity use</b>	Calculated as the kWh/year at actor level, functional level, core VC level, and per kg of end product.
<b>Fishing pressure</b>	Refers to the level of fishing efforts (active fishing licences or boats, number of days fishing, number of hooks per day, yield per day, etc.) that the fish stock is subject to.
<b>Food loss and waste</b>	Refers to the quantitative and qualitative loss of aquatic products that have been intended for human consumption. Loss occurs from production up to, but not including, the retail stage of the VC. Loss can be caused by factors such as poor transportation and processing practices. Quantitative loss refers to food which is no longer fit for human consumption. Qualitative loss refers to food which has suffered a deterioration in quality but is still sold and consumed. To measure food loss, the quantities of aquatic products lost along the value chain, from production up to, but no including, retail are calculated. Food waste refers to the aquatic food lost in the retail and consumption functions of a value chain.
<b>Food safety</b>	The assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.
<b>Fuel consumption</b>	Calculated as MJ/year at actor level, functional level, core VC level and per kg of end product.
<b>Full-time equivalent (FTE) jobs</b>	The total number of 8-hour working days divided by 230 (days).
<b>Gross Domestic Product</b>	The total value of goods produced and services provided in a country during one year.

<b>Indirect value added</b>	The cost of the domestic goods and services that the VC actors purchase from outside of the core VC.
<b>Inorganic waste</b>	Type of waste that does not contain organic compounds, and therefore are difficult to decompose by microorganisms.
<b>Maximum sustainable yield</b>	The highest theoretical equilibrium yield that can be continuously taken (on average) from a stock under existing (average) environmental conditions without significantly affecting the reproduction process. Also referred to sometimes as potential yield.
<b>Net impact on balance of trade (of VC)</b>	Calculated by deducting imports from exports (in USD) for all products related to the VC, including both the VC's products and the inputs/ services used in the VC.
<b>Net impact on public funds</b>	The net impact on public funds is expressed in USD and equals taxes plus fees minus subsidies.
<b>Non-native species</b>	Species that originated somewhere other than its current location and has been introduced to the area where it now lives.
<b>Organic waste</b>	Any waste containing material that comes from living organisms (plants or animals) and is biodegradable.
<b>Overfished</b>	A stock is considered overfished when exploited over an explicit limit beyond which its abundance is considered "too low" to ensure sustainable reproduction. In many fisheries for the term is used when biomass has been estimated to be below a limit biological reference point that is used as the signpost defining an "overfished condition".
<b>Overfishing</b>	A term used to refer to the state of a stock subject to a level of fishing effort or fishing mortality such that a reduction of effort would, in the medium term, lead to an increase in the total catch. Often referred to as overexploitation and equated to biological overfishing.
<b>Profit</b>	Revenues minus costs.
<b>Rate of integration</b>	The rate of integration (expressed as a percentage) indicates how much the VC is part of the national economy. It is calculated as $100 * (\text{total VA} / [\text{total VA} + \text{imported consumables}])$ .
<b>Return on investment</b>	$100 * (\text{operating profit over total cost})$ , expressed as a percentage (%).
<b>Return on sales</b>	$100 * (\text{net profit over total revenues})$ , expressed as a percentage (%).
<b>Sanitary and phytosanitary (SPS) measures</b>	Measures to protect humans, animals and plants from diseases, pests or contaminants. All countries maintain measures to ensure that food is safe for consumers, and to prevent the spread of pests or diseases among animals and plants. These sanitary and phytosanitary measures can take many forms, such as requiring products to come from a disease-free area, inspection of products, specific treatment or processing of products, and setting allowable maximum levels of pesticide residues or permitted use of only certain additives in food. Sanitary (human and animal health) and phytosanitary (plant health) measures apply to domestically produced food or local animal and plant diseases, as well as to products coming from other countries.
<b>Shucking</b>	The process of removing oyster meat from the oyster shell.

<b>Stock status</b>	The stock status refers to the biomass (B) of fish in the water and provides information on whether a stock is overfished, maximally sustainably fished or underfished. The amount of biomass (B) that produces the maximum sustainable yield (MSY) is referred to as BMSY. If the biomass of fish in the water is below BMSY, the stock is overfished. If the amount of fish in the water is more than what would produce MSY, the stock is underfished.
<b>Total value added</b>	The sum of direct value added and indirect value added.
<b>Total value of outputs</b>	The total value of the output (in USD/year) of all VC actors. This equals the sum of the value of production (sales + self-consumption), minus losses.
<b>Value added</b>	Net profits plus wages plus government revenues.
<b>Vulnerable ecosystem</b>	An ecosystem is vulnerable when it is at a high risk of collapse.
<b>Vulnerable species</b>	Species that is threatened with extinction unless the circumstances that are threatening its survival and reproduction improve.
<b>Wastewater</b>	Used water from any combination of mainly oyster harvesting and processing activities.
<b>West African mangrove oyster (Crassostrea gasar)</b>	A bivalve mollusc found in intertidal coastal zones of the Atlantic Ocean, also known as Crassostrea tulipa: from Mauritania to Angola and from Venezuela to Brazil. It grows on the bark of the stilt sections of mangrove trees, which are exposed during low tides and covered during high tides. It can also be found on some other suitable intertidal substrates in its range. This oyster has evolved to survive exposed to the air during low tides.







# 1. Introduction

**FISH4ACP** is an initiative of the Organization of African, Caribbean and Pacific States (OACPS) to support sustainable fisheries and aquaculture development. The five-year value chain (VC) development programme (2020 to 2025) is implemented by the Food and Agriculture Organization of the United Nations (FAO) with funding from the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ).

**The mangrove oyster value chain in the Gambia** is one of 12 VCs competitively selected from over 70 proposals worldwide for support from the FISH4ACP programme. This report presents the outputs of analysis and design work completed in 2022 to conclude a functional analysis of the VC, assess its sustainability and resilience, develop an upgrading strategy to which the FISH4ACP programme will contribute, and plan for full implementation from January 2023.<sup>1</sup>



**Mangrove oysters**  
(*Crassostrea tulipa* or *gasar*)

<sup>1</sup> This summary document is based on a supporting and more detailed analysis and design document, officially published by FAO: (Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO). The more detailed document provides additional information on methodology, supporting analytical tables and detailed calculations, and background and supporting data

The standard FISH4ACP **methodology** was applied in a slightly adapted manner. This involved consideration of the potential vision from the very beginning of the project. Given the size and economic value of the oyster VC, a proportional approach to data collection was also adopted such that some indicators within the sustainability assessment were assessed qualitatively. A wide range of data collection tools were however utilized, and included observational visits, focus groups, surveys (of actors and consumers), expert consultations, key actor interviews and key informant interviews. The surveys were used to obtain quantitative data to inform the economic sustainability assessment. With the analysis and design work in the Gambia starting early in 2022 when COVID-19 travel restrictions began to be lifted, the international FISH4ACP consultants were able to travel to the Gambia for the inception workshop, the validation workshop and the planning workshop, allowing all three workshops to be held in person. The inception workshop visit allowed the FISH4ACP consultants to familiarize themselves with the oyster VC and was used to train the national partner (the Institute of Social Research and Development [ISRAD]) in the data collection tools which ISRAD then implemented. A national professional officer, based in the Gambia and working from the FAO Gambia office, also supported the work throughout the analysis and design phase. Towards the end of the analysis and design phase, a dedicated shellfish frame survey was funded by FISH4ACP to obtain additional data on actor numbers and activities which informed the analysis and design.

## 2. Functional analysis

Mangrove oysters have been harvested in the Gambia for subsistence purposes for many decades, if not centuries, with commercialisation of the sector starting around the 1970s. The functions that take place in the value chain prior to consumption are: the collection of oysters; the farming of oysters; the processing of oysters; and the retailing of oysters (with very limited sales of oysters in the food service sector by informal street food vendors).

**Figure 1: Mangrove oyster<sup>2</sup> and dugout canoes used for collection**



**Key findings** from the functional analysis are:

**A total of 1 200 people are involved in the value chain as actors** (c.a. 90 percent of them women). The VC is strongly vertically integrated with 70 percent of actors processing and retailing the oysters they collect themselves, with the remainder either collecting and processing only, or retailing only. There are no middlemen/traders involved.

<sup>2</sup> A single species, *Crassostrea tulipa*, is found in the Gambia, as confirmed by genetic testing completed by FISH4ACP in January 2023. Oysters are most commonly found growing as a conglomeration of shells on mangrove roots in inter-tidal areas, but also grow permanently submerged on more rocky substrates, in which case they can grow to larger sizes.



'In-shell' **production in 2022 is estimated at 9 453** (200 tonnes of which was farmed<sup>3</sup>) with total sales of around 300 tonnes a year of processed oysters<sup>4</sup> with a sales value of GMD 83 million (USD 1.4 million).

**Ninety-five percent of all sales volumes are to individual consumers**, with 5 percent of sales bought by informal street vendors (number unknown) for use and sale by them in food dishes<sup>5</sup> containing oysters. There are currently no sales of oysters to more formal restaurants or hotels (many of which form part of the tourism industry). Of the 95 percent sold to individual consumers, small quantities are taken overseas for consumption and sale by/to the Gambian diaspora. Apart from these small volumes and unquantified informal cross-border product flows where communities live right on the border, **the VC is a domestic one** and involves no formal imports or exports.

**The VC involves few oyster products**, with boiled/steamed oysters being by far the dominant form of product sold. Ninety-three percent of all oysters sold are in boiled/steamed form, with just 6 percent as grilled/smoked, and less than 1 percent in dried form. There are no sales of fresh oysters or other value-added products (e.g. oysters in jars, preserves, etc.). Retail sales of oysters take place in various locations. **Most (c.a. 90 percent) oysters are sold in major urban markets<sup>6</sup>** or by the roadside in the Tanbi area. Small volumes (around 10 percent of production) are sold by processors in the communities and villages where processing takes place.

**Prices** in the market differ by size and product form but are quite consistent between different market locations. Prices for 'big' boiled oysters of GMD 50-60 per cup (c.a. USD 1 per cup and equivalent to GMD 350-360/kg or USD 6.5/kg) are comparable to the current local prices for red meat and much higher than the cost of chicken (GMD 100-150/kg) and many other forms of fish protein (which can be purchased for GMD 50-100/kg). Nevertheless, demand for oysters is strong despite oyster prices having risen in recent years. Prices for small boiled oysters are discounted to around GMD 40 per cup, while large smoked oysters achieve a premium and are sold at around GMD 70 per cup.

**Oyster processors in some cases sell empty shells** (the waste product from processing) to producers of white lime, for use in construction, for use as fertiliser, or to poultry feed producers. But most shells are discarded at processing sites in the communities.

**Support services in the extended value chain** are few, given the few and low-cost items required to work in the VC which are readily available in the local market, for example, pans, buckets, baskets and machetes. The one larger investment item required is the non-motorised dugout canoe for oyster collection and accessing mangrove areas. Oyster collectors can buy as well as rent these canoes.

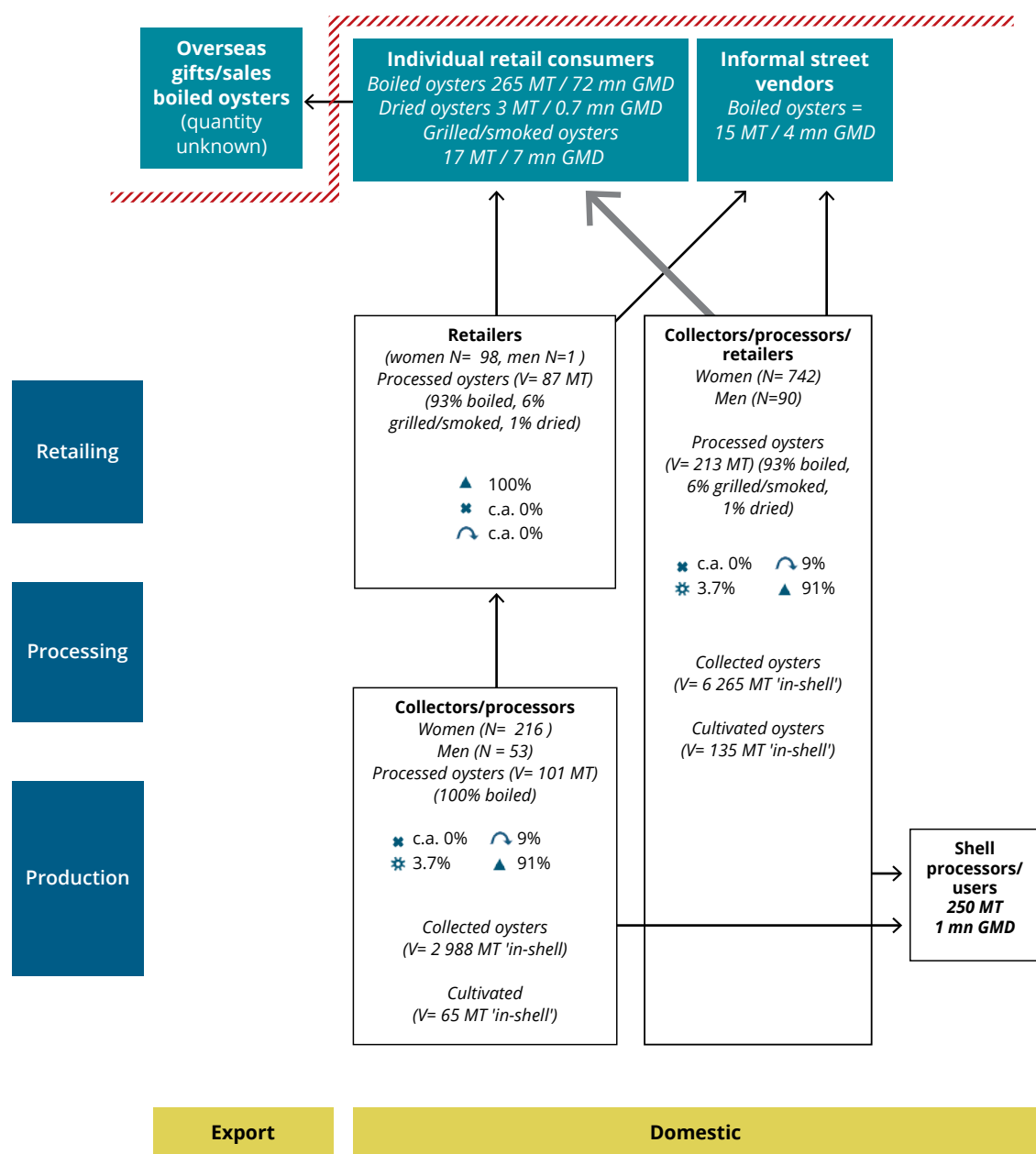
<sup>3</sup> There are no dedicated oyster farmers. All those involved with oyster farming also collect and process oysters. Farming practices involve the use of horizontal bamboo poles.

<sup>4</sup> 3.7 kg of boiled and shucked oyster are obtained from every 100 kg of oysters in their shells.

<sup>5</sup> For example, "*Benachin*" in which it is common to find oysters cooked with the rice.

<sup>6</sup> The major urban markets are: Serrekunda (Kanifing municipal Council [KC]), Brikama (West Coast Region [WCR]), Latri Kunda (KC), Lamin (WCR), Kemoto (Lower River Region [LRR]) and, in North Bank Region (NBR), Essau.

**Figure 2: Mangrove oyster value chain map, 2022 (the Gambia)**



### Legend

#### Ratios and percentages:

- ▲ Sold (%)
- ✖ Loss (%)
- ↻ Self-consumed (%)
- ✱ Conversion ratio

#### Quantities and volumes:

- N Number of actors
- V Volume in metric tonnes (MT)

#### Flows and interactions

- Sale
- /// National border

#### Abbreviations

- MT Tonnes
- mn Million
- GMD Dilasi
- c.a. Around/about

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Notes: 1/ dedicated retailers in limited cases may dry oysters (so they don't need to throw product away), or grill/smoke oysters. This explains why in the VC map collectors/processors sell 100 percent of oysters boiled, but retailers do not. 2/ retailers' sales volumes do not exactly equal collectors/processors' sales volumes despite the fact that retailers are not assumed to self-consume, due to assumptions about the number of retailers.

**The oyster season** starts each year in December or January and continues through to June (with July being the start of the rainy season). However, due to increases in the number of collectors in some areas (e.g. Tanbi) it has been necessary to control harvesting through agreed management arrangements, with harvesting not starting until March and only lasting for four months. During the season most actors work on a full-time basis in the VC, that is, more than 30 hours a week.

**Collection** typically involves 6 hours of work on a particular day (and only in daylight hours) with actors departing by small (3-5m) dugout canoes to arrive at the collection areas at low tide. Collection areas may range from <1km to as much as 8km from the point of departure. While the tide is out, larger oyster shells or groupings of shells made visible by the low tide are removed from the mangrove roots (without damaging the roots).<sup>7</sup>

**Processing** of oysters takes place at landing sites and involves boiling/steaming the oysters for 30-60 minutes in cut-off metal oil drums (see below) with blankets placed over the drums to aid the boiling/steaming. This process causes the oyster shells to open, allowing them to be 'shucked'. Once the boiled oysters have been shucked (which takes 4-5 hours on average), they are washed/cleaned in water to remove any small pieces of shell, and then stored in pans or baskets before taken for sale.

**Figure 3: Drum and blanket used for boiling/steaming oysters over wood fire (Bullock, West Coast Region)**



**Figure 4: Oyster shucking after boiling (Sutu Sinjang, West Coast Region)**



**Actors then take the boiled oysters to market for sale.** This takes place immediately after processing is completed so there is no need for chill storage facilities at the processing sites. The baskets used to take oysters for sale and used when retailing are normally the same ones used when separating the oysters by size during shucking.

<sup>7</sup> In some communities (e.g. Memmeh in the North Bank Region), collectors free-dive to collect larger oysters which are not inter-tidal but remain submerged and grow individually on rocky substrates.



**Figure 5: Retail sales (Serrakunda market, Banjul)**



**Figure 6: 'Cups' used to measure retail sales of oysters**



**Oyster farms** have been constructed with financial and technical support from the Department of Fisheries and donor projects since 2010. There are now five farms, mainly located in the Tanbi area. The current method of farming involves making a small hole in large oyster shells before they are tied to a length of nylon of around 100 cm. The nylon lines with shells are then taken to the farm site, where the nylon lines are tied to horizontal bamboo poles and left to hang vertically. Oyster spat naturally attach themselves to the empty oyster shells. As the oysters grow, the nylon lines may be left hanging vertically or wrapped around the horizontal poles. Regular maintenance and de-fouling of other organisms (such as star fish) from the shells may also be carried out. The oysters are harvested just before the rainy season in June/July after around 8 months.

**Figure 7: Oyster farm (Lamin)**



In terms of the **enabling environment**:

- **Commercial banks, micro-finance institutions, insurance companies and mobile money operations have poor rural coverage/penetration and are not used by many VC actors.** Only 25 percent of VC actors have a bank account, and only 2 percent use mobile banking. Oyster value chain actors are more amenable to using traditional community-based lending and savings arrangements ('osusu'), which gives them access to revolving loans based on amounts in the savings portfolio.
- **Policy and legislation governing the sector is recent and generally appropriate**, and there is an Oyster and Cockle Co-Management Plan (agreed in 2012, but not updated since then) for the Tanbi Special Management Area (6 300 ha) in the Tanbi Wetlands National Park.
- **The Department of Fisheries provides a range of support and services to the VC**, but the Food Safety and Quality Authority (**FSQA**) does not test the oysters for food safety.
- There is generally no **infrastructure** at the landing sites. Access to and from these landing sites is typically only possible using unpaved/graded tracks, and the oysters are boiled there in the open air. The shucking is carried out under informally-constructed semi-permanent structures typically made of collected wood, with branches to provide shade. At market locations informal tables are used to display the oysters, and urban council-run markets are generally congested, often with poor access (and by foot only), and have no chill or cold storage facilities available.
- A number of **donors**, for example, USAID, Green Climate Fund, The French Development Agency (AFD), MAVA (Swiss philanthropic organisation) and GIZ are active in supporting the VC and the mangrove ecosystem on which it depends.
- **Organization of some oyster VC actors** began in 2007 with the creation of the TRY oyster women's association, bringing together around 500 female oyster harvesters from 15 villages in the Greater Banjul area. However, not all oyster collectors in the Gambia (estimated at 1 200) are part of the TRY association. This is of obvious strategic importance to the upgrading strategy given the potential for replication or expansion of the current actor organization, and the fact that at present the voices of those actors are not organized nor well represented.
- Actors in the oyster VC come from a **wide variety of ethnic groups**, including Jola, Mandinkas, Manjagos, Karoninkas, Serer and Fula, with many being first- or second-generation descendants of immigrants from Senegal and Guinea Bissau. However, there is very little seasonal in-migration of workers to communities to engage in the oyster VC.







### 3. Sustainability and resilience assessment

An assessment of the **economic performance of the VC** shows that the profitability of the three actor groups (collectors/processors/retailers, collectors/retailers, and retailers) is good, with a return on sales of 80 percent (well above the cost of capital of around 20 percent), and individual actors making profits of around GMD 65 000 per year on average. The return on investment is also high as investment costs are very low for most actors. Oyster farming/processing is also profitable but less so than wild collection/processing. While the oyster season lasts, those engaged in it work on a fairly full-time basis. However, these actors are only involved with the VC for an average of 4.3 months per year, which makes an estimated total full-time employment of 468 FTE. Almost all those working in the sector are self-employed/family members with virtually no hired employment created. However, in some cases individual owner-operators do employ other individuals to assist with the processing/shucking of oysters after boiling/steaming. The minimum wage in Gambia is GMD 50/day<sup>8</sup> while the data collection and analysis show average daily earnings of those in the VC of GMD 672/day.

The direct value added (GMD 82 million a year) generated by the VC is almost exclusively captured by the actors/owners themselves. This reflects the low levels of employment in the VC as most actors are self-employed, and the fact that the government extracts very little resource rent from the VC. Government charges are limited to small amounts paid as market duties to local government councils and market authorities, and no licence or access fees are charged to harvest oysters. The indirect value added (GMD 3 million a year) is low, and low as a share of outputs. This reflects the low value of input items required by actors to complete the collection, processing and retailing functions. The total value added is high and makes up 87 percent of the total value of output at VC level.

In terms of effects in the national economy, annual oyster VC value added of USD 1.4 *million* a year is very small (0.03 percent) when compared with the national GDP in 2020 of USD 1.87 *billion*.<sup>9</sup> Impacts on the balance of trade are estimated to be neutral or zero as there are no formal exports of oysters, and virtually no imports are used in the VC, except for some imported items such as plastic pans and protective clothing. There is very little impact of the VC on public funds with very little and few payments to government from actors (see previous paragraph), and while the government provides some financial support and extension to oyster VC actors, these are thought to be small. As noted earlier, access to capital for VC actors is poor and interest rates from commercial banks (15 to 18 percent) and microfinance institutions (20 to 25 percent) are high.<sup>10</sup>

Average prices for large-boiled oysters in the Gambia are USD 6.5 per kg for large oysters and USD 5 per kg for small oysters, broadly comparable in terms of international competitiveness with oyster prices in Senegal for boiled oysters of a similar size which are about USD 8 per kg.<sup>11</sup>

The ultimate beneficiaries of the value chain are the end-consumers who consume the oysters in the domestic market. The value of the product to the end-consumers is good with domestic sales

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<sup>8</sup> <https://www.minimum-wage.org/international/the-gambia> (accessed June 2022)

<sup>9</sup> Gambia, The | Data (worldbank.org) (accessed June 2022)

<sup>10</sup> Gillen, M., 2022.

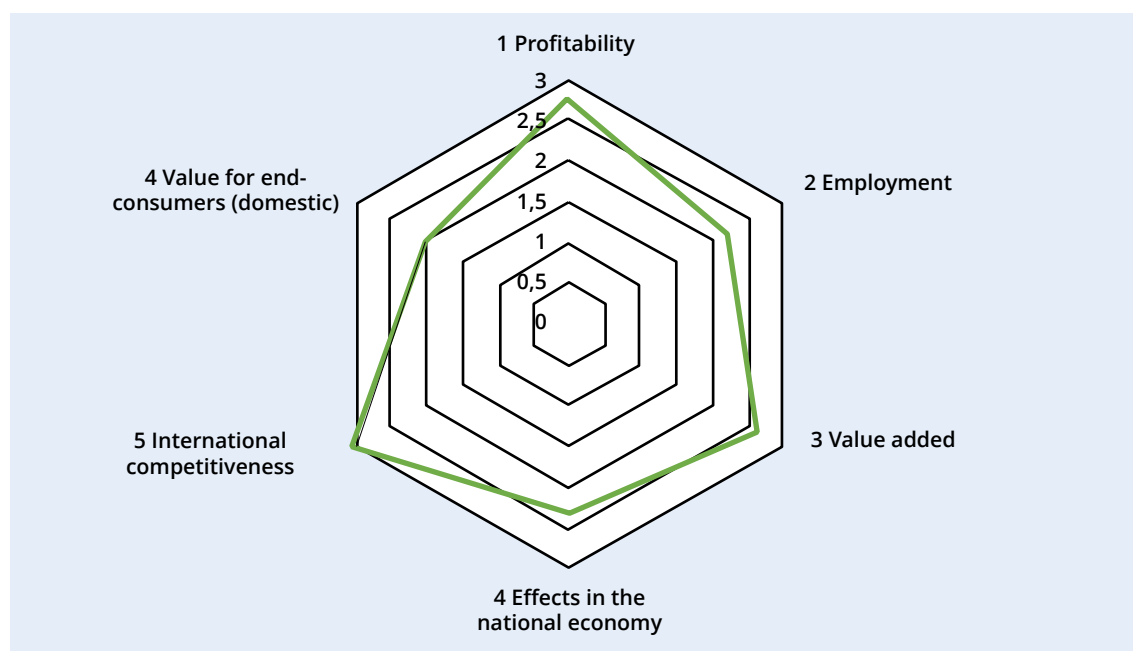
<sup>11</sup> exchange rate: USD 1 = XOF 550



prices more than 20 percent below parity price (the prices in Senegal for similar products, that is, boiled oysters). The FISH4ACP consumer survey found that consumers have generally positive views about the quality, available quantity, reliability of supply, and price of oysters in the domestic market. However, while there are no direct substitutes for oysters in the domestic market, oysters are far more expensive than other fish products, and more in line with the price of red meat.

A summary of the economic sustainability assessment across different domains is presented in Figure 8 below.

**Figure 8. Economic sustainability performance scores for the value chain**



Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Note: The figure shows the scores of five economic domains, which are the averages of the scores of the subdomains under each domain. The scores range from 1 (highly concerning/unsustainable) to 3 (not concerning/sustainable).

An assessment of the **social performance of the VC** shows that with regards to inclusiveness of the oyster VC, it faces some problems. While average earnings for actors is GMD 120 per hour worked, the distribution of wages between workers is somewhat inequitable. While there are only small differences in per capita net income between collectors/processors/retailers and collectors/processors, individual retailers generate less value added per hour worked. There are also large differences between those with higher and lower earnings in all actor groups. Value added is retained mostly by VC actors with little paid labour and few payments to the government. Furthermore, the VC is small in size with an estimated 1 200 actors that only work seasonally collecting oysters. On the other hand and of a positive nature is that the oyster VC represents an employment opportunity to vulnerable groups, and most of the actors are women of all ages, many of whom belong to minority ethnic groups. And even considering the seasonality of oyster harvesting, the net income generated for four months provides a yearly average above the poverty line. Furthermore, 87 percent of actors do not rely solely on the VC for their net income as they have other earnings outside the oyster season from activities such as other shellfish (cockle and crab) collection, gardening and livestock rearing.

Gender equality is considered sustainable in the oyster VC, with 90 percent of all actors being women (but with no legal or management restrictions on men being involved). Oyster collection has historically been a women's activity at all the functional levels (collection, processing and retailing); hence their economic involvement is very high with no discrimination in terms of their involvement. However, women are still the main contributors to domestic work, and while most of the oyster VC actors' households are headed by females and the net income earned from the oyster business is managed and controlled by them, most of it is spent to support family needs. Women also play a lead role in the TRY oyster women's association and in other community-based actor organisations.

Food and nutrition security with regards to the oyster VC is assessed as unsustainable. Oyster production in the Gambia is seasonal (4–8 months) and production volumes do not meet the strong national demand. Oyster availability during the year and across the country is also inconsistent – while availability may be good during the oyster season, there are virtually no sales from July to December and there is poorer access to product in upper river regions. The prices of oyster products have increased in recent years. As noted earlier, prices are comparable with the price of red meat, and oysters are now only affordable for wealthier households. Oysters thus provide only a low contribution to the country's food security. Concerns also exist over food safety, despite the boiling/steaming process, as oysters can pick up pathogens (e.g. algal toxins) from the water while they are alive that can be difficult to eradicate by cooking. Contamination with foodborne pathogens can occur after processing. The country does not have a water quality monitoring system, nor any depuration facilities to cleanse the oysters after harvesting to prevent food safety risks, and no food safety controls for oysters.

The picture with regards to decent employment in the oyster VC is mixed, and thus there are some concerns. On a positive note: i) there is little to no involvement of children in the VC during school hours and no forced labour in the VC; ii) job security is good with many actors having been working in the VC for many years; and iii) the average net income that oyster VC actors earn is well above the minimum wage, making the sector attractive, despite having a low adoption of technologies or innovative practices. However, most of the workers (collectors, processors and retailers) if not all, are informal and seasonal. And while it is a common practice for collectors to apply certain safety standards such as wearing gloves or protective clothes around the feet to avoid injuries while harvesting, VC actors often experience injuries due to their activity and the precarious condition of the protective equipment they use.

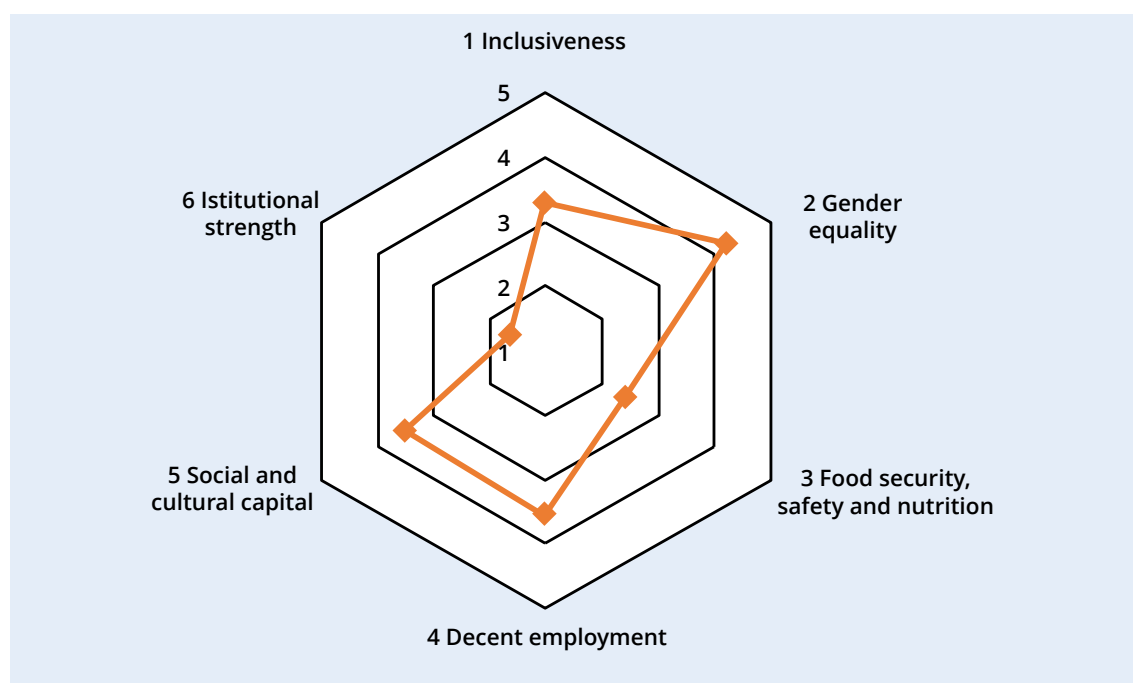
The oyster VC social and cultural capital domain is also mixed or concerning in terms of performance. Collective action helps to set prices of benefit to actors, and around 60 percent of actors belong either to TRY or to another community association increasing access to training and support. However, 40 percent are not represented or part of such associations. Levels of trust both vertically and horizontally in the VC are strong, and many activities (and especially processing) are conducted jointly. Most of the VC actors claim to have access to secure markets in the sense that oysters sell well, and feel empowered conducting VC activities. Oyster collection has raised awareness of the importance of mangrove preservation, and there is a general belief that eating oysters brings health benefits. However, only a few actors participate in decision-making in terms of governance, the majority of the actors do not adequately network in terms of the sharing of sector-specific information, and support provided by the Department of Fisheries is sporadic, infrequent and patchy in terms of geographical coverage.

The oyster VC institutional strength domain is assessed as unsustainable. The oyster fishery has one management plan for the Tanbi Wetlands National Park, but it has not been updated since

its publication in 2012, and there are several persistent conflicts with intruding neighbouring communities. Furthermore, most of, if not all, the VC actors are informal and have not been registered within any public competent authority, and public support to the sector is weak. Actors do not normally have bank accounts and their access to formal finance services is limited. Obtaining current and reliable statistical data remains one of the challenges the fisheries and aquaculture sector in the Gambia faces, including for the oyster VC. This applies both to data needed to govern the sector effectively, and also to market data and information. Government institutions are constrained by resources, for example, finance and human. The latter in terms of number and technical capacity. This impedes the provision of timely and accurate data, and there is virtually no data routinely collected on the oyster VC.

Based on the analytical assessment of social performance as discussed above, an overview of social performance for the VC is provided in Figure 9.

**Figure 9. Social sustainability performance scores for the value chain**



Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. The figure shows the scores of six social domains, which are the averages of the scores of the subdomains under each domain. The scores range from 1 (highly concerning/unsustainable) to 5 (not concerning/sustainable)

An assessment of the **environmental performance of the VC** shows that in terms of impact on the climate, the oyster value chain in the Gambia is assessed as sustainable. Electricity is not used in the oyster value chain at all. As canoes used in harvesting are generally paddled, the level of fuel consumption in the value chain is very low and not significant enough to raise sustainability concerns. While difficult to quantify its carbon footprint, there is some wood burning in oyster processing (boiling and grilling/smoking) that generates CO<sub>2</sub> emissions, and is of some concern and has potentially negative impacts on forest cover and vegetation. In addition, the cutting of trees used to construct dugout canoes used by most harvesters reduces the potential for carbon sequestration. But the impacts of the VC on forest cover is likely to be very small in absolute terms and compared to other uses of wood.

The water footprint of the oyster value chain is limited and thus sustainable. There is no ice consumption or use requiring fresh water, and salt/brackish water is used in processing activities (boiling and washing) which is extracted from the natural environment (estuaries). There are some risks associated with water-based pollution as there is no wastewater treatment, and wastewater generated along the value chain is dumped directly into the natural environment. However, given that wastewater is only used when boiling/steaming oysters and the quantities are small, these risks are not assessed as being that significant.

Of most concern for the environmental assessment is that considering recent trends, oyster harvesting is not sustainable. Although a quantitative assessment of stocks is not available, oyster stocks are overexploited in some locations like the Greater Banjul Area and Tanbi where oysters harvested are now characterized by smaller sizes. Fishing pressure has increased due to an increasing number of harvesters. The existing management plan is not enforced in Tanbi and other areas are not subject to any management arrangements.

Regarding its impacts on biodiversity and ecosystems, the oyster value chain is sustainable. Oyster harvesting is a very selective activity. There is no problem of bycatch associated with the collection of oysters, and because of its selectivity there are no detrimental effects on endangered, threatened and protected (ETP) species. The limited farming that takes place uses local oyster species instead of genetically modified or alien species. Therefore, the use of aquatic genetic resources is responsible. Regarding the mangrove forest, which is the primary vulnerable ecosystem related to the oyster value chain, oysters are harvested from mangrove tree roots in almost all cases without damaging them. However, while the quantities involved are thought to be small, there are some concerns over the cutting of terrestrial trees to obtain wood used for the fires to make white lime from oyster shells.

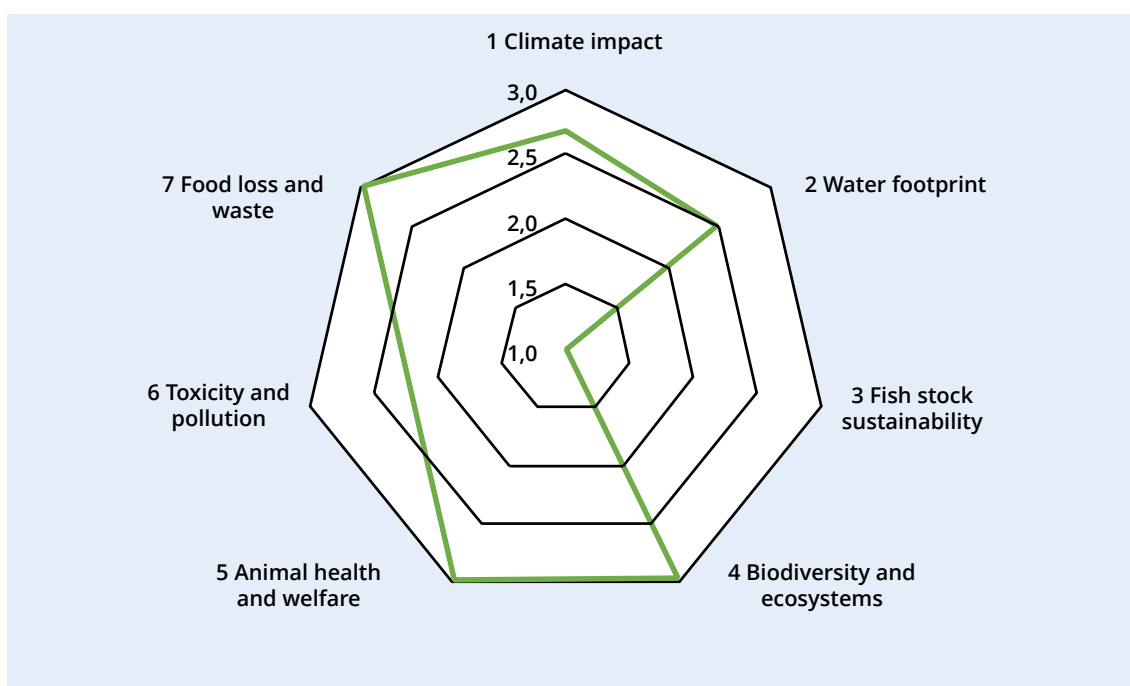
The oyster value chain does not raise any particular sustainability concerns in terms of animal health and welfare, as oyster farming activities rely on natural spat fall onto empty oyster shells and there are no particular husbandry and handling measures required. For the same reason, there is no need for specific biosecurity measures. Regarding oysters, no appropriate slaughter technique is defined by the World Organization for Animal Health.

Although it is difficult to quantify, the issue of toxicity and pollution related to the oyster value chain is of some concern. While feed, drugs and chemicals are not used, air pollution is concerning, as no mitigation measures are taken against the smoke generated from burning wood used for boiling and grilling/smoking oysters and for producing white lime from shells. Furthermore, there are large amounts of solid waste in the form of empty oyster shells that have accumulated over many decades around the processing sites (although besides the visual impact the piles of shells do not physically pollute the environment). Regarding inorganic solid waste pollution, there are no sustainability concerns, as the Gambia banned non-biodegradable plastic bags since 1 July 2015 and oysters are normally packaged in paper bags when retailed.

There is effectively no food loss and waste in the oyster value chain. All the harvested and processed product is sold, primarily in boiled/steamed form, or on occasions where the product cannot be sold the same day it is dried and sold over subsequent days. The lack of waste stems from strong demand, a short value chain, and the fact that no chill or cold chain is required given the boiling/steaming process and the subsequent immediate transport to market and sale. The only waste that may occur is by consumers failing to consume oysters and discarding them, due to a possible lack of refrigeration and unreliable power supplies for fridges in households.

A summary of the analytical assessment of environmental performance is presented in Figure 10.

**Figure 10. Environmental sustainability performance scores for the value chain**



Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Note: The figure shows the scores of seven environmental domains, which are the averages of the scores of the subdomains under each domain. The scores range from 1 (highly concerning/unsustainable) to 3 (not concerning/sustainable).

**Resilience is a meta-dimension of sustainability** that entails how economic, social and environmental sustainability aspects, which relate to performance under normal circumstances, are affected by shocks. Considering the likelihood of occurrence (re-occurrence) and the (potential) severity of impact, the following potential shocks are considered the most relevant to the oyster VC, based on stakeholder consultations and secondary information. Text in brackets indicates the type and nature of the potential shock.

- Fall in demand for oysters in the domestic market (economic shock, potentially resulting from health scares and consumer concerns over food safety).
- Fall in availability of oysters available for collection (environmental shock, resulting from pollution, disease or over-exploitation).
- Increase in transport and other input costs (economic shock, resulting from macro-economic factors).
- Increase in actor numbers (social shock, resulting from new entrants, the lack of individual user rights, and the open access nature of the fishery in some areas).

**Redundancy** resilience of a VC can be enhanced if the VC has excess capacity which enables the maintenance of the VC's core functionalities in the event of shocks. In the case of the oyster VC, the lack of any storage facilities means there are no stocks of supply held in reserve, and the levels of savings by VC actors is low.

**Diversity.** The more diverse a value chain is, the less likely it is that a shock will wreak havoc on the VC. The oyster VC is very homogenous in terms of the technologies, functions, products and actors. Almost all actors carry out very similar activities and methods in the collection, processing and marketing of oysters. There is little diversity in terms of end products (almost all boiled) or

different forms of value addition (no branding of packaged products), or in marketing channels (with almost all oysters sold in urban retail markets). The actors themselves are also not diverse in terms of function and type, with a large proportion being collectors/processors/retailers.

**Connectivity.** Good connections of various kinds between actors, other VC stakeholders and resources, and the extent to which they may hold up in case of a shock, impacts on the ability to quickly identify problems and needs, and to attenuate the effects of the shocks. The VC displays strong social linkages at the community level, with processing activities in particular often being a group activity allowing time for the exchange of information and the development of strong social relationships. Many of the actors are organised into the TRY oyster women's association, with the organisation providing a good basis for imparting knowledge to VC actors and for the association to be aware of any issues or shocks facing actors. Relationships between actors and government are also generally good (although contact is not always very frequent), with staff in the Department of Fisheries having good relationships with actors. The relatively small distances generally involved in travelling between processing sites and markets also means that in physical terms there is good connectivity between actors and their markets, although the quality of road access can limit connectivity.

**Collaboration.** Collaboration between actors and other VC stakeholders enhances resilience capacities since VC stakeholders share the risks among themselves and, as a group, have a better picture of the risks and how to manage them. At a horizontal level, both collection and processing functions in particular are often undertaken by groups of actors, enabling good collaboration. Given the vertical integration of functions by individual VC actors, collaboration between vertical functions in the VC is by definition very strong. As noted above, the presence of the TRY oyster women's association provides a good forum for the exchange of experiences between actors, as does the group nature of the processing activities at the village and community level. The TRY association also supports collaboration between actors and the government. Levels of trust between actors, and between actors and government, are also generally assessed as not being problematic, and the presence of co-management arrangements (for the Tanbi area, if not all areas in which oysters are collected) is evidence of generally good collaboration.

**Learning and adaptation.** Learning and adaptation refers to the levels of flexibility and innovation in the VC, which may serve to increase resilience. Efforts have been made in the past to innovate in terms of new end products and packaging (oysters in jars). However, these efforts were not successful and demonstrate a lack of flexibility by producers to alter existing practices (which are largely individual in nature) to a more collective approach to marketing. Indeed, the technologies and practices used in collection, processing and retailing have changed very little, if at all, over the years, and would struggle to do so as a response to shocks. The ability for core actors in the VC to adapt and engage in activities less subject to shocks is low, that is to say, actors could not easily switch to other income-generating activities in their communities. Earlier programmes to monitor water quality are not ongoing, and there is no routine monitoring of the state of oyster stocks. This reduces early detection of environmental shocks impacting on resource abundance, which would otherwise enable actors to prepare for such shocks.

**Participation and inclusion.** Participation refers to the empowerment and engagement of the full range of diverse VC stakeholders in fora and processes which can reduce the impact of shocks. Only around 40 percent of actors in the VC are represented by the TRY oyster women's association, and so some actors are less connected to response and recovery mechanisms.

The **sustainability and resilience heat map** in Figure 11 provides a synthesis of the economic, social and environmental sustainability assessment and the resilience analysis. The main conclusions to be drawn from the heat map are that there is a mixed performance across the sustainability dimensions and resilience. The VC performs relatively well with regards to economic sustainability. While there are several yellow/concerning indicators (9 of 21), there is only one indicator that is highly concerning (prices relative to substitutes). However, even the high and rising prices do not so far seem to have reduced domestic market demand for oysters. Social sustainability is poor, with this domain accounting for 6 of the 12 highly concerning red hotspots. These hotspots relate to a variety of 'access' issues (to information, finance and resources), as well as the uneven levels of value added between individual actors. The seasonal nature of the oyster fishery also reduces its ability to contribute to food security, both directly in terms of the oysters available for consumption, and indirectly through the ability of VC actors to use net household income to purchase food, as most actors only operate for around 4 months a year. The majority of the indicators assessed under the environmental sustainability domain are not concerning. However, a critical finding from the assessment is that both stock status and fishing pressure are highly concerning. Given that all social and economic benefits from the VC rely on a sustainably managed oyster stock, this suggests that the upgrading strategy will need to focus strongly on correcting these aspects of poor VC performance. When considering resilience, the assessment highlights several areas of considerable concern which could serve to reduce the ability of the VC actors to respond to shocks, notably the lack of an ability to hold stocks (due to a lack of storage facilities) and the homogenous nature of VC activities.

**Figure 11. The Gambia mangrove oyster value chain sustainability and resilience heat map**

Economic Sustainability	Social Sustainability	Environmental Sustainability
Net profits	Wage and employment distribution	Electricity use
Trend in net profits	Value added distribution	Fuel Consumption
Return on sales	Poverty and vulnerability	Carbon footprint
Return on investment	Discrimination	Water and Ice Consumption
No. of jobs in FTE	Women's economic involvement	Water pollution & wastewater treatment
No. of full-time jobs	Gendered division of labour	Stock status and stock dynamics
No. of wage labour jobs/ salaried jobs	Gendered access to productive resources	Fishing pressure
No. of family/self-employed jobs	Women's decision-making and leadership	Impact on associated species
Average wage proxy family labour	Availability of food	Status of vulnerable ecosystems
Direct value added at core VC level	Accessibility of food	Status of ETP species
Indirect value added at VC level	Utilization of food (nutrition, safety)	Responsible use of aquatic genetic resources
Total value added at VC level	Stability of food (trends)	Application of biosecurity measures (cont.)



Economic Sustainability	Social Sustainability	Environmental Sustainability
Net impact on the balance of trade	Respect of labour rights	Appropriate animal husbandry and handling
Rate of integration	Child and forced labour	Air pollution
Net impact on public funds	Job safety and security	Inorganic solid waste pollution
Access and cost of capital	Job attractiveness	Organic solid waste pollution
National protection coefficient	Collective action (horizontal linkages)	Food loss
Domestic resources cost ratio	Coordination of transactions (vertical linkages)	Food waste
Consumer price benefit surplus	Social cohesion	
Consumer evaluation	Cultural traditions	
Price relative to substitutes	Policy, regulations, and standards	
	Access to finance	
	Access to natural resources	
	Access to information	
Resilience		
Redundancy	Diversity	Connectivity
Collaboration	Learning and adaptation	Participation and inclusion

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO.

<span style="color: green;">■</span> Not concerning	<span style="color: yellow;">■</span> Concerning	<span style="color: red;">■</span> Highly concerning
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<b>Economic sustainability score<sup>12</sup>:</b>	<b>73.8%</b>
<b>Social sustainability score:</b>	<b>54.1%</b>
<b>Environmental sustainability score:</b>	<b>80.5%</b>
<b>Resilience score:</b>	<b>41.7%</b>
<b>Overall sustainability score:</b>	<b>65.9% (34 of 69 green, 23 of 69 yellow)</b>
<b>Number of highly concerning hotspots (red):</b>	<b>12 (of 69)</b>

<sup>12</sup> The sustainability scores are calculated by adding up across sub-domains (1 for green, 0.5 for yellow, 0 for red) and dividing this by the number of subdomains, expressed as a percentage.







## 4. Upgrading strategy

Considering the VC and the shift from analytical complexity to strategic simplicity, an analysis of the strengths, weaknesses, opportunities and threats (SWOT) of the VC to inform the upgrading strategy is provided below in Figure 12.

**Figure 12: SWOT analysis of the mangrove oyster value chain in the Gambia**

<p><b>Strengths (internal)</b></p> <ul style="list-style-type: none"> <li>• Low input costs, strong market demand, technical skills necessary preventing new entrants, lack of middlemen due to vertical integration, and rising prices, all contributing to good incomes for VC actors.</li> <li>• Wastage of harvested product from point of collection to consumption is virtually non-existent due to short time between processing and sale, and strong market demand.</li> <li>• Good levels of organization, coordination and representation of many VC actors, which may be used as a model in areas where representation is less organised.</li> <li>• Employment creation for women and minority ethnic groups.</li> </ul>	<p><b>Weaknesses (internal)</b></p> <ul style="list-style-type: none"> <li>• Oyster fishery is seasonal meaning seasonal earnings, contributions to food security and employment.</li> <li>• Lack of use of individual user rights (community rights in Tanbi and open access in others) has resulted in increased fishing pressure.</li> <li>• Insufficient funding and capacities result in poor data collection so the state of stocks is not well known, although stocks suspected to be fully- or over-exploited.</li> <li>• Cutting of wood required for fires for processing and for paddle canoes has some negative environmental impacts.</li> <li>• Cultured production of oysters is limited in scale and technology meaning low profits and value added from aquaculture.</li> <li>• Homogenous activities and lack of product storage/ holding facilities means actors have low resilience to potential shocks.</li> <li>• Access by actors to finance is limited.</li> <li>• Work-related accidents and injuries</li> </ul>
<p><b>Opportunities (external)</b></p> <ul style="list-style-type: none"> <li>• Aquaculture technologies offer potential to increase production and overall profitability.</li> <li>• New marketing channels for fresh oyster products and sale of oyster shells are available for development.</li> <li>• Donor interest in the sector which could be leveraged to provide support and funding.</li> <li>• Use of regional experience of water quality monitoring practices as the basis for water quality testing.</li> <li>• The existence of some limited areas where oysters are available but not being collected.</li> <li>• Internationally recognised best practices in management provide the basis for increasing/re-building oyster stocks.</li> </ul>	<p><b>Threats (external)</b></p> <ul style="list-style-type: none"> <li>• Poor water quality or pollution and reduced levels of mangrove coverage impacts negatively on volumes of oyster production.</li> <li>• Consumers stop or reduce buying oysters due to water quality or post collection practices which compromise product safety/hygiene, causing consumers to reduce/avoid purchases due to health concerns. This threat is only theoretical at present.</li> <li>• Climate change impacts negatively on mangroves and oyster productivity. These impacts may be long term and relate primarily to inundation of mangroves.</li> <li>• Competing use of river and mangroves causes user conflicts.</li> </ul>

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO

The **strengths** of the VC are that it is well established having been operating for many decades using tried and tested methods which serve to generate good levels of net income for the actors involved (almost exclusively women, and many from minority ethnic groups). Market demand is strong, and there is virtually no post-harvest loss/waste thanks to the rapid processing and sale of oysters. Collaboration of actors, and with government, in many geographical areas of production is generally good.

**Weaknesses** of the VC include suspected overfishing and declining status of oyster stocks largely due to a failure to limit those engaged in collection activities, and an embryonic aquaculture sector which has not developed sufficiently in terms of volume to generate meaningful levels of income diversification. Other weaknesses are the seasonal nature of the fishery (which means that actors must find other household income-generating activities for significant periods during the year), poor access to finance, and insufficient data about the VC being collected on an ongoing basis.

Considering potential **opportunities** for the VC, these revolve most strongly around developing and improving the available aquaculture technologies and practices, enhancing and ensuring resource management through building on existing collaboration and partnerships, exploiting demand for fresh oysters and oyster shells, and leveraging donor interest in supporting the development of the actors' capacities, as well as improving the equipment and infrastructure available to actors.

Looking to the future, it is important to consider the **threats** to the VC. Most notably these include the risk of a fall in demand for oysters (most likely as a result of a health scare due to poor food safety controls and practices), or declining oyster production due to climate change, disease, or the impacts of other factors on water quality and mangrove cover.

Informed by the SWOT analysis, the sustainability assessments, the VC map and stakeholder interests as reflected during consultations, a **shared and agreed vision** for the mangrove oyster value chain has been developed together with stakeholders during the validation and activity planning workshops. This vision is:

***"By 2032, there will be a vibrant and sustainable oyster sector in the Gambia, with oyster value chain actors being resilient to potential shocks and generating profits through an increase in production and enhanced value addition."***

The time frame specified in the vision is based on the need to move quickly while allowing sufficient time for the strategies to support the vision to be put into place.

Specific and measurable **targets** associated with the vision (by 2032) are:<sup>13</sup>

1. Annually updated and implemented oyster and cockle management plan (for the Tanbi area).
2. Increase in wild oyster production from 9 253 tonnes in 2021 to 10 178 tonnes in 2032 (10 percent increase), due to stock rebuilding and better harvest controls in over-exploited areas, and if possible through expansion of collection activities into areas not currently well utilised.
3. Increase in aquaculture production from 200 tonnes in 2021 to 1 000 tonnes per year in 2032. This would raise aquaculture production from c.a. 2 percent of current production to c.a. 10 percent of production by 2032.
4. Increase in the proportion of actors represented by respective community associations from 50 percent in 2021 to 80 percent in 2032.

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<sup>13</sup> GMD values at current prices.

5. Increase in the sale of oyster shells by VC actors from 250 tonnes in 2021 to 2 500 tonnes per year in 2032 (1 500 tonnes sold bulk and 1 000 sold as shells processed/ground in communities)
6. 15 communities involved in selling oyster shell jewellery and other high-value oyster shell items.
7. Sale of fresh oysters to restaurants and hotels has begun by 2023 and continues, rising in volume to 25 tonnes a year by 2032.
8. Increase in direct value added by 35 percent.

The underlying **narrative for the upgrading strategy** for the mangrove oyster value chain in the Gambia represents an integrated approach to realise the vision and helps to explain the theory of change. The exploitation of wild oyster stocks will be placed on a sustainable footing with the help of grants and other supporting measures, such as training courses and workshops (to build capacities) and feasibility studies (to further understand and justify interventions included in the strategy). This will be implemented through improved resource management resulting from updated and improved management arrangements and increased participation of value chain actors and government stakeholders in decision-making. At the same time, support will be provided to expand and upgrade the emerging oyster aquaculture sector through financially viable new production methods and an expansion in the number of oyster farms and areas under cultivation, as well as by updating the associated regulatory framework. Increased aquaculture production will serve to increase natural spat availability and increase the incomes of actors. This dual focus on wild and farmed oysters will serve to better support the value chain actors in meeting the strong demand for oysters in the local market. Pilot schemes to trial the sale of new oyster products (e.g. fresh oysters) and explore new marketing channels not currently utilised in the domestic market (e.g. high-end hotels and restaurants) will provide learning experiences that will underpin the articulation and implementation of a market strategy for the mid to longer term. The market strategy will potentially be based on segmenting the market and differentiating sales by farmed and wild collection methods, with a strong emphasis on ensuring robust product hygiene standards for consumer safety. The market strategy is envisaged to rely on domestic sales.<sup>14</sup> The overall upgrading strategy will also explore and develop the potential to generate additional value added from the oyster shells which are the by-products of oyster processing. Opportunities may lie in bulk sales of shells for 'industrial' use in poultry feed mills or as fertiliser, or their use in innovative tourism (and export) products such as jewellery and handicraft items which could be made by value chain actors in the off-season. Market development will be coupled with and supported by improvements in equipment and infrastructure, where relevant financed by actors themselves based on improved access to finance and in other cases by donors. This will help to realise the expected developments in value chain performance, increased resilience of value chain actors to potential economic and environmental shocks, and improved working conditions for actors in the value chain.

The **four elements (or components) to bring about the vision are:**

1. ***Improving oyster resource and mangrove ecosystem monitoring and management.*** This will involve updating and improving the Tanbi oyster and cockle management plan (to include management, access and harvesting arrangements, protection of bio-security issues, etc), increasing the number of value chain actors who are part of and represented by the TRY oyster women's association or other community-based associations, routine stock assessments,

<sup>14</sup> Given the requirement for exports to be underpinned by a shellfish sanitary programme meeting export standards for the European Union or US and the time that would be required to establish one strong domestic market, and the complex logistical arrangements for export, an export focus is unlikely to be feasible/desirable within the lifespan of the strategy.

- implementing a water quality testing programme in specific areas, and supporting mangrove protection, re-planting and re-growth.
2. **Developing new and improved aquaculture methods.** This will involve research to explore potential aquaculture methods suitable to local species and conditions, and then a series of activities for piloting and experimentation to identify optimal spat collection areas and the trialling and rolling-out of new and improved aquaculture production methods. Expansion of the area under farming will take place following careful site selection (recognising the potential complexity of land tenure issues and the granting of concessions) and agreement over ownership and management arrangements for new aquaculture farms. Expansion will also need to be supported by increased access to services, technology and finance to value chain actors, to ensure bio-security and to provide an appropriate legislative environment governing oyster cultivation. This element will also need to ensure that the economics of oyster farming are fully understood and that investments are justified in financial terms, rather than just being possible in biological and technical terms, given the fixed and operational costs involved and the resulting revenues based on market prices for the product.
  3. **Market development for oysters and oyster by-products.** This element will have two main parts, one focussing on oysters, and the other on shells as the by-products of oyster processing. Important for the part focussing on oysters will be activities designed to ensure food safety and hygiene for oysters being sold. Market research and pilots will test the potential for new products (primarily fresh oysters, but potentially others such as oysters in jars)<sup>15</sup> to be sold in the domestic market. New marketing channels, especially hotels and restaurants, will be explored. Research and pilots will be used as the basis for activities to articulate and agree a marketing strategy, which would then become part of the overall upgrading strategy. Some investments in marketing-related equipment and infrastructure will be required. The second part of the element will focus on market research and then the building of market relationships and sales arrangements between oyster processors and buyers of shells, as both a low-cost bulk input to poultry feed or fertiliser, and as small-volume high-value tourism products. For the latter, skills development for the production of sales items will be supported, once product options have been explored for their potential demand (in both domestic and export markets) and likely prices.
  4. **Improving working conditions and enabling conditions.** This element will involve the provision of equipment and infrastructure to improve working conditions and reduce current safety concerns about working practices at different stages of the value chain, that is, collection, processing and sale. It will involve the provision of personal protective equipment (PPE) and safety equipment used during the collection of wild oysters and their steaming/boiling or smoking, following consultations to verify the real demand and potential for their use. It will also involve research, trials and funds for improved steaming/boiling methods, chill/cold storage of processed oysters, processing-related shelters and sales-related equipment. In all cases, careful attention will be paid to the economic viability, certainty over use, sustainability, and any management-related arrangements for the equipment or infrastructure provided. A small and targeted programme to teach value chain actors how to swim will be established for those that need it. Support for increased access to finance will enable VC actors to make the necessary investments.

Through the implementation of the upgrading strategy and its four elements, linkages will be developed with the strategy being deployed by the FISH4ACP project in Senegal, which is also

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<sup>15</sup> Earlier attempts to sell in jars were not successful, so the reasons why would be explored.

focusing on mangrove oysters. This will ensure cross-VC learning and potentially economies in the funding of certain activities.

A range of activities and inputs (e.g. studies, training and funds) supported by government, the private sector (core VC actors and service providers), the FISH4ACP project and other donors will produce the outputs needed to bring about improvements in the enabling environment (intermediate outcomes) and, in turn, a series of environmental, economic and social outcomes, in support of the vision.

The **Theory of Change** (ToC) for the VC upgrading is presented in Figure 13, which shows the logic and linkages between the inputs, outputs, outcomes and vision in a figurative way. The ToC covers the whole upgrading strategy (whose implementation will go beyond the scope of the FISH4ACP project) rather than being specific to the FISH4ACP project.

Successful implementation of the upgrading strategy would result in an **upgraded business performance** of VC actors, an **enhanced enabling environment** through improved management of wild oyster stocks, improved arrangements for the aquaculture sector, better food safety controls, and improved equipment and infrastructure, as well as **upgraded governance** notably with regards to marketing and sales arrangements.

The key economic, social and environmental performance indicators under current and upgraded practices, aggregated at the VC level, are shown in Table 1 below (on an annual basis). These indicators show the positive impacts of the upgrading strategy across the three elements of sustainability.

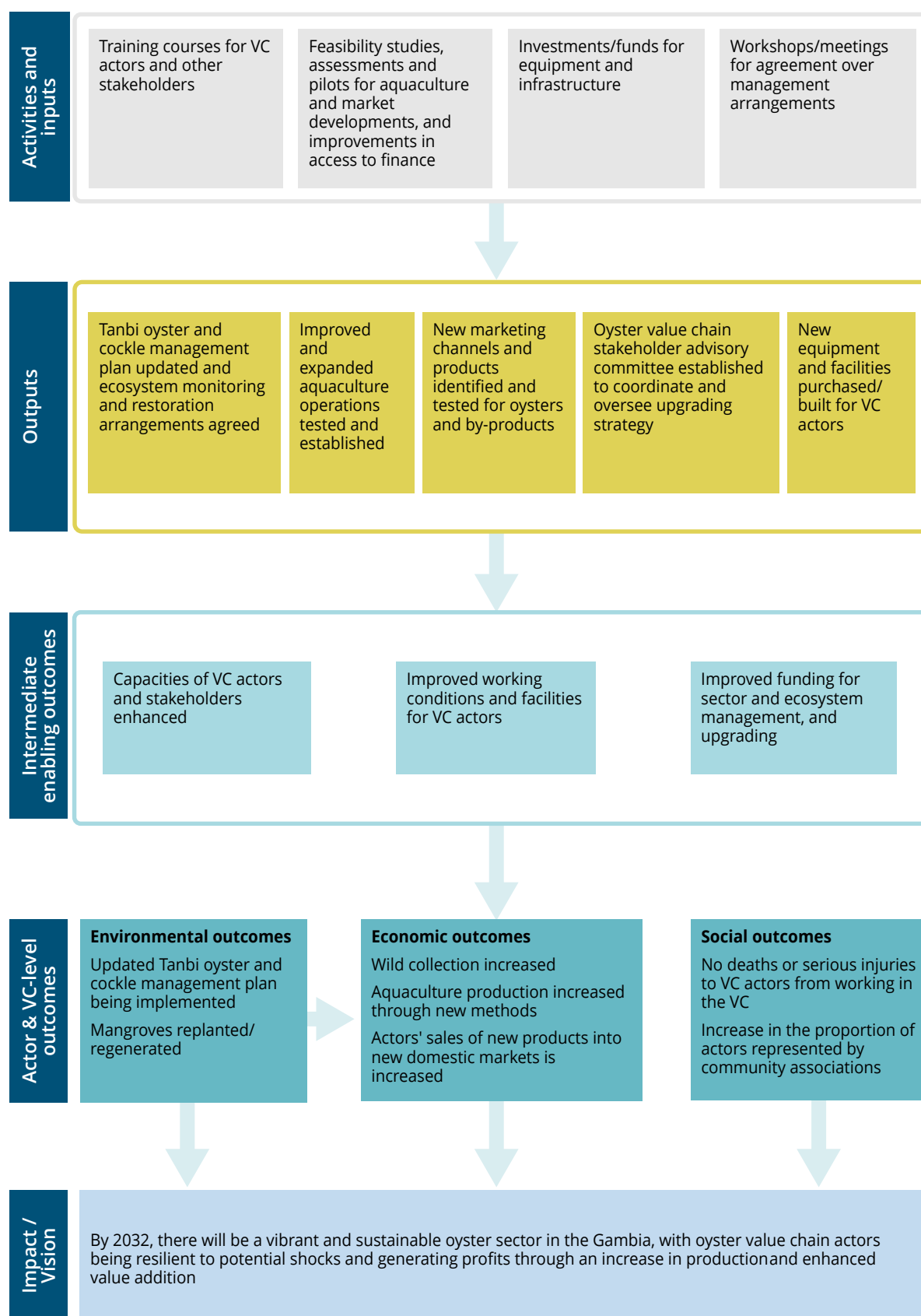
**Table 1: Key economic, social and environmental performance indicators under current and upgraded practices (aggregated at VC level)**

Economic indicators	Current situation	With upgrading
Total VC sales values	USD 1.63 million per year	USD 2.28 million per year
Total VC direct value added	USD 1.37 million per year	USD 1.87 million per year
Social indicators	Current situation	With upgrading
Proportion (%) of actors' part of community associations	50%	80%
Full-Time Equivalent employment	468 (375 women)	515 (413 women)
Number of social red sustainability hotspots	4	0
Environmental indicators	Current situation	With upgrading
Stock status	Subject to overfishing and overfished in some areas	Stocks not subject to overfishing and not overfished
Number of oyster and cockle management plans updated and improved annually	0 per year	1 per year
Hectares of mangroves increased	tbd	tbd
Number of environmental red sustainability hotspots	2	0

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO



**Figure 13: Theory of Change for the overall upgrading strategy of the oyster value chain in the Gambia**



Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO

Increased profits generated through the upgrading strategy will contribute towards increasing the resilience of the VC actors. Resilience will also be enhanced through the improvement in the ecosystem status of the mangroves, on which the oysters depend, and which serve a key function in climate change mitigation. The 'diversity' of the value chain will also be enhanced, thereby increasing resilience to market shocks, through the new marketing channels (e.g. restaurants) and products (e.g. fresh product and jewellery) developed for the sale of oysters and shells. Diversity will also be increased through the expansion of oyster culture, thereby increasing resilience through reducing the reliance on wild oyster collection. Actions in the upgrading strategy related to increasing the levels of VC actor participation in representative organisations, will increase levels of 'participation and inclusion', thereby increasing resilience, and will also serve to increase 'connectivity', allowing value chain actors to respond to shocks and challenges in a coordinated manner. Greater levels of participation and inclusion in such representative organisations, along with expanded and improved government service provision (especially in aquaculture developments and product handling/hygiene control), will also serve to increase the potential for 'learning and adaptation' and thereby the resilience of the VC actors.







## 5. Implementation plan

Bringing about these performance improvements and realizing the four elements of the upgrading strategy will require many activities to be funded and implemented. **FISH4ACP, the government, the private sector and other donors will all have a role to play in funding and implementing activities.**

Table 2 provides a summary **list of activities** in support of the different outputs. Some costs included in the table will need to be revised based on studies examining in more detail the feasibility and need for investments, and after refinement of the cost estimates.

Activities to support specific outputs under each of the four elements of the strategy have been further articulated in the supporting and more detailed analysis and design document. In that document, for each activity a text description has been provided to help implementation, along with an indication of timing, funding source and type of investment, which will have to be confirmed in the course of implementation.

The activity and investment plans are for the **whole upgrading strategy**, rather than being FISH4ACP-specific.

**Table 2: Summary of upgrading activities and investments (in USD)**

Outcome 1: Improved management of wild oyster stocks and mangrove ecosystems		Funding source	Total Costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
1.1 Stock assessment and other studies completed to inform contents of revised Tanbi oyster and cockle management plan and locations for mangrove replanting and regeneration	1.1.1 Conduct studies on topics needed to inform update and improvements to Tanbi oyster and cockle management plan and issues related to mangrove restoration/ protection	FISH4ACP	45 000	Facilitation / studies	2023
	1.1.2 Conduct assessment of oyster stocks status	FISH4ACP / (then Government)	40 000 (20 000)	Facilitation / studies	2023, 2027, 2030
1.2 Meetings and workshops held to update and improve existing Tanbi oyster and cockle management plan	1.2.1 Hold TRY meetings/workshops with TRY, Department of Fisheries, and other actors to discuss, agree and validate annual changes/updates to plan	FISH4ACP	30 000	Facilitation/ studies	2024

(cont.)

1.3 Mangrove replanting programme implemented in critical/defined areas	1.3.1 Develop and implement a mangrove replanting programme in clearly defined priority areas	AFD (other donors)	tbd <sup>16</sup>	Plant and equipment	2024 onwards
1.4 Mangrove areas designated, reserved and protected for natural regeneration	1.4.1 Develop legislative arrangements and mechanisms to protect mangroves in specific areas and allow for natural regeneration	AFD (other donors)	tbd	Facilitation / studies	2023 onwards
1.5 Water quality testing programme is implemented in key selected regions/areas	1.5.1 Define and implement a water quality testing programme in specific areas	FISH4ACP / (then private sector)	50 000 (75 000)	Facilitation / studies	2024 onwards
1.6 Training of water quality monitors completed	1.6.1 Conduct training of water quality monitors (likely to be from the communities)	FISH4ACP	13 000	Training	2024
1.7 TRY strengthened and other organisations created	1.7.1 Conduct outreach in villages to further strengthen the TRY association and build new organisations in areas outside of Tanbi to aid management and support VC interests	FISH4ACP	50 000	Training	2023-2025

Outcome 2: VC actors adopt new oyster farming practices and expand oyster farming operations		Funding source	Total costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
2.1 Land tenure and site location study completed	2.1.1 Conduct study to assess land tenure issues and site location for aquaculture expansion	FISH4ACP	20 000	Facilitation / studies	2023
2.2 Technical feasibility study of alternative farming methods/ species completed	2.2.1 Conduct technical feasibility study for alternative farming methods/ oyster species	FISH4ACP	30 000	Facilitation / studies	2023
2.3 Study of the financial viability and management arrangements of alternative methods of oyster farming completed	2.3.1 Conduct financial feasibility study and assessment of farm management arrangements for alternative/new oyster farming methods	FISH4ACP	15 000	Facilitation / studies	2023

(cont.)

<sup>16</sup> Not yet known as dependent on AFD and Ministry agreeing detailed programme

2.4 Pilot/ demonstration of new methods for expansion of oyster farming completed <sup>17</sup>	2.4.1 Conduct pilot field-based trials of new methods and in new areas	FISH4ACP	90 000	Plant / equipment	2024
	2.4.2. Communication/ dissemination events around pilot trial results	FISH4ACP	30 000	Training	2032
2.5 Aquaculture regulations re-drafted	2.5.1 Review and update aquaculture regulations	FISH4ACP	25 000	Facilitation / studies	2024
2.6 Replication of successful new/ improved aquaculture methods	2.6.1 Replication of methods and investments in other sites	Private sector	150 000	Investment	2005 onwards
<b>Outcome 3: New sales outlets/channels being utilized and new fresh oyster and oyster shell by-products are available on the market</b>		<b>Funding source</b>	<b>Total costs (USD)</b>	<b>Type of cost</b>	<b>Timing (by)</b>
<b>Outputs</b>	<b>Activities</b>				
3.1 Market research study completed on new marketing channels for oysters and by-products, and new products	3.1.1 Conduct market study to assess potential for new product and marketing channels for oysters and oyster by-products (shells)	FISH4ACP	10 000	Facilitation / studies	2023
3.2 Market development strategy developed and agreed in consultation with stakeholders	3.2.1 Develop a market strategy with time-bound responsibilities for market development	FISH4ACP	10 000	Facilitation / studies	2023
3.3 Training of actors and pilot market trial completed for new oyster channels and products	3.3.1 Train actors in requirements of new product/channels for oysters and support pilot/test of market arrangements	FISH4ACP	12 500	Training	2023
3.4 Training of actors and pilot market trial completed for oyster shell sales	3.4.1 Train actors in requirements of new product/channels for oyster shells and support pilot/test of market arrangements	FISH4ACP	25 000	Training	2023
3.5 Training of food safety inspectors and actors completed	3.5.1 Conduct training for food safety inspectors and VC actors on oyster product hygiene/ safety standards	FISH4ACP	35 000	Training	2024

(cont.)

<sup>17</sup> Need for coordination with similar activities in Senegal

3.6 Food safety controls of oyster products are conducted	3.6.1 Conduct programme of food safety controls for oyster products	FISH4ACP / (then Government)	5 000 (17 500)	Facilitation / studies	2024 onwards
3.7 Communities supported to start wild oyster collection	3.7.1 Conduct consultations and skills training in villages which don't engage in oyster collection but which are near to oyster stocks, to assess and support involvement of new actors in the VC	FISH4ACP	25 000	Training	2025
3.8 Replication of fresh oyster and shell sales	3.8.1 Replication of fresh oyster and shell sales by other communities	Private sector	50 000	Investment	2005 onwards
<b>Outcome 4: An enabling and secure environment is created for VC actors, strong sector management, and implementation and monitoring of the VC upgrading strategy</b>		<b>Funding source</b>	<b>Total costs (USD)</b>	<b>Type of cost</b>	<b>Timing (by)</b>
<b>Outputs</b>	<b>Activities</b>				
4.1 Study into equipment and infrastructure needs completed	4.1.1 Complete a study to further assess needs and justification for equipment and infrastructure	FISH4ACP	25 000	Facilitation / studies	2023
4.2 Appropriate equipment and infrastructure specified, procured and delivered	4.2.1 Specify, procure and deliver appropriate equipment	FISH4ACP	50 000	Plant and equipment	2024 and 2025
	4.2.2 Specify, procure and deliver appropriate infrastructure	Donors	60 000	Infrastructure	2024 onwards
4.3 Study completed to identify data gaps and needs, and define a data collection programme for the sector and M&E of the VC strategy	4.3.1 Complete a study to review existing data collection, data gaps, and data collection needs for the VC and upgrading strategy and develop a data collection framework (content and implementation arrangements)	FISH4ACP	17 500	Facilitation / studies	2023

(cont.)



4.4 Training completed in data collection and M&E of strategy	4.4.1 Conduct training programme for those involved with data collection and M&E strategy	FISH4ACP	5 000	Training	2023
4.5 Ongoing data collection and M&E of strategy completed	4.5.1 Collect and publicize relevant data	FISH4ACP and Government	55 000	Facilitation / studies	2024 onwards
4.6 Strategy developed to increase access to finance and enhance savings	4.6.1 Prepare and validate a strategy to increase access to finance and enhance savings of VC actors	FISH4ACP	10 000	Facilitation / studies	2023
4.7 Finance and savings strategy implemented	4.7.1 Facilitate access to finance and support savings by actors	FISH4ACP	20 000	Facilitation / studies	2024 onwards
4.8 Water safety/ swimming programme implemented for VC actors in need	4.8.1 Complete a programme to teach VC actors who can't swim how to do so	FISH4ACP	25 000	Training	2025
4.9 Technical support and services provided to farmers	4.9.1 Provide technical support, training and services to VC actors to support uptake of new methods and practices across all elements of the strategy	FISH4ACP, Government, Donors	275 000	Training	2023 - onwards

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Note: 1/ Over 2023 – 2025 USAID is providing c.a. USD 200 000 for activities in Tanbi and Bullock as part of the regional Women Shellfishers and Food Security Project. There may be potential for cost-sharing of some activities by the USAID project and FISH4ACP across all four outcomes, thereby saving costs for both FISH4ACP and USAID, and/or the potential for some FISH4ACP activities to exclude work in Tanbi and Bullock if similar activities are being supported in those areas by USAID. As a breakdown of the USAID budget by specific activity is not available at the time of writing (January 2023), the USAID funds are included in the cost tables as part of activity 4.9.1 (under training) rather than being distributed between different outcomes/activities of the upgrading strategy. 2/ Activities will be completed in collaboration with FISH4ACP activities in Senegal where appropriate.

**Activities to be financed by:**

- FISH4ACP<sup>18</sup>
- Donors
- Private sector
- Mixed sources e.g. FISH4ACP and government, other donors and private sector)

<sup>18</sup> Based on current proposals. Contact between FISH4ACP and other donors may enable other donors picking up funding for some activities currently allocated for FISH4ACP funding

Drawing on the information provided above, the investment table (Table 3) below provides an overview of the investments needed to realize the vision and how these investments are expected to be financed. It should be noted that the level of investments identified in the table below is indicative and will have to be confirmed by the various parties involved.

**A total investment cost of USD 1.42 million** is estimated for a variety of plants and equipment, facilitation and studies, training and infrastructure. Costs related to element 1 of the strategy account for 22 percent of total costs, element 2 accounts for 25 percent of total costs, element 3 for 13 percent of total costs, and element 4 for 38 percent of total costs.

**Table 3: Value chain upgrading investment table (USD)**

In USD	Financing sources				Total
Type of investment	FISH4ACP	Government	Other donors	Private sector	Totals by type
Facilitation/studies	372 500	72 500		75 000	520 000
Plant/equipment	140 000			200 000	340 000
Training	295 500		200 000		495 500
Infrastructure			60 000		60 000
<b>Totals by source</b>	<b>808 000</b>	<b>72 500</b>	<b>260 000</b>	<b>275 000</b>	<b>1 415 500</b>

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Note: 1/ some investments are dependent on studies providing sufficient justification and more detailed costings. 2/ FISH4ACP investments do not include costs of the national project officer or PMU costs in FAO/Rome supporting project implementation. 3/ investments do not include AFD investment in mangrove rehabilitation as these are not yet known and investments are not specific to the oyster VC but have wider societal benefits.

Table 4 shows the key stakeholders involved in the four elements of the strategy.

**Table 4. Key stakeholders and catalysts involved in the upgrading strategy and its four elements**

Upgrading strategy elements	Key stakeholders and catalysts involved
Improved management of wild oyster stocks and mangrove ecosystems	<ul style="list-style-type: none"> <li>• Department of Fisheries</li> <li>• VC actors</li> <li>• VC associations (e.g. TRY)</li> <li>• FISH4ACP</li> <li>• AFD</li> <li>• URI/USAID</li> <li>• Department of Parks and Wildlife Management</li> <li>• Department of Forestry</li> <li>• Department of Water Resources</li> </ul>
VC actors adopt new oyster farming practices and expand oyster operations	<ul style="list-style-type: none"> <li>• Department of Fisheries</li> <li>• VC actors</li> <li>• FISH4ACP</li> <li>• VC associations (e.g. TRY)</li> </ul>

(cont.)

Upgrading strategy elements	Key stakeholders and catalysts involved
New sales outlets/channels being utilized, and new safe fresh oyster and oyster shell by-products are available on the market	<ul style="list-style-type: none"> <li>• Department of Fisheries</li> <li>• VC actors</li> <li>• FISH4ACP</li> <li>• VC associations (e.g. TRY)</li> <li>• Tourism operators</li> <li>• Seafood buyers in local restaurants</li> <li>• Poultry feed mill operators</li> <li>• Food Safety and Quality Authority</li> </ul>
An enabling and secure environment is created for VC actors, strong sector management, and implementation and monitoring of the VC upgrading strategy	<ul style="list-style-type: none"> <li>• Department of Fisheries</li> <li>• VC actors</li> <li>• FISH4ACP</li> <li>• VC associations (e.g. TRY)</li> <li>• Navy/Fire Department</li> <li>• URI/USAID</li> <li>• Other donors</li> <li>• Micro finance institutions</li> </ul>

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO

The intention is for the main project phase of FISH4ACP in the Gambia to continue seamlessly from the analysis and design phase. The main project phase is expected to start in **January 2023**, and to run until **February 2025**, which is when the overall FISH4ACP programme will finish. A short inception phase will run to March 2023. This phase will allow for additional planning and stakeholder engagement prior to the implementation of upgrading strategy activities. During the inception phase, the following tasks will be completed, through a collaborative approach between the NPO, the PMU in Rome and the Department of Fisheries.

- Insert targets into the logframe where currently not provided.
- Obtain approval from key public and private stakeholders on this design report and the implementation plan.
- Complete launch event (in early February). This will involve joint FAO/Department of Fisheries press releases and a launch workshop in which relevant stakeholders make endorsements of the strategy and their proposed involvement in it through the activities.
- Hold the first Stakeholder Advisory Committee meeting.

A number of **risks** to the successful implementation of the upgrading strategy have been identified and assessed for their likelihood and potential impact. Mitigating strategies have been defined but risks cannot be completely avoided, as indicated in Table 5 below.

**Table 5: Summary risk analysis table**

Risk description	Likelihood (1-5)	Impact (1-5)	Overall Risk (1-25)	Mitigation
Failure of pilot activities and/or replication of pilot activities supported by FISH4ACP is not widespread	3	5	<b>15</b>	High-quality technical inputs to pilot activities and targeted facilitation and support. Lessons from elsewhere. Preliminary assessment of demand for new products.  Specific activities targeted at communicating and disseminating results of pilot activities.
Capacity of actors and Department of Fisheries to engage with FISH4ACP given other activities/ demands	3	4	<b>12</b>	Phasing of activities, coordination with other donors and support from the stakeholder advisory committee.
Lack of stakeholder enthusiasm for strategy post FISH4ACP	3	3	<b>9</b>	Participatory nature of FISH4ACP methodology and creation of VC advisory committee.
Difficulties in accessing all actors	3	3	<b>9</b>	Utilization of Department of Fisheries contacts and those from FISH4ACP field work in communities not represented by TRY. Constant efforts to reach communities more distant from Banjul.
Climate change impacts threaten investments	2	2	<b>4</b>	Appropriate siting and climate-proofing aquaculture investments.

Source: Macfadyen, G., Vilela López, B., Thiao, D., Ward, A., 2023. *The mangrove oyster value chain in the Gambia: Analysis and design report*. Rome, FAO. Note: overall risk calculated by multiplying risk likelihood and risk impact. The views of the consultants and scores are subjective. Overall risk = likelihood x impact





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This report presents the results of the value chain analysis of the mangrove oyster value chain in the Gambia 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.

FISH4ACP is implemented by FAO with funding from the European Union (EU) and the German Federal Ministry for Economic Cooperation and Development (BMZ).



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**Contact:**  
Fisheries and Aquaculture –  
Natural Resources and Sustainable  
Production  
**FISH4ACP@fao.org**  
Food and Agriculture Organization  
of the United Nations