



Food and Agriculture
Organization of the
United Nations

FISH4ACP

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

ANALYSIS AND DESIGN REPORT

The Coastal Pelagics Value Chain in Sao Tome and Principe

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Abbreviations and acronyms

ACP	Africa, the Caribbean and the Pacific
AFRACA	African Rural and Agricultural Credit Association
BGFI	Banque Gabonaise et Française Internationale
BISTP	International Bank of São Tomé and Príncipe
BMZ	Federal Ministry for Economic Cooperation and Development (of Germany)
CO ₂	carbon dioxide
COMPRAN	Commercialization, Agricultural Productivity and Nutrition Project
CPUE	catch per unit effort
EEZ	exclusive economic zone
ETP	endangered, threatened or protected
EUR	euro
FA	Fishery Administration
FAO	Food and Agriculture Organization of the United Nations
FGD	focus group discussion
FTE	full-time equivalent
GDP	gross domestic product
GEF	Global Environment Facility
GPS	global positioning system
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated fishing
Kg	kilogram
KII	key informant interview
MCS	monitoring, control and surveillance
MoV	means of verification
MSME	micro, small and medium-sized enterprise
MSP	multistakeholder partnership
nei	not elsewhere included
NGO	non-governmental organization
OACPS	Organisation of African, Caribbean and Pacific States
PAPAFPA	Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme
PNASE	National School Feeding and Health Programme (PNASE, in Portuguese)
PRIASA	Infrastructure Rehabilitation for Food Security Support Project
PROFOPESCAS	Project to Strengthen Civil Society for the Socio-Economic Development of the Fisheries Sector
REINA	Business Incubators and Accelerators Network of Sao Tome and Principe (REINA, in Portuguese)
SDG	Sustainable Development Goal

SFPA	Sustainable Fisheries Partnership Agreement
SME	small and medium enterprise
STN	Sao Tomean dobra
STP	Sao Tome and Principe
SWOT	strengths, weaknesses, opportunities and threats
TBD	to be determined
TCP	Technical Cooperation Programme
UNDP	United Nations Development Programme
USD	United States dollar
VA	value added
VC	value chain
VMS	vessel monitoring system

Exchange rate

USD 1: STN 23.29 (December 2022)

1 Introduction¹

1.1 Background and objectives

This report was developed under the FISH4ACP programme, an initiative of the Organisation of African, Caribbean and Pacific States (OACPS) to support sustainable fisheries and aquaculture development. FISH4ACP is a value chain development programme 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). Adopting a holistic approach to sustainability, FISH4ACP seeks to promote investments into fisheries and aquaculture value chains with the goals of stimulating inclusive growth, reducing poverty, and improving food and nutrition security while at the same time ensuring the sustainability of marine and aquatic resources.

FISH4ACP aims to achieve the sustainable development of aquatic product value chains (VCs) through five outcomes:

- (i) improved stakeholder understanding of the value chain and participative development of a value chain upgrading strategy;
- (ii) increased micro, small and medium-sized enterprises (MSMEs) economic performance;
- (iii) improved inclusiveness and social sustainability throughout the value chain;
- (iv) enhanced management of natural resources and consideration for climate change; and
- (v) facilitated MSMEs access to finance and investment.

FISH4ACP is a five-year programme (2020–2024) implemented in 12 countries in Africa, the Caribbean and the Pacific (ACP). Twelve value chains (one per country) were competitively selected from over 75 proposals for programme implementation². The first year of the programme is devoted to conducting value chain assessments and developing value chain upgrading strategies, the latter intended to be implemented in years 2–5 of the programme. This report was developed in this context and presents an outcome of the work conducted in the first year of the FISH4ACP programme in Sao Tome and Principe.

¹ A shorter summary version of this report is published separately, thus an executive summary is not provided.

² The 12 value chains (VCs) are the mahi-mahi VC in the Dominican Republic; the Atlantic seabob VC in Guyana; the oyster VC in Senegal; the farmed tilapia VC in Côte d'Ivoire; the farmed catfish VC in Nigeria; the Lake Tanganyika sardine, sprat and lates VC in the United Republic of Tanzania; the farmed tilapia VC in Zimbabwe; the shrimp VC in Cameroon; the pelagics VC in Sao Tome and Principe; the oyster VC in the Gambia; small pelagics in Zambia; and the purse seine tuna VC in the Marshall Islands.

1.2 FISH4ACP in Sao Tome and Principe

In the country proposal on the development of the coastal pelagics value chain that was submitted by the Directorate of Fisheries of the Ministry of Agriculture, Rural Development and Fisheries, a clear focus was placed on the need to tap into the country's resource richness and improve post-harvest handling, packaging and storage to reduce food loss and waste and increase the supply of high-quality products in the domestic market. These combined efforts are expected to bring about increased employment opportunities and food security for Sao Tome and Principe thanks to value addition and government revenues. At the same time, the country proposal indicates the need to improve safety at sea for fishers, strengthen entrepreneurship and promote the provision of improved inputs and services, as well as design upgraded business models and facilitate financial access implement upgrading interventions. Accordingly, this value chain assessment report was developed in response to such need.

In Sao Tome and Principe, the FISH4ACP programme targets the coastal pelagic fisheries VC, namely the following species: flying fishes (*Exocoetidae* sp.), little tunny (*Euthynnus alletteratus*), frigate tuna (*Auxis thazard*), bigeye scad (*Selar crumenophthalmus*), decapterus nei, blue runner (*Caranx crysos*), balao halfbeak (*Hemiramphus balao*) and skipjack tuna (*Katsuwonus pelamis*) (Figure 1). In Sao Tome and Principe, two tuna-like species – little tunny and frigate tuna – are normally identified as a single species and locally called “fulu fulu” tuna. This name is used in the report to refer to both species.

FIGURE 1. FLYING FISH (LEFT), BALAO HALFBEAK (MIDDLE) AND MIXTURE OF COASTAL PELAGICS (RIGHT) IN SAO TOME AND PRINCIPE LANDING SITES AND MARKETS

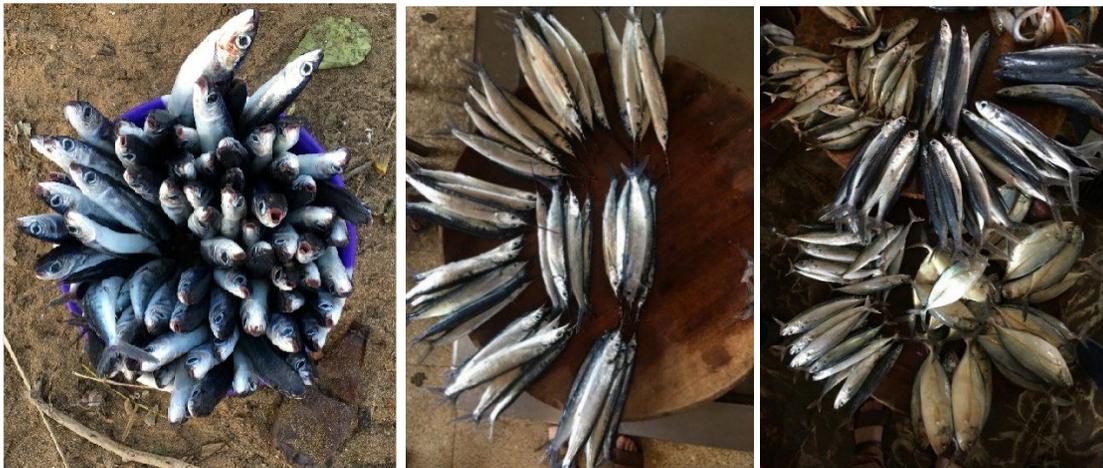


Photo credit: ©Bernal Vilela López

1.3 Methodology

In the context of the FISH4ACP programme, FAO has joined forces with the European Commission, the Organisation of African, Caribbean and Pacific States (OACPS), and Agrinatura to develop a VC analysis and development approach based on FAO's Sustainable Food Value Chain and Agrinatura's Value Chain Analysis for Development (VCA4D) methodologies (Agrinatura, 2017; FAO, 2014). The FISH4ACP methodology, applicable across all countries included in the project, has four main components: functional analysis, sustainability assessment, upgrading strategy development and implementation planning (actions and investments). The approach is highly participatory, from the outset involving value chain stakeholders from the public and private sector to ensure national ownership of all four components, thereby increasing the likelihood of success of project interventions.

The functional analysis looks at the current structure of the VC, dynamics that reveal how and why this structure is changing, and the capacities and incentives that drive behaviours of VC actors. It starts by identifying end-market opportunities, as the economic performance of the VC is ultimately determined by its ability to capture value in an end market. Based on the in-depth analysis of a wide range of primary and secondary data, the functional analysis presents a detailed VC map and systematically analyses the nature of the various VC elements across four layers, namely: (i) actors in the core VC; (ii) input and service providers; (iii) the societal environment; and (iv) the natural environment. This analysis includes the constraints and opportunities associated with the various VC elements and their linkages. The analysis is explicitly based on understanding the behaviour of VC actors and governance mechanisms that create incentives or disincentives for the observed behaviour. Through this in-depth and systemic approach, the functional analysis helps to identify the binding constraints in the VC and their root causes, as well as the leverage points for maximum impact that will critically inform the development of an upgrading strategy that will bring about the desired economic, social and environmental impacts.

The sustainability assessment, then uses a range of quantitative and qualitative indicators to measure the performance of the value chain in terms of its economic, social and environmental dimensions. This assessment includes six economic sustainability domains (i.e. profitability, employment, value added, effects on the national economy, international competitiveness, and value for end consumers); six social sustainability domains (i.e. inclusiveness, gender equality, food and nutrition security, decent employment, social and cultural capital, and institutional strength); and seven environmental sustainability domains (i.e. climate impact, water footprint, fish stock sustainability, biodiversity and ecosystems, animal health and welfare, toxicity and pollution, and food loss and waste). The sustainability assessment identifies sustainability hotspots, which help to determine which opportunities should be pursued for upgrading, alongside government priorities and private sector

ambitions. The assessment also includes the value chain's resilience to shocks, such as those caused by the COVID-19 pandemic.

The upgrading strategy development, the next step in the approach, starts with the development of a common vision based on the findings from the functional analysis and sustainability assessment. With facilitation by the project, VC stakeholders themselves develop this common vision, along with an associated set of targets to achieve for the VC over a given time period. This vision and these targets are then used to devise an upgrading strategy, which aims to address the binding constraints, sustainability hotspots and their root causes and builds on the strengths and opportunities in the VC, as identified in the functional analysis and sustainability assessment. Various upgrading options are proposed in three categories: upgraded business models (elements); upgraded governance (linkages); and upgraded enabling environment (organizations, infrastructure, institutions, sociocultural elements). These upgrading options are either derived from global best practices adapted to the situation at hand, or represent unique solutions prepared by experts in the particular upgrading area. The validity of these solutions typically needs to be assessed during the early stages of the action plan implementation. A holistic approach to sustainability is included throughout this vision and strategy development process in order not to overlook any potential adverse impacts of the proposed upgrading interventions and to assure maximum resilience to systemic shocks (such as those caused by COVID-19).

The implementation planning, as the final step in this process, translates the upgrading strategy into action and investment plans to be implemented during years 2–5 of the FISH4ACP programme. The plans detail a sequence of activities that need to be conducted and investments that need to be made to implement the identified upgrading strategy. To ensure the sustainability of FISH4ACP's interventions, both the development of the plans (as part of this report development) and their implementation require the application of a facilitation approach, which facilitates local stakeholders' active participation and encourages stakeholders to take on their roles and develop a sense of ownership of the development of the value chain.

In Sao Tome and Principe, the conduct of the value chain analysis effectively followed the FISH4ACP methodology, with some modifications to the standardized questionnaire templates, to fit the specific contexts of the VC and local situations. Secondary research (desk research) was first undertaken, followed by intensive primary data collection efforts conducted on both islands. A wide range of primary data collection tools were used, including actor interviews, which focused on issues related to the functional, sustainability (economic, social and environmental) and resilience analysis of the VC; key informant interviews (e.g. with input/service providers, ministry officials, experts, groups and associations); focus group discussions; group discussions with experts; and surveys with VC actors and consumers. Primary data collection was undertaken by the programme's national partner – a consortium of three local non-governmental organizations, namely, Oikos–

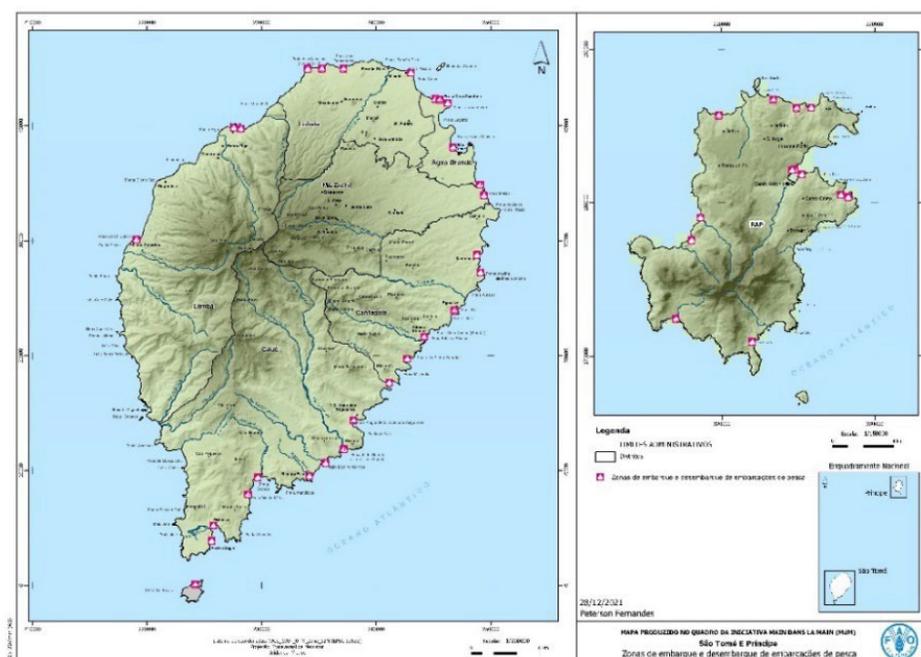
Cooperação e Desenvolvimento, Fundação Príncipe and Programa Tatô – in close consultation and coordination with FAO (i.e. value chain analysis team and Project Management Unit). A national professional officer, based in Sao Tome and Principe, supported the work throughout the analysis and design phase.

1.4 Brief history and overview of the value chain

The fisheries sector is one of the growth drivers in Sao Tome and Principe, exploiting coastal and highly migratory resources. The catches are mainly artisanal (see Figure 2), with a minor part coming from a small fleet of semi-industrial- vessels. Domestic catches fluctuated between 11 700 tonnes and 9 730 tonnes between 2015 and 2018 (FAO, 2020a), with most fish, including the present time, supplying the domestic market and little being exported. Over the past few years, the artisanal fleet has improved, trying to shift from subsistence to a more commercial approach, which has led to increased landings. However, the sector remains characterized by basic production and marketing capacities.

The artisanal fishing sector is, after cocoa, the most important income source for low-income families. It provides principal or supplementary employment to about 30 000 people, including fishers and traders (mostly women). Fish plays a key role in the country's food security, with fish representing more than 50 percent of the protein consumption of Sao Tome and Principe's population ((Serkovic & Million, 2019); the average consumption is 29.3 kg per year (FAO, 2019).

FIGURE 2. SAO TOME AND PRINCIPE MAP WITH ARTISANAL FISHING LANDING SITES



Source: FAO, 2021a.

Over the period 1950–2019, the number of artisanal fishers in Sao Tome and Principe increased significantly, from 1 200 to 4 100, approximately. This growth is linked to total population growth, which tripled between 1950 and 2010 (Belhabib, 2015). During this period, the catch also increased from around 4 500 tonnes in 1950 to 14 500 tonnes in 2010 (Belhabib, 2015), mainly as a result of technological improvements, such as better quality nets, lines and hooks, and use of fish aggregation devices and motorized boats, coupled with increasing demand from a growing population and an increase in fishers (Maia *et al.*, 2018).

In recent years, several initiatives, mostly promoted by international donors and agencies, have supported the artisanal fishing sector, targeting what is considered the poorest sector of Santomean society: fishers and, particularly, women fish traders. Despite these efforts, the situation of the sector has improved only slightly.

Besides artisanal and semi-industrial fishing, and under the Sustainable Fisheries Partnership Agreement (SFPA) between the European Commission and Sao Tome and Principe, commercial fishing on an industrial scale is conducted in Sao Tome and Principe waters exclusively by foreign fleets that target large pelagic species and land their catches elsewhere.

2 Functional analysis

This section describes the structure of the coastal pelagics value chain in Sao Tome and Principe. Four analytical steps were completed, each of which is presented in a specific subsection:

- VC mapping to provide a general picture of the value chain from production to consumption, indicating the functions, the actors, the linkages between them and the main channels (Section 2.1).
- End-market analysis to consider current and potential end-market opportunities (Section 2.2).
- Analyzing the elements of the VC, in terms of the actors in the core VC, the input suppliers and service providers in the extended VC, the societal enabling environment, and the natural environment (Section 2.3).
- Analyzing the governance and linkages in the system to consider how well the VC functions as a whole (Section 2.4).

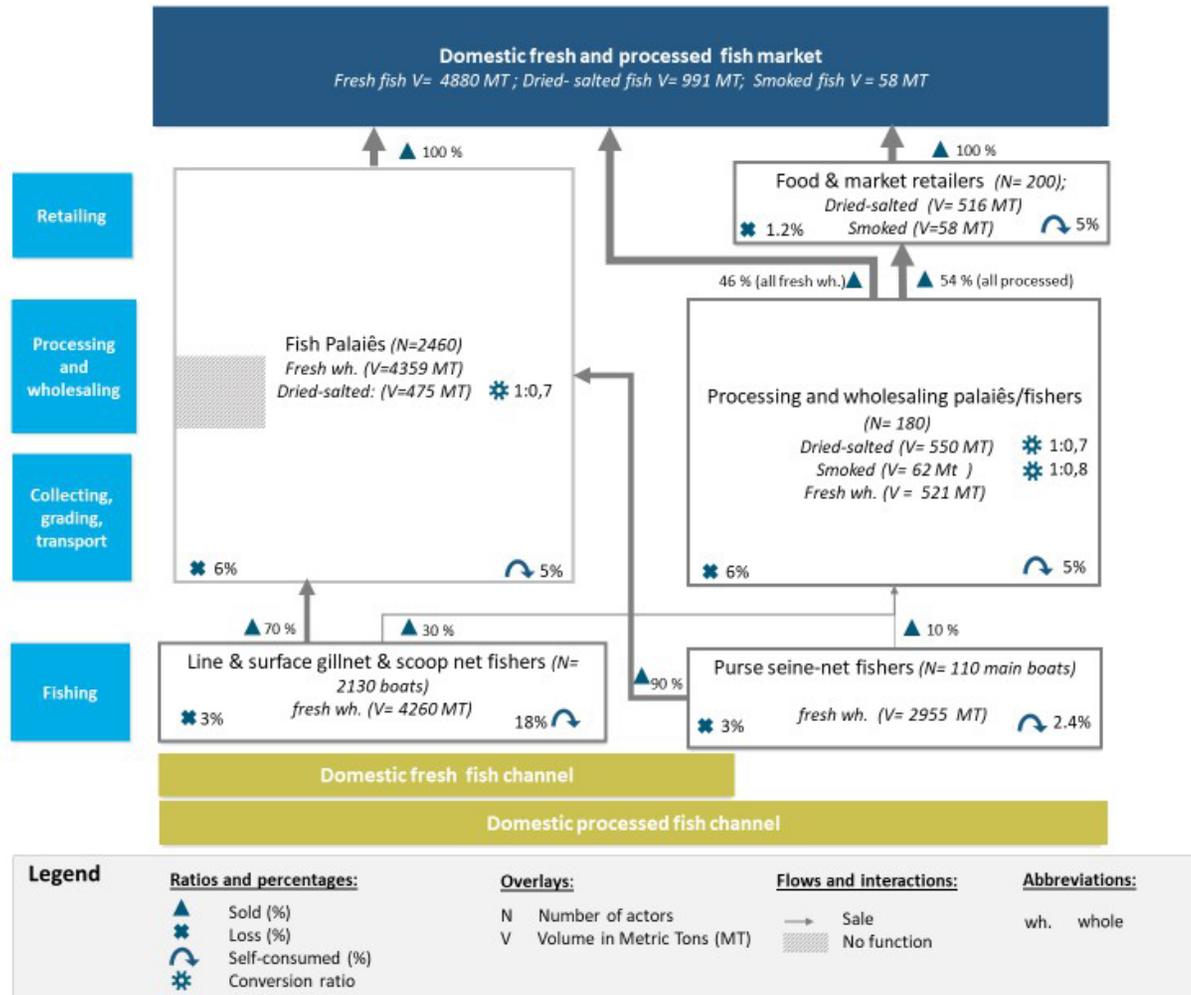
2.1 Value Chain mapping

VC mapping (Figure 3) shows the flow of products from production to consumption, indicating actors, functions, linkages and main channels. The number of boats is assumed to be the same as in the Artisanal Fisheries Frame Survey of 2019 (Direção das Pescas, 2019). Catch per unit effort was then estimated based on data collected under a project run by Flora

& Fauna International³ during 2019 and 2020 in nine landing sites of southern Sao Tome and all fishing communities in Principe and shared with FAO. For boats fishing with hook and line, surface gillnets and scoop nets, daily captures were around 10 kg, and for boats fishing with purse seines around 150 kg. Based on interviews with fishers, it was assumed that the group using purse seines fish around 185 days per year, while the other group fish 240 days per year. Artisanal fleet coastal pelagic FISH4ACP targeted species total landings are estimated at around 8 480 tonnes. It is important to note that these estimations were calculated using a different data source and methodological approach than the ones calculated by the Directorate of Fisheries, which estimated total fish landings of the same eight species of coastal pelagics to be around 2 600 tonnes for 2020.

³ Previously unpublished data were gathered by Guillermo Porriños under the auspices of the Eurasia Programme of Fauna & Flora International (FFI), working with Fundação Principe, Oikos and MARAPA with funding from FFI, the Blue Action Fund and Arcadia, a charitable fund of Lisbet Rausing and Peter Baldwin.

FIGURE 3. SAO TOME AND PRINCIPE ARTISANAL FLEET COASTAL PELAGICS VALUE CHAIN (2022)



Adapted from Ardjoediro and Neven. 2008. *The Kenya Capture Fisheries Value Chain: An AMAP-FSKG Value Chain Finance Case Study*

Note: Volumes included in the boxes refer to fish volume after self-consumption, loss and processing.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

There are two market channels in the VC for Sao Tome and Principe coastal pelagics, which exclusively supply the domestic market. The largest channel is for fresh fish, which accounts for around 82 percent of the total fish supplying urban and rural markets in both islands. The second channel is for processed fish and accounts for the remaining 18 percent of the total fish traded, with most of the processed fish (17 percent) salt dried and a smaller part (1 percent) smoked. Fish processors generally act as wholesalers and sell their product to food and market retailers or, to a lesser extent, to local restaurants. Very little of the local fleet's catches, around 8.3 tonnes and 9.1 tonnes in 2015 and 2016, is exported (INE, 2017).

Although most of the fish is caught by artisanal fishers, a small proportion (around 3 percent of the total catch and mainly demersal fish) is captured by an obsolete fleet of semi-industrial boats, which are not always in operating condition and thus are not considered in this analysis. Typically, fishers are men, while women act as local fish traders and are responsible for collecting, transporting, transforming and selling fish. Women fish traders are also known as "palaiês", the local word for food (or other products) traders.

According to primary data collected for this analysis (Annex 1), more than 60 percent of consumers normally buy coastal pelagics in any of their three market presentations (fresh, salted, smoked), with 20 percent showing preference for fresh coastal pelagics and 18 percent for fresh and salted fish. Coastal pelagics are consumed by all members of the household (see Section 3.2.3).

Artisanal fishers

On both Sao Tome and Principe islands, around 4 100 artisanal fishers were involved in coastal pelagic fisheries, using around 2 240 crafts and capturing an estimated amount of 8 480 tonnes of coastal pelagic fish (value chain analysis, calculations) in 2020. Artisanal fishers can be divided into two actor types: (i) the artisanal line, surface gillnet and scoop net fishers who use small, wooden dugout or outrigger canoes (around 2 130 vessels); and (ii) the artisanal purse seine fishers from the northern part of Sao Tome island, particularly located at Praia Gamboa, who use larger motorized vessels that are often constructed of fibreglass (around 110 vessels) and fish in the southern part of the island where fish stocks are more abundant.

According to primary data collected as part of this study, the average catch by boat per year amounts to 2.5 tonnes of targeted coastal pelagics for canoes using hook and line, surface gillnets and scoop nets and around 28 tonnes for boats using purse seines. Hook and line, gillnet and scoop net fishers use approximately 18 percent of the catch for home consumption, while purse seine fishers only use 2.4 percent (Porriños *et al.*, 2021); losses are estimated at 3 percent for both fisher groups.

Fish palaiês (women fish traders)

Current estimations indicate that there are around 2 460 women fish traders, called palaiês, who buy fish from fishers at landing sites. They transport fish using public transportation and sell to processors and wholesalers or, in most cases, choose to retail the product themselves. When fresh fish goes unsold, the palaiês either conserve it overnight in cold storage to sell the following day or preserve the fish by salt drying it. An average fish palaiê sells around 1.8 tonnes of fresh coastal pelagics and 193 kg of dried coastal pelagics per year. Home consumption accounts for around 5 percent of the product and losses comprise, on average, 6 percent.

Processing and wholesaling by palaiês and fishers

An estimated number of 180 palaiê processors act as wholesalers, including fishers from Principe who also engage in this activity. Drying is most often done using salt and exposing the fish to sunlight on a drying rack, directly on the ground on a mat of palm leaves or on a rocky surface. The average processing ratio is 10 kg fresh coastal pelagics to 7 kg salt-dried coastal pelagics. Fish can also be smoked (10 kg of fresh coastal pelagics to 8 kg of smoked pelagics), but this method is used for minor quantities of fish (62 tonnes in total for the whole country) seasonally and often on request. In Principe, smoked fish is only used for self-consumption, while in Sao Tome it is traded in small quantities (value chain analysis calculations; KII, 2021; Porriños, 2020a).

An average processor/wholesaler sells around 3 tonnes of dried coastal pelagics and around 345 kg of smoked coastal pelagics per year. They also sell around 2.9 tonnes of fresh fish. Approximately 6 percent of products are lost, and 5 percent is home consumed. The equipment and processing techniques are often inappropriate, negatively affecting product quality and leading to post-harvest loss. These palaiês will mainly sell their processed fish to market retailers at Bobo Forro and other markets, or to food retailers or local restaurants.

Food and market retailers

In addition to 2 460 fish palaiês who also retail, there are approximately 200 additional retailers in Sao Tome and Principe that retail dried and smoked fish in markets or as food vendors; in addition, a number of restaurants also serve fish. The retail sector sells a total of 516 tonnes of salted coastal pelagics (2.6 tonnes per retailer/food vendor) and 58 tonnes of smoked coastal pelagics. Approximately, an estimated 5 percent is home consumed, and around 1 percent is lost.

The coastal pelagics VC is composed almost exclusively of a substantial number of small-scale actors, typically of an artisanal-based sector. Fishing and processing technologies are basic. There is an overall lack of conditions for a functional cold chain, which affects conservation and quality of products. The actors are weakly coordinated among themselves;

for instance, instead of collaborating with each other to reduce costs, each trader transports fish on their own using public transportation. These determinants negatively affect sector efficiency and profitability.

2.2 End-market analysis

Domestic fish consumption

The entire catch landed in Sao Tome and Principe is absorbed by the domestic market, responding to a strong increase in demand for fish resulting from the demographic growth of the country (Le Douguet, 2018), whose population almost tripled in size over the past few decades, growing from approximately 60 000 (1960) to 210 000 inhabitants in 2018 (World Bank, 2020a).

Average fish consumption per capita in Sao Tome and Principe is around 29 kg per year, which is clearly above the sub-Saharan African average, which in 2018 was 8.9 kg according to FAO (FAO, 2020b). Furthermore, fish is the most important source of animal protein with fish protein contributing to more than 50 percent of total animal protein consumption (Le Douguet, 2018; Sy and Soares Diogo, 2019).

The main market outlets for fish products are rural and urban markets, where fishmongers sell a large share of the catch as fresh product, particularly in the capital, where about 70 percent of the fish is sold (Serkovic and Million, 2019; Sy and Soares Diogo, 2019). The VC is characterized by the lack of basic hygiene and poor sanitary standards, which not only pose a risk for consumer health but also do not match standards for the hotel market and other high-value markets (Sy and Soares Diogo, 2019).

Domestic consumption of FISH4ACP coastal pelagics targeted species

Based on this value chain analysis and considering that whatever is not lost is self-consumed or sold for consumption, the current total domestic consumption of the eight⁴ coastal pelagic species targeted by the FISH4ACP programme is estimated to be around 4 880 tonnes for fresh coastal pelagics, 991 tonnes for dried salted pelagics and 58 tonnes for smoked pelagics. In Sao Tome and Principe, consumers like to eat small fish because they are inexpensive (Le Douguet, 2018). (Douguet, 2018).

⁴ Data for fulu fulu tuna (little tunny, *Euthynnus alletteratus*, and frigate tuna, *Auxis thazard*) are presented together since they are identified as a single species at the local level. Reported catches for skipjack tuna (*Katsuwonus pelamis*) only represent 0.2 percent of the total.

The largest share of the product is sold as fresh fish. Fish is processed and sold mostly as salt dried, though in small proportions it is smoked, to avoid spoilage if fresh fish is not sold on time or, mainly in Principe, to trade with Sao Tome for salt-dried fish. According to the consumer survey⁵ conducted as part of this study, one-fifth of consumers consume fresh coastal pelagics, while more than 60 percent consume them in any of the three main forms available in the country: fresh, salted and smoked.

Almost 60 percent of consumers indicated coastal pelagics as the most popular commodity and the most significant one for nutritional security, followed by demersal fish, large pelagics, pork meat and chicken legs, showing how relevant fishery resources are in Sao Tome and Principe, particularly coastal pelagics. This popularity may be due to their availability and their relative low price compared with other large pelagics and pork or chicken meat (Table 1). Coastal pelagics are consumed across the country, which is unsurprising given the relatively small size of the islands and the importance that fishery resources have for the entire nation.

According to consumer surveys carried out as part of this study, all interviewed households consume coastal pelagics. Three-fourths of the consumers buy this commodity at least twice a week, of which more than 42 percent buy it more than four times a week. In Principe, this percentage rises to 60 percent. Approximately, 70 percent of the consumed coastal pelagics are prepared and eaten at home or outside the home (e.g. at food vendors or restaurants), while around 25 percent of the consumers exclusively eat the pelagics at home. In Principe, the latter percentage rises to 60 percent. With regard to the quantity of fish wasted, almost 85 percent of the respondents do not waste any of the fish bought.

The cost of the product changes depending on the species and how they are sold (individually, grouped or by weight). Flying fish and balao halfbeak can be sold individually or, in most cases, in groups of three to seven fish, while other species are sold by kilogram. Table 1 presents the prices to final consumers of the project-targeted coastal pelagics.

⁵ There were 209 consumers included in the survey.

TABLE 1. LOCAL RETAIL ESTIMATED PRICES IN STN FOR KG OF FISH AND MEAT COMMODITIES

	Lean season	High season	Regular price
Flying fish	40	20	3/unit or 30/kg
Balao halfbeak	50	30	10/unit or 40/kg
Bigeye scad	70	50	65
Blue runner	80	60	70
Mackerel scad	60	40	50
Fulu fulu tuna	70	50	60
Skipjack tuna	75	55	65
Pork (retailer)			130
Chicken			65–70

Note: STN = Sao Tomean dobra.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

According to interviews with VC actors and consumer surveys on domestic markets, there is no uniformity in market/buyer requirements and there are hardly any specific quality standards that domestic buyers require; instead general norms are maintained with regard to product freshness. Unstable energy supply and lack of ice are the two main barriers mentioned by VC actors to the preservation of fish in accordance with appropriate hygiene and quality standards. However, consumers at rural and urban markets usually do not pay extra for high quality of products (Sy and Soares Diogo, 2019).

Tourism sector and coastal pelagics

The General Directorate of Tourism and Hospitality (DGTH, in Portuguese) in Sao Tome and Principe reported that between 2010 and 2016, the number of tourists visiting the country increased from 8 000 to 29 000 per year, an increase of 263 percent. The economic contribution of the tourism industry for 2016 represented 14 percent of the national GDP (Direção Geral do Turismo e Hotelaria, 2018). In 2017, the economic contribution of tourism to GDP stood at 24.3 percent, and the contribution to employment, as well as jobs indirectly supported by the industry, was 23.6 percent of total employment (14 500 jobs). In this context, there is consensus that tourism in Sao Tome and Principe constitutes a priority sector for the development of the country. There are no official figures on how the COVID-19 pandemic has affected this sector but, since international travel has almost returned to its pre-COVID levels in the first quarter of 2022, it is expected that the tourism sector will continue to strengthen and resume its significant contribution to the country's GDP.

The growth of the tourism sector also impacts the increase of internal demand (Le Douguet, 2018). Currently, the hotel sector only absorbs 2 percent of the national catch. However, as a result of the growing tourism sector, this market niche is growing in importance as well. As opposed to urban and rural market outlets, the hotel market demands a product of high and consistent quality and a regular product supply. In return, purchase prices offered by hotels are high and therefore present an interesting income opportunity for fishers and palaiês. However, apart from minor quantities of blue runner and skipjack tuna, normally, coastal pelagics are not yet utilized by the hospitality sector, which prefers to offer demersal or large pelagic fish to customers. According to data gathered, clients of the hospitality sector do not normally appreciate coastal pelagic species because they have more bones and are more difficult to eat. Additionally, hotel chefs mentioned during interviews that coastal pelagic species are also more difficult to prepare than other fish. On top of that, these fishes, because of their smaller size, lose freshness and quality easily if proper conservation measures are not used.

In any event, the tourist sector represents a growing market segment and can be an important opportunity for the fishery VC by triggering increased value added in the fisheries sector and providing new income opportunities. Fresh fish products that comply with adequate hygiene and food safety standards of hotels could command higher prices, contributing to an improvement in the VC infrastructure.

International market

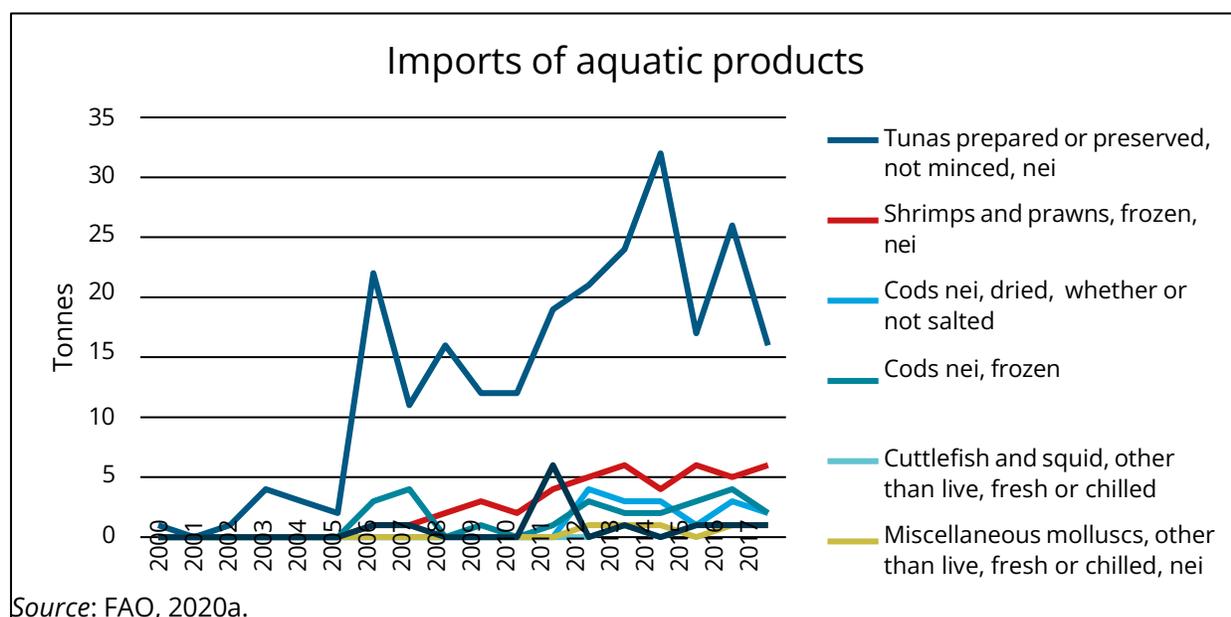
Sao Tome and Principe, like other small island developing states, presents key characteristics, such as small territorial size with implications for pressure on limited (fishing) resources, narrow economic basis; and remoteness and isolation with large distances to major markets entailing a weak trade connectivity, leading to challenges for trading local goods, including its fishery products, beyond its borders.

Furthermore, Sao Tome and Principe currently does not have a deep-water harbour in its main port. This prevents foreign fishing fleets from landing their catches, or being serviced or monitored, which prevents the country from benefiting more from commercial fisheries (World Bank, 2019). In addition, the small and shallow port of Sao Tome does not allow larger ships to directly load and unload cargo, contributing to increased costs of traded goods, which represents a competitive disadvantage compared with the ports of other countries (Global Security, 2022) (see also Section 2.3.3.3).

The absence of adequate infrastructure, coupled with a general lack of capacity to comply with food safety standards along the value chain, represents a major obstacle in reaching improved markets and adding value to its products (Serkovic and Million, 2019). A lack of infrastructure investments as well as targeted policies has kept its connections to regional and global markets at a low level (Global Security, 2022; World Bank, 2019).

The country imports aquatic products in small quantities; in 2017, imported quantities equalled 29 tonnes. Even though the quantities are small, a considerable increase in imports can be observed in Figure 4. The product imported in largest quantities is canned tuna (16 tonnes in 2017), followed by frozen shrimps (6 tonnes in 2017). However, it can be concluded that imported products occupy a very small market niche on the national market for aquatic products in comparison with the amount of fish caught and consumed locally.

FIGURE 4. IMPORTS OF AQUATIC PRODUCTS BETWEEN 2000 AND 2017



2.3 Analysing the elements of the value chain

The elements of the VC are analysed at four layers: (i) the actors in the core VC; (ii) the input suppliers and service providers in the extended VC; (iii) the societal enabling environment; and (iv) the natural environment. The latter two layers look at how the environment influences the VC.

Actors in the core value chain

The core actors in the value chain are those shown in the VC map in Figure 3. Five VC actor types have been identified – artisanal fishers with two different types of actors and traders with three different types of actors: (i) hook and line, surface gillnets and scoop net fishers and (ii) purse seine fishers; (iii) fish palaiês; (iv) processing and wholesaling palaiês; and (v) food and market retailers.

The semi-industrial fleet, whose vessels have been declining in number throughout the years, is not considered as a key actor of this value chain since the fleet only catches around 2 percent of the country's coastal pelagics. There is also a foreign industrial fleet operating in Sao Tome and Principe waters (see Section 2.3.3.1). This fleet targets mainly tuna or tuna-like species and does not unload its catch in the country. Neither fleet is considered in the scope of this analysis.

Artisanal fishers

The general fisheries regulation (Asssembleia Nacional, 2021) defines artisanal fishing as the type of fishing intended to sell fish, carried out with a vessel measuring up to 10 metres with manual or mechanical propulsion and operating within 12 nautical miles of the coast. Artisanal fishing is practised all along the coastal area of Sao Tome and Principe with 43 landing sites currently in use (Direção das Pescas, 2019).

The 2019 artisanal fisheries survey counted 4 155 fishers and 2 237 boats in the country, with more than 91 percent of the vessels based in Sao Tome communities and the remaining in Principe (Direção das Pescas, 2019). Based upon study data, all fishers are male with an average age of 41 years. Over 76 percent of fishers have 10 or more years of fishing experience, and nearly 40 percent own a boat. Moreover, 77 percent do not belong to any association or organization, and although 44 percent have received specific training to conduct their activities, 95 percent expressed a need to have additional fishing-related training. None of the fishers use mobile banking services, and only 11 percent have bank accounts.

In Sao Tome and Principe, artisanal fishing vessels are of three main types (Direção das Pescas, 2019): dugout canoes, outrigger canoes and fibreglass boats (Figure 5). There are 2 023 dugout canoes, made from a single tree trunk, 20 percent of which are engine propelled. There are 129 outrigger canoes, locally known as “praos”, that are made from fibreglass or laminated wood panels and can contain engines of up to 15 CV. Finally, there are 85 fibreglass boats built in Sao Tome with a standard design (10 m long × 1.5 m wide), which can be equipped with larger and more powerful engines (Porriños *et al.*, 2021). Because more than 90 percent of the artisanal fishing vessels are dugout canoes, which are more fragile and unsafe than the other two types of vessels, many fishers are trying to shift to the safer prao canoes (World Bank, 2019; Serkovic and Million, 2019). Most of the artisanal fishing effort is concentrated in a narrow coastal strip, on the shallower waters of Sao Tome and Principe's insular platforms, as fishers lack the means to venture further out to sea, even though due to scarce fishery resources they tend to go further away from the coastline to fish (KII, 2021; Belhabib, 2015; Omali Vida Nón, 2019; Santos, da Conceição and Bolingo, 2017).

FIGURE 5. MAIN VESSELS USED FOR COASTAL PELAGICS (LEFT: DUGOUT CANOE; MIDDLE: PRAO CANOE (OUTRIGGER CANOE); RIGHT: FIBREGLASS BOAT)

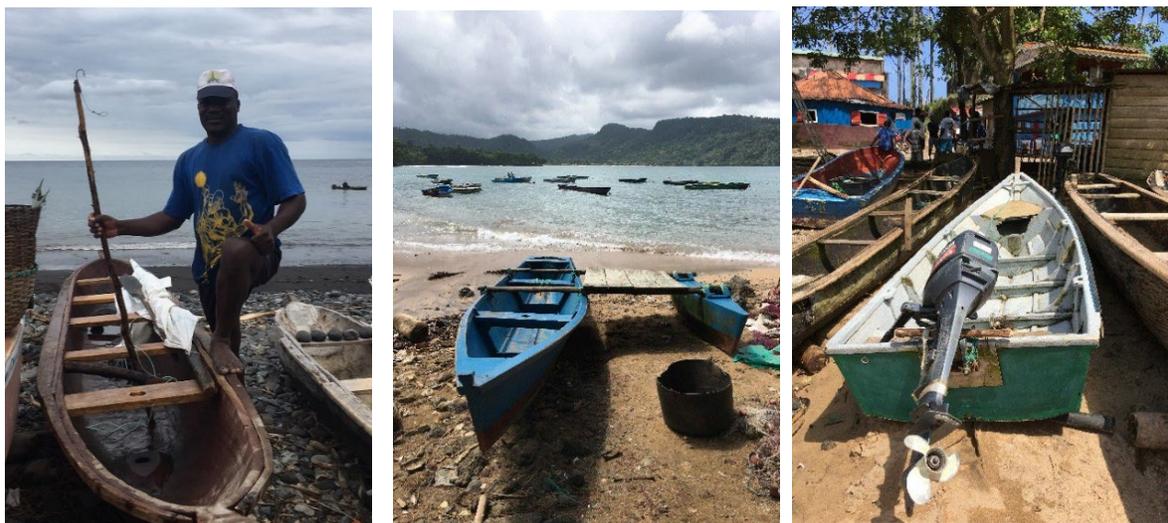


Photo credit: ©Bernal Vilela López

On Sao Tome and Principe, the fishing gear most commonly used to capture coastal pelagics are: (i) drifting surface gillnets (locally called *rede voador*); (ii) scoop nets (called *voador panhã*); (iii) different types of hook and line; and (iv) purse seine and seine gillnets (called *rede brisa*). The use of different gear in the country defines two actor types for artisanal fishers participating in the coastal pelagics value chain:

- **Purse seine and seine gillnet fishers** (110 vessels, 100 in Sao Tome). Purse seine fishing is practised on both islands, while gillnets are only used in Sao Tome. In Principe, between four and six fishers participate in the fishing operation, while in Sao Tome there can be 12 fishers or more (Porriños *et al.*, 2021). In Sao Tome and Principe, the main species caught are fulu fulu tunas⁶ (43 percent), West African halfbeak (30 percent) and scads (4 percent) (Porriños, 2022, unpublished data³). The coastal pelagics' total catch with these seines is 3 120 tonnes with an average of 3.5 fishing trips per week.

The purse seine fishery uses divers to locate fish shoals, to maintain the position of nets, and to prevent fish from escaping from nets. While this fishing gear is intended to catch pelagic fish, it is also used in coastal areas to catch demersal species, whose stock is threatened by this inappropriate fishing practice (Le Douguet, 2018; Santos, da Conceição and Bolingo, 2017). In Sao Tome, these gear are mainly used by northern communities, especially in Gamboa, Loxinga and Praia Cruz, and also in the Angolares community, located in the southern part of the island.

⁶ little tunny (*Euthynnus alletteratus*) and frigate tuna (*Auxis thazard*).

- **Fishers using a combination of drifting surface gillnets, scoop nets, and hook and lines** (2 130 vessels, 95 percent in Sao Tome island) during the year:
 - **Drifting surface gillnets.** This is the most practised type of net fishing across both islands; the catch is almost exclusively flying fish. It is normally operated by two fishers. Its use decreases during the gravana (dry) season, which occurs between mid-May and August or September (see Section 2.3.4; climate), coinciding with the spawning season of flying fish, a species whose eggs can stick to the nets, damaging them (Santos, da Conceição and Bolingo, 2017).
 - **Scoop nets.** This gear is used in Sao Tome during the gravana (dry) season to capture flying fish. Fishers use a luring device to attract flying fish and then capture them with a scoop net (Santos, da Conceição and Bolingo, 2017).
 - **Different types of hooks and line.** These gear are used in the two islands by one or two fishers per boat. Around 35 percent of the catches belong to the project target species, with blue runner accounting for 20 percent, fulu fulu tunas for 7 percent and bigeye scad for 6 percent (Porriños, 2022, unpublished data).

Hook and line and gillnet fishing follow a similar seasonality in the two islands. Their effort reaches a minimum around December–January and a peak between February–March, decreasing steadily until June (coinciding with the worse weather conditions of the gravana season), and then increases again to reach a second peak in September in Principe and November in Sao Tome.

On the other hand, scoop nets are only used in Sao Tome during the gravana season to catch flying fish (Porriños *et al.*, 2021). During the year, on most days, fishers use a combination of hook and line (early morning trips) and surface gillnets (evening trips). This fleet catches, combining all fishing gear, 5 360 tonnes of coastal pelagics, with an average of 4.5 fishing trips per week.

The total catch of coastal pelagics by the artisanal fleet is around 8 480 tonnes (Table 2), representing approximately 97 percent of coastal pelagic landings in the country with the remaining 3 percent coming from the semi-industrial fleet.

TABLE 2. ARTISANAL FLEET TOTAL YEARLY AVERAGE CATCHES PER SPECIES (DATA FROM 2020 TO 2021)

Catches (tonnes/year)	Blue runner	Bigeye scad	Scads nei	Fulu fulu tunas	Balao halfbeak	Skipjack tuna	Flying fishes	Other fish	Total catch	Total catch coastal
Hook and line	1 587	460	46	554	0	17	18	5 011	7 693	2 682
Surface gillnet	23	16	0	1	0	0	1 608	50	1 698	1 648
Scoop net	0	0	0	24	0	3	1 000	396	1 423	1 026
Seine net	41	31	151	1 701	1 192	0	3	842	3 961	3 120
Total	1 651	507	198	2 279	1 192	20	2 630	6 300	14 776	8 476

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

The use of different fishing strategies is a source of conflict between southern and northern fishers in Sao Tome island. Because of the increase in the number of boats in the northern part and the consequent depletion of fishery resources, many fishers from the north fish in the island's southern fishing grounds on almost a daily basis (Le Douguet, 2018). The use of seine nets requires larger motorized boats, with a greater number of fishers and a larger water surface area to fish. Therefore, seine net use in the southern fishing grounds creates conflicts with fishers from southern communities, who believe that they are being driven away from their traditional fishing grounds (Le Douguet, 2018; Santos, da Conceição and Bolingo, 2017).

Furthermore, there have been reports of use of inappropriate fishing gear, such as nets with mesh sizes smaller than legally permitted (Santos, da Conceição and Bolingo, 2017), or an unreasonably high mesh density, which reportedly has negative impacts on fish resources (Bragança Gomes *et al.*, 2018).

Fishers in Sao Tome and Principe face different challenges when purchasing fishing nets or motors (because of their quality, cost and/or availability in the market), or fuel and good quality oil for boat engines (because of low purchasing power). They have verbal agreements with input and service providers. Typically, fishers finance their businesses with their own funds with few requesting loans, though a few ask family or boat owners. Most fishers have difficulty accessing credit either because they lack financial knowledge or due to the absence of credit providers. None have insurance (interviews with VC actors, 2021).

Porriños (2020a) discusses how benefits from fishing trips are split among persons directly or indirectly involved in fishing operations. Fishing lines and hooks generally belong to fishers, while nets (which are more expensive and have higher maintenance cost), as well as boats and engines, are owned by specific individuals and rented out. Fishers usually rent the engine, boat and net from the same owner to avoid conflicts over the distribution of profit. Normally, the owner also provides the fuel for the trip, whose cost is subtracted from the profits of the fishing trip and paid to the owner. The remaining amount is split between the boat owner and the fishers, with the boat owner keeping 70 percent of the profit (in the case of seine net vessels) or 50 percent (in the remaining cases), which can be paid in fish or in cash (after the fish has been sold). Prices change depending on fish availability. The fieldwork conducted for this study identified that, in Príncipe, fish is more expensive during the gravana season because of the wind and fewer catches. However, fish becomes more abundant and cheaper from August to December. This pattern is different in Sao Tome; according to Porriños (2020a), the prices of fresh fish drop during the gravana season when landings are higher, which might be due to flying fish catches using scoop nets. During the rainy season (September to December), the prices of fresh fish increase. The pattern of better weather and greater landings results in cheaper fish repeats from January to February but changes again during the rainy season from March to May.

Fishers from the southern part of Sao Tome island often complement their fishing activities with other economic activities, such as growing and selling vegetables, while northern fishers are normally full-time fishers (Le Douguet, 2018). Except for those on Príncipe island, the large majority of artisanal fishers do not carry out processing activities (personal communication, Directorate of Fisheries, 2021; Porriños, 2020a).

On-board handling and conservation of fish is poor because of vessel design (more than 90 percent of the artisanal fleet consists of dugout canoes), and fishers have little access to equipment and ice and also lack certain skills and knowledge. Almost none of the fishers surveyed in this study use ice on-board, few use cool boxes, and the majority do not use anything to conserve fish, instead simply protecting the fish from the sun with some type of cover. While most of the fishers wash their catches to improve their presentation and also separate them by species to facilitate sales, they usually do not weigh any of the fish. Catches are sold at landing sites, sometimes directly on the ground or over a plastic sheet, mostly to palaiês and consumers. Nearly all the fishers surveyed stated that the demand for fish has increased, and that it is easy or very easy to find buyers, with whom they only have verbal agreements.

Despite artisanal fishers lacking appropriate boats and equipment, their fishing efforts have led to a decline in coastal fishery resources (actor interviews, 2022; KII, 2022; Sy and Soares Diogo, 2019). The survey conducted in this study corroborates the report by many fishers that fish was more abundant five years ago. Fishers identified the use of gillnets with small

mesh size, fishing in the bays, and industrial fishing as the causes of this decline (Nuno, 2019). In fact, because of the scarcity of fishery resources, hook and line artisanal fishers are forced to go beyond the 12 nautical miles reserved to artisanal fishers by the general fisheries regulation, sometimes reaching as far as 45 nautical miles from the coastline to capture enough fish (KII; Bragança Gomes *et al.*, 2018).

The consultation with VC actors (survey, interviews, focus group discussions and key informant interviews) in 2021 identifies a series of issues fishers face:

- Lack of appropriate fisheries management and enforcement of regulations.
- Continuous decline of fish availability and catches, forcing fishers to look for fish in more distant waters with inadequate fishing boats, which increases safety at sea issues.
- Increases in operational costs and safety issues as fishers move to more distant waters to follow fish.
- Conflicts in fishing grounds between fishers using seine nets and those who use other gear.
- An artisanal fleet mainly composed of dugout canoes (more than 90 percent), with little or no room to preserve fish and limited navigation autonomy.
- Need to improve on-board handling and conservation of fish to maintain fish quality.
- Need to import from other African countries fishing gear, engines and material to build fibreglass boats.
- High cost and availability issues of fishing gear and materials, engines and petrol, particularly relevant in Principe island.
- Challenges to have proper maintenance of fishing gear.
- Principe fishers are highly dependent on Sao Tome for market information.
- Low performing fisher associations, with little activity, providing little to no support to members.
- Poorly maintained or non-existing infrastructure to support the sector, such as landing sites, cold storage, roads, energy supply and water availability.
- COVID-19 strongly impacted the tourism sector, reducing income alternatives for fishers.
- Difficulty to access bank (micro)credits and finance the purchase of equipment, materials or services.
- Need for training (i.e. navigation, safety at sea, and fish handling and conservation).
- Need to improve dialogue with government to better address the issues the sector faces.

Semi-industrial fishers

In January 2022, Sao Tome and Principe had 12 semi-industrial vessels, with nine of them operative and three under maintenance (direct observation, January 2022). This number

contrasts with 2014 statistics, when 32 semi-industrial fishing vessels existed in the country (Sy and Soares Diogo, 2019).

The semi-industrial fleet can be differentiated in two different categories:

- (i) **Smaller vessels:** 7-metre long vessels using 20–40 CV engines with no cabin (Figure 6), with capacity for eight fishers. These vessels normally fish in waters surrounding Principe on fishing trips that last up to five days, generally leaving on Mondays and returning on Fridays. They fish using hook and line with around half of the catches being coastal pelagics (KII, semi-industrial boat owner, 2021).
- (ii) **Bigger and more autonomous vessels:** 12- to 14-metre long boats using 250–300 CV engines with cabins with capacity for 14 fishers (Figure 6). These vessels fish in the exclusive economic zone (EEZ) of Sao Tome and Principe, Equatorial Guinea and Gabon, conducting three fishing trips every two months. They hook and line fish in Sao Tome and Principe waters, but also use gillnets when fishing outside Sao Tome and Principe's EEZ. Around 35 percent of their catches are coastal pelagics (KII, semi-industrial boat owner, 2021).

FIGURE 6. SAO TOME AND PRINCIPE SEMI-INDUSTRIAL FLEET BOAT TYPES WITH CABIN AND WITHOUT



Photo credit: ©Bernal Vilela López

The semi-industrial fleet was a donation from the Government of Japan, with the last vessel received in 1993; it also exists due to the Government of Sao Tome and Principe, who made these vessels available to private national actors. Currently, the boats are in poor condition, as boat owners are not financially capable of renewing the fleet. In January 2022, there were five operative “smaller” vessels (three under maintenance) and four “bigger” vessels.

One of the main challenges of the semi-industrial fleet is the lack of ice, both in quantity and quality. Boat owners do not have facilities to produce ice, and its purchase increases the fish price on the first sale. In addition, there is no adequate infrastructure at landing sites, and VC actors belonging to this group face problems in financing equipment purchases (KII, semi-industrial boat owner, 2021).

The estimated annual catch of this fleet, considering the potential catch of the twelve vessels, was estimated at 476.8 tonnes,⁷ with 216.8 tonnes (see Annex 2) belonging to coastal pelagics targeted by the value chain under analysis. All the fish is sold whole and fresh and follows similar market channels as those landed by artisanal fishers. The main difference is that this fleet regularly supplies the only supermarket that exists in Sao Tome (Super CKdo); it can also supply fish to hotels and restaurants since the products are generally better preserved. Because the demand for fish is high, the fleet has no problem selling all its catch.

Considering the operational situation of these vessels, their decline in number throughout the years and their relatively small catches of fish, particularly of coastal pelagics, they were not considered as a key actor in this value chain.

Fish palaiês

Palaiê is a Santomean word that means “trader” and, therefore, women involved in fish trade (processors, retailers, wholesalers or hawkers) are referred to as “palaiês de peixe” (fish traders) or, simply, palaiês (Porriños, 2020a). A 2014 frame survey counted 2 355 palaiês in Sao Tome and Principe (Direção das Pescas, 2014), a rise of 15 percent since the 2007 frame survey. Considering the population growth rate between 2014 and 2020, this number could have increased to around 2 600 by 2020. However, Sy and Soares Diogo (2019) described that fish trade is not full-time employment for many palaiês, as there is not enough catch during most months of the year for all of them to have daily work.

An average fish palaiê will trade mainly fresh fish. However, they can also trade processed fish (predominantly salt dried and, in smaller quantities, smoked) either to avoid fish spoilage (if they have large quantities of unsold fish) or through the purchase of processed fish for subsequent resale. In fact, excluding dried-fish wholesalers, most of the palaiês interviewed as part of this study sell their fish either fresh or salt dried. In this direction, two studies conducted by Nuno (2019, 2021) among 269 palaiês determined that 96 percent sold fresh fish while 65 percent sold also dried fish.

⁷ This is aligned with the semi-industrial landing estimated by the Directorate of Fisheries for 2020: 457.5 tonnes.

According to this VC assessment, most of the fish palaiês began operating their business with some family support or, in the case of some palaiês of Porto Alegre, with the financial support of their association. While their preferred option is buying fish directly from fishers in landing sites, they can also purchase fish from other palaiês. Most of them have more than five regular providers. Typically, they purchase all kinds of fish, not just coastal pelagics, and separate them by species before selling. They pay the fisher in cash and upfront (at the moment of purchase) or, when quantities are large, pay after they have sold the product (a system that is referred to as *fiado*). When using the latter system, some palaiês encounter difficulties paying fishers if they do not sell the fish within a day, forcing them to negotiate a payment with the fisher at a later date.

The palaiês point out several factors that influence the cost of fish, with the most important being its availability, which mainly depends on the fish seasonality as explained above, and its quality. In Principe, the cost of petrol is also a relevant issue influencing cost. Fish availability is also the main key factor identified as determining volume of fish sold.

After purchasing fish, palaiês will put it in buckets or baskets of 25–30 litres, conserve it with some ice, if available, and protect it with a cloth. Palaiês use public transport, either (i) a mini-bus, locally known as “hiace” (because of the vehicle model, “Toyota Hiace”), if distances are further; (ii) motorbikes for shorter trips (mainly in Principe) (see Section 2.3.2.2 for transportation cost in Sao Tome); or (iii) carry the fish on their heads and travel by foot to the points of sale, mainly to urban markets (mostly to Bobo Forro market, Sao Tome’s main market), rural markets or, on fewer occasions, peddling directly in communities or selling to local restaurants or to food vendors (who generally are women who cook and serve food). If catches are low and they cannot purchase the minimum amount of fish necessary to obtain a profit (60 kg or more in some communities), palaiês may use different strategies to transport the fish to the main markets. For instance, traders in Santa Catarina will freeze the fish until they have enough quantity to justify a travel to the city of Sao Tome, and traders in Porto Alegre combine their fish with other palaiês and take turns going to the city (Porriños, 2020a).

Palaiês will first try to sell the fish fresh, whole and unprocessed. If by the end of the day they are left with unsold fish, they will try preserving it to sell the following day, either in refrigerators (their own or others) or in cold storage chambers that exist in some markets, though these do not always have enough space for all the fish and thefts have been reported. Other palaiês may salt-dry the fish to preserve it (see next section for processing techniques).

Ice can be bought at some landing sites, ground or in blocks. In some cases, if ice is not available, palaiês can purchase ice at city markets, once the fish is sold, to use it for preservation of the next lot bought the following day.

Palaiês face several challenges while conducting their operations and striving to meet good fish hygiene and quality standards. The main one is the absence of a consolidated cold chain,

either due to shortages or lack of energy and ice, or low availability of cold storages, with many reporting issues keeping their products fresh. Another problem is transportation, because of its cost, low or inadequate frequency, or poor state of roads, mainly affecting palaiês from Príncipe or from outside the city of Sao Tome. In Príncipe, water availability was also mentioned as a key issue, together with the theft of fish from Santo António market. On the other hand, salt appears to be generally available. Despite not having any quality certification system in the country, most of the palaiês interviewed were willing to pay for one if available.

None of the palaiês interviewed have a written contract with their clients, with whom they reach verbal agreements, receiving the payment for their products mainly in cash but also with credit. Still, most of them state having difficulty selling fish mainly due to delays in payments or not recovering credit.

Whereas fishers in Sao Tome find equipment and products locally, in Príncipe they face more challenges finding such items as scales or cool boxes, for example. Once acquired, they normally keep them in good condition. However, many have noticed a cost increase with regard to products, equipment and services during the past five years, and would like to have greater access to cold storages.

With regard to finance services, many palaiês do not have a bank account, and none of them have ever used bank services through their phone. They finance their business through their fish sales, with some receiving family support. If they need to request a loan, they will normally ask friends or family. However, many acknowledge having difficulties accessing financing because of lack of knowledge or institutional support, or due to not having access to banks or persons with funding capacity. None of them have business insurance, claiming either they do not know it exists, or do not have access to it.

There is a general feeling their business has decreased over the past five years. The main causes are the reduced quantity of fish, the change of the Sao Tome market location to Bobo Forro market (it is more distant from the city centre and, therefore, fewer customers) and, to a lesser extent, to the increase in the number of palaiês. Some palaiês also mentioned the impact of COVID-19, with fewer consumers and fish available. However, many expressed their willingness to keep their business in the future and are open to adopting new technologies, even paying for them.

In general, the marketing system is fragmented, with each palaiê dealing with a relatively small amount of product, entailing low profit margins. Only palaiês based in Porto Alegre reported support from their palaiês association, which was more linked to receiving some financial support and training than providing services promoting collective work. This lack of organization hampers the development of economies of scales in this sector.

Dry fish processors and wholesalers

As seen in the previous section, salt-drying fish can be a coping strategy used by some palaiês to avoid spoilage of unsold fresh fish. However, there are around 180 palaiês (and fishers from Principe island) more specialized in drying and wholesaling fish. Many of them are in Principe (around 140), where fish catches are higher compared to the size of the population, but they also exist in Sao Tome.

The process of drying consists in opening the fish from the dorsal side and eviscerating it, then washing with water to remove the blood with the help of a brush. The fish is later placed in a container to drain excess water and dry salted with granular salt, which entails rubbing salt along the whole fish. Other ingredients such as garlic or spices may be added for the sake of adding flavour. The fish is kept for one to five days in a closed container before it is placed onto a drier (KII, 2021, Porriños, 2020a).

According to the palaiês surveyed in this study (24 salt-drying palaiês in different communities of Sao Tome), the coastal pelagic species that is more widely used for salt drying is flying fish (100 percent of them process it and recognize it as the main processed species). Consultations with the presidents of different fisher and palaiê associations in the two islands identified blue runner, West African halfbeak and fulu fulu tunas as the other three main species processed. Porriños (2020a) states bigger fishes of various species are also processed but in less regular quantities than the first three.

Porriños (2020a) describes the three most common methods of drying salt fish as used in Sao Tome and Principe: quialo, solar drier or ground drying (Figure 7). The quialo is a wooden frame drier with a grid in the middle made of thick net or vegetal material such as palm trees or bamboo. Quialos normally have a surface of 4-square metres and a hole in the middle to facilitate access to the central part of the drying rack. A newer drier version has been introduced recently (the so-called “solar drier”), which is comprised of two overlaid racks with a plastic cover that protects the fish from rain and animals. Alternatively, if palaiês lack funds or space, fish can also be placed on the ground for drying. Respondents to the Porriños’ analysis explained that quialo allows for the drying of larger quantities simultaneously and in a shorter time if weather conditions are favourable. However, if it rains, the fish needs to be quickly removed and protected. On the other hand, the solar drier is more convenient to protect fish from adverse climatological conditions, animals and theft. The current model, however, is too small to dry fish in large quantities, and low drying efficiency was reported for the fish placed on the lower rack. Some communities in Principe relocate seasonally to temporary settlements to be closer to fishing grounds with more favourable weather conditions, salt drying all the catches, mainly for transport to Sao Tome.

FIGURE 7. MAIN DRYING TECHNIQUES USED FOR COASTAL PELAGICS (LEFT: GROUND DRYING; MIDDLE: QUIALO DRIER; RIGHT: SOLAR DRIER)



Photo credit: ©Bernal Vilela López

The period to dry fish depends on the type of drier used and the weather conditions; a solar drier normally takes 2 to 3 days, the quialo type 4 to 5 days, while drying it on the ground takes the same amount of time as the quialo drier. The process takes longer when it rains, with greater risk of losing quality.

The main market destination of dried fish in the country is the Bobo Forro market in Sao Tome, but dried fish can also be found in district markets and sold by food palaiês (KII former fisheries officer, 2022). Most of the dried fish comes from Principe island.

Sao Tome dried fish wholesalers

The main Santomean communities producing salted fish are Porto Alegre, Santa Catarina, Neves and Sao Joao dos Angolares. Fish dried in communities existing in Sao Tome is mostly sent to the Bobo Forro market where it is sold by palaiês operating there who are paid upon completion of sale.

In Sao Tome, processors use both solar driers and quialos. The communities of Santa Catarina and Malanza have more solar driers, while Porto Alegre and Sao Joan dos Angolares have more quialos. In Neves, most of the processors dry fish on the rocks and also on the ground on palm leaves. Most of the communities were supported to build and use solar driers from the NGO MARAPA through different development projects, but many no longer work because they were inadequately designed, with processors having difficulties reaching the solar drier shelves and consequently reverting to the use of quialos or the ground itself for drying.

According to the VC survey data conducted among Santomean processing and wholesaling palaiês, these actors have spent an average of 21 years in this business. Significantly, 75 percent state that it is easy for them to find fish suppliers and that, overall, they are satisfied with them. This survey showed that the solar drier is slightly more used than the quialo, followed by drying on the ground. Most of the palaiês own the driers (solar or quialo types) they use. Many of them store their products in a bucket covered with a cloth at their houses,

and most of them claim that it is easy finding clients to buy their dried fish. Palaiês buy fresh flying fish per unit at STN 5 to STN 10 and sell each at STN 2 to STN 5.

Two-thirds of the surveyed palaiês are not members of an association, and more than half have not received any kind of training on processing. Still, most of them declare having obtained technical information from the Directorate of Fisheries, NGOs or attending various events; however, more than 50 percent of palaiês are not satisfied with the kind of inputs, support service or information received, and all would like to receive training to better process their products. Almost none of them have a bank account, and they do not use bank services.

Principe dried fish wholesalers (Porriños, 2020a)

Both fishers (men) and palaiês (women), but also people unrelated to the artisanal fisheries sector dry fish, mainly for export to Sao Tome. The process of buying fish is similar to the one presented in the previous section, with the difference that the fish is paid for upfront and not at a later time, as fishers permit on Sao Tome. This may be a challenge for palaiês hoping to access this market because they do not always have enough funds. Additionally, some palaiês report difficulties in finding suppliers of fresh fish, since fishers also dry fish.

The main cost incurred by palaiês is the purchase of fish. Some palaiês also hire two to four people from outside their household to help with fish evisceration. Sending dried fish to Sao Tome was reported as their only income-generating activity. However, all palaiês reported that because of the high cost of production and transportation, they obtained a very small profit margin.

Even if some minor dried fish trade is conducted on the island, the bulk of the fish is sent to Sao Tome. Fish is normally sent via boat to a palaiê in Sao Tome, who will in turn wholesale or retail it. Otherwise, Principe wholesalers themselves will transport the fish and sell it directly to dried-fish vendors at the main market in the city of Sao Tome. Besides transportation costs (Section 2.3.2.2), the fish is packed in 90–120 kg tarpaulin bags (STN 100 each bag), with additional taxes (STN 100 each bag) and payments to dockworkers (STN 60–120 each person). In addition to these costs, thefts have been reported during transportation. These costs only make fish profitable when wholesalers send fish in large quantities, such as 100 kg and 300 kg.⁸

The Sao Tome palaiês receiving dried fish from Principe for retailing are generally based at the city's main market of Bobo Forro (Section 2.3.1.4.1). They normally receive the fish from a distributor, who divides the original load among different palaiês to facilitate its sale, as a single palaiê may not be able to sell such a large quantity. The distributor collects payments 8 to 15 days after delivery, once all the fish has sold. The palaiê will be compensated for her

⁸ For more information, see www.gporrinos.com/uploads/1/0/8/7/108752045/baf_value_chain_assessment_driedfish.pdf.

services with some dried fish and a monetary amount from the Principe wholesaler before the money is transferred to the bank of the wholesaler. Other distribution channels exist, although they are not that prevalent. For instance, shop owners in Sao Tome might buy fish directly from producers in Principe, paying for the fish upfront and retailing it to final consumers. Other traders will buy Principe dried fish and wholesale it at higher prices to retailers further inland.

Intervention for fish, processing and wholesaling palaiês involves the following:

- Explore the potential for better organization of palaiês to improve advocacy and access to services, inputs (also access to finance) and markets. This could be done by revitalizing existing associations.
- Capacity development in improved handling and processing methods and quality standards.
- Access to improved cold storage and ice.
- Access to improved processing technology such as better driers.
- Improve access to high-value markets, particularly the incipient tourism sector.
- Improve access to Sao Tome market from Principe processors.
- Improve access to finance and support for investment in fish processing and trading.

Retailers

Retailers include fish palaiês, who mostly trade fresh fish, starting with its purchase, usually from fishers, to then retail it (see Section 2.3.1.2); market and food palaiês trade only salted fish.

FIGURE 8. SOME FISH MARKETS IN SAO TOME ISLAND (LEFT: TRINDADE MARKET; MIDDLE: BOBO FORRO MARKET; RIGHT: PRAIA GAMBOA MARKET)



Photo credit: ©Bernal Vilela López

Dried fish market and food retailers

Around 200 market and food retailers sell dried fish to final consumers (Figure 8). Around 85 of them are palaiês retailing dried and smoked fish in urban markets, mainly operating in the Bobo Forro market. As the market has concrete tables for displaying products, the

palaiês bring basic items to conduct their sales, such as scales, plastic trays, palm leaf baskets, and fabric to cover fish or knives. These retailers pay 5 STN per fish basket introduced into the market and 5 STN each day they are there. The market has enabled a room, where a generator is supposed to operate, for storing dried fish from one day to the next. The use of this storage room is free. The remaining 115 are food retailers, women working in urban and peri-urban areas of the country cooking and selling food to consumers. Salted fish can be found among the ingredients they use and are therefore included in this section. On average, these actors trade 2.5 tonnes of dried and 282 kg of smoked coastal pelagics annually.

2.4 Other outlets

Restaurants

Local restaurants generally have fish, including fresh coastal pelagics such as balao halfbeak, blue runner, bigeye scad and flying fish, on their menus; these are usually served grilled but can also be fried and boiled. These species represent around 30 percent of the fish sold in this type of establishment. In general, the volume of fish sold varies depending on consumer demand but also on fish availability. In the past five years, restaurants have experienced ups and downs, particularly due to the severe impact of COVID-19. The quantity of coastal pelagics they trade per year varies from one establishment to the other, as well as with product seasonality, but compared with other actors identified in the VC map, these quantities are believed to be much less.

Restauranteurs buy fish from market palaiês but also from fishers, and it is transported by car in buckets or sacs to their establishments. Fish is stored in cool boxes or refrigerators with minimal food losses. However, there are general complaints regarding power and water shortages, as well as the claim that suppliers could improve fish freshness.

In comparison with the palaiês, restaurant owners typically have bank accounts, use mobile bank services, and can ask commercial banks for loans, even though they note that the interest rates are high and the processes complicated.

CKdo Supermarket

There is one supermarket in Sao Tome, Super CKdo, that has a sales stand selling fresh fish over crushed ice. The supermarket has cold storage to conserve fish from one day to the next if needed. Whenever there is an electricity shortage, a generator can be activated to keep fish cool. The supermarket sources mainly from the semi-industrial fleet, which can also obtain coastal pelagics, including blue runner, for their customers.

Support service providers in the extended value chain

Value chain actors are supported by service providers, which play an essential role in facilitating the process from production to consumption. For this VC, there are physical input suppliers, transport providers, training and extension services, and financial service providers.

Physical input suppliers

Boat manufacturers

Three main types of fishing boats are used by artisanal fishers in Sao Tome and Principe: dugout canoes, outrigger canoes and fibreglass boats. More than 90 percent of them are dugout canoes, almost 6 percent are outrigger canoes, and the remaining are fibreglass boats.

- The dugout canoes are locally made, mostly from the tree trunks of acacia and “oca”. The cost of a canoe ranges from STN 7 000 to STN 20 000, and takes several weeks to build, a work generally done by specialists based in the communities.
- The outrigger canoes, or “praos”, are constructed with imported material that can be found on the island (plywood sheets, wooden boards, and different chemical products such as glue, diluent, bitumen or paint). They cost around STN 25 000 each, taking one to three weeks to complete by two persons. The prao canoe is characterized by lower fuel consumption and increased safety because of improved boat stability.
- The fibreglass boats are constructed with materials that are normally imported from Portugal (fibreglass rolls, resins, etc.). Depending on the size of the boat, they are sold for STN 55 000, STN 80 000, STN 160 000 and STN 210 000.

The construction of prao and fibreglass vessels by local workshops is supported by the government, which subsidizes 25 percent of the total price and provides advantageous conditions for fishers so that they can pay the remaining cost to the government. In 2021, six fibreglass and ten prao vessels were constructed under these conditions (KII former fisheries officer, 2022).

The manufacturers of praos and fibreglass boats complain that materials are not always available in the market to build these types of boats. Additionally, there are payment issues due to fishers experiencing reduced catches, in turn resulting in lower income and reduced orders stemming from the COVID-19 pandemic (KII boat manufacturers, 2021).

Boat manufacturers normally provide maintenance and repair services for boats. They see opportunities to grow their business, such as having better shipyards, improving their technical know-how and producing necessary materials in local areas.

Providers of physical inputs and repair services.

The last artisanal fishers frame survey (Direção das Pescas, 2019) reported 411 surface gillnets, 592 “maxipombo” nets (nets used to create seine nets) and 2 427 hook and line type gear in Sao Tome and Principe. These are the main gear used to capture coastal pelagics.

A few small shops specialized in selling fishing goods are in Neves, Porto Alegre and Angolares. However, other shops sell ropes, hooks, engines and other inputs, all first-hand material. The price of gillnets varies between STN 10 000 and STN 15 000, while the price of seine nets varies from STN 90 000 and STN 120 000 for smaller nets (350 mesh) or around STN 200 000 for larger ones (1 000 mesh). The price of hooks depends on the hook size (number 16–20: STN 20; number 12–15: STN 25; and number 6–10: STN 80). Fishing rods vary from STN 20 to STN 120, and 100 metres of wire costs from STN 150 to STN 400 depending on the thickness.

Fishing gear and other related items can also be subsidized by the government with its own funds or through international development projects. These goods are normally provided, in a credit form, to fisher associations to sell. Yet, these products may not always be available in the market, particularly in Principe island, and fishers complain about their quality.

Fishing boat engines are mainly imported from Gabon and Togo. Prices vary between STN 75 000 and STN 85 000 (15 hp), STN 96 000 (25 hp) and STN 120 000 to STN 130 000 (40 hp). Normally, dugout and prao vessels use motors of 15 hp and fibreglass boats use 15 or 40 hp. The demand for engines is increasing, as fishers need to travel further to fish.

There are five specialized engine mechanics in the country, four in Sao Tome and one in Principe. Yet, the country has a general lack of appropriate tools and pieces with which to repair engines. In fact, some mechanics are still using tools donated by the Japanese Government from the late 1980s. Other tools and repair items can be bought locally in “Nigerian” shops, but these are of low quality and do not last long; also, they are not always available. Generally, fishers take regular care of their engines, spending an average of STN 500 every three months for their maintenance.

Depending on the engine system, fishers will need gasoline or gasoline and oil to work. Gasoline is available in Sao Tome petrol stations and in local shops. Gasoline sold in shops is generally cheaper, but it is often mixed with other substances, which affects its quality and, subsequently, the performance of the engine. On the other hand, oil of good quality is not always available in the market. Given that demand for outboard motors is increasing, an increase in fuel use is also expected.

Products used by palaiês (baskets, buckets, knives, cloths, scales, etc.) are usually available in the shops of Sao Tome, yet in Principe they sometimes cannot be found locally, especially cool boxes and scales. This is also the case for materials used to construct quialo and solar type driers (plastic, wood, ropes, nails, etc.), with good quality plastic having to be imported.

Cold storage and ice production

Most fishers do not have conservation equipment on their vessels. Because fishing trips are conducted further away from the coast and take a long time, post-harvest losses already start on-board the vessels due to a lack of preservation methods.

There are ice-making units that can produce flake or, in some cases, block ice and cold chambers throughout the country, most of them constructed with the support of development projects, such as the Infrastructure Rehabilitation for Food Security Support Project (PRIASA) (Table 3), or with private funds, such as Fatigelo and Gelmofrio cold chambers.

TABLE 3. COLD CHAMBERS AND ICE FACTORIES INSTALLED WITH PRIASA PHASE I SUPPORT

Description	Capacity	Place
One cold chamber	100 m ³	Bobo Forro market
One cold chamber	40 m ³	Bengá (Neves)
One cold chamber	35 m ³	Santo António – Príncipe
One cold chamber	20 m ³	Santana market
Ice factory	2 tonnes/day	Bobo Forro market
Ice factory	2 tonnes/day	Bengá (Neves)
Ice factory	1 tonnes/day	Santana market

Note: PRIASA = Infrastructure Rehabilitation for Food Security Support Project.

Source: PRIASA government focal point.

Bobo Forro, Angolares, Santana, Neves, Praia Gamboa and Príncipe island have cold chambers and ice-making units, while Guadalupe and Trindade only have ice-making units. However, they are not always operative, and some are degraded (personal communication, 2022; Porriños, 2020a; Sy and Soares Diogo, 2019). Some causes of disuse and degradation relate to poor maintenance, the absence of cold system specialists in the country, the lack of a continuous energy supply that affects the equipment operability, and poor management of facilities; in some cases, the benefit generated from selling ice is not enough to cover the operation costs.

Flake ice is stored in cold storages, and consumers bring their own packaging to buy the quantity needed; ice per kilogram is sold at STN 1–5. Ice in blocks weighs 15 kg and costs STN 50, while 30 kg blocks cost STN 100.

There is no refrigerated transport for fishery products in the country, with the fish generally transported in common vehicles (Section 2.3.2.2). The lack of an operative cold chain leads to a loss of quality (and therefore of value) during transport and commercialization and continues the reliance on traditional preservation techniques, such as salt drying, and prevents development of quality fresh or frozen fish markets. Sy and Soares Diogo (2019) estimated a loss in value due to the lack of conservation equipment, involving price decreases from STN 50 000/kg to STN 15 000/kg.

Transport services

Most fish are transported domestically by privately owned buses (hiace) (Figure 9) and motorbikes or by cargo boat from Principe to Sao Tome. Distances and the costs of taking a public bus to Sao Tome or to Bobo Forro market are shown in Table 4, with trips taking up to 120 minutes from the furthest distances (Porto Alegre or Santa Catarina) to 10 minutes from places such as Praia Cruz or Praia Gamboa. Approximate travel costs are based on a 30–60 kg sack of dried fish and 15–30 kg buckets or baskets of fresh fish.

TABLE 4. TRAVEL DISTANCE AND COST TO SAO TOME

Location (from – to)	Passenger cost (STN)	Baskets/buckets cost (STN)	Dried fish sacks (STN)
Moto van			
Praia-Melão/Pantufo-Sao Tome	15	10-30	-
Praia Cruz/Gamboa-Sao Tome		20-50	-
São Pedro-Bobo Forro		20-40	-
Porto de Alfandegas-Bobo Forro	10	-	20-70
Hiaces to Sao Tome			
Porto Alegre and Malanza	100	30-40	30-50
Santa Catarina	50	25-40	30-40
São João dos Angolares	30	20-40	25-40
Neves	30	10-20	30
Guadalupe	25	10-20	-
Ribeira Afonso	25	5-15	-
Santana	20	5-15	-
Água Izé	20	5-10	

Note: STN = Sao Tomean dobra.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2023. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Dried fish from Principe to Sao Tome is sent by boat, which implies different transportation costs (Porriños, 2020a): transportation to Santo António city by car or motorbike (STN 300–

600), transport fee applied per bag to the carrier (100 STN each), boat ticket if needed (STN 1 000 one-way trip), and transportation from Sao Tome harbour to its final destination.

Four different vessels cover the line from Santo António to Sao Tome. Three of them – *Jack Charles*, *Ferroferro* and *Robote* – allow cargo transportation and, consequently, transport of dried fish. The frequency of their travel varies between once a week for smaller vessels such as *Jack Charles* to once a month to the largest one, *Robote*. The vessels do not have a regular schedule; they leave once they have enough passengers and cargo. Furthermore, vessels are not always reliable, as they experience frequent breakdowns.

FIGURE 9. HIACE ON SAO TOME ISLAND



Photo credit: ©Bernal Vilela López

Training, extension and sanitary control services

The Directorate of Fisheries and the NGO MARAPA are the main players providing training and technical assistance to VC actors. MARAPA has trained in safety at sea, post-harvest handling and processing techniques. It has also supported the development of the sector by introducing prao vessels in the country, conservation and processing equipment, such as ice-making units or solar driers, and GPS technology. It normally works in partnership with the Directorate of Fisheries supporting associations of fishers and palaiês (KII MARAPA Director, 2022). MARAPA does not have its own funds and is mainly funded by international development institutions through the implementation of projects, which may represent a challenge to the consolidation of their work. The support and services provided by MARAPA is acknowledged by some of the VC actors who mentioned having obtained new conservation and transformative fishing skills to improve product quality thanks to MARAPA trainings.

The Directorate of Fisheries has received support from different international development agencies to train VC actors since the late 1980s. In addition, a 2011 project set up a fisheries extension service that worked, in collaboration with MARAPA, to strengthen associations, fishery products marketing and microcredit management; however, this network does not always have sufficient funds or staff to operate on a regular basis. Currently, the department of sanitary inspections (Directorate of Fisheries) provides training sessions on the safe handling of fish products (KII Directorate of Fisheries, 2021). In addition, the Port Captainty provides life-saving and security at sea training to fishers (KII Port Captainty, 2021).

In total, 54 percent of fish traders (women) and 57 percent of fishers (men), respectively, have received training at training sessions or events, or directly from NGO officers or from the Directorate of Fisheries technicians. Additionally, another 26 percent and 28 percent, respectively, declared receiving technical information to support their activities from TV and radio. On the other hand, 75 percent of the interviewed boat owners (100 percent men) declared receiving technical support for their activities, but none of the interviewed food traders (100 percent women) reported receiving any type of training.

Other NGOs, such as Oikos, Fundação Príncipe, Fauna & Flora International as well as MARAPA, have worked or are currently working with fishers to improve fisheries management in Sao Tome and Principe and are also working to develop marine protected areas (see Section 2.3.3.2). In addition, Programa Tatô raises awareness and trains local communities on the preservation of the turtle population.

Under the PRIASA project, a laboratory for sanitary control was constructed and equipped to be managed by the Directorate of Fisheries but is not yet operative (KII PRIASA coordinator, 2022).

Financial services

Sao Tome and Principe has several formal financial service providers that offer commercial loans to small and medium enterprises, such as the International Bank of São Tomé and Príncipe (BISTP), Afriland First Bank, Banque Gabonaise et Française Internationale (BGFI), Ecobank and Credial. All of them are licensed, follow the banking standards set by the Central Bank of São Tomé and Príncipe, and are audited by the latter bank. BISTP has branches in all districts of the country and in the Autonomous Region of Principe; Afriland First Bank has two branches in the country's capital and one in the Autonomous Region of Principe. However, value chain actors face difficulties in accessing finance, and only a small share of total credits granted reaches the agriculture and fishery sector (World Bank, Country Economic Memorandum for São Tomé and Príncipe, 2019).

Some of these banks (BISTP, Afriland First Bank and Credial) have provided credit to a few VC actors or civil servants to purchase fishing equipment, boats and outboard motors. Others, such as BGFI Bank and Ecobank, have never granted credit to fishers but are willing

to do so under well-designed criteria acceptable to these banking institutions. When providing loans, they usually include collateral, such as a house, land guarantee or a guarantor, who is primarily employed, to secure the loan.

Banks do not consider fisheries as a high potential sector for loans, which explains the low level of penetration. For banks, the fishing sector is a high-risk sector, since fishers often do not catch fish and the level of default on loan repayment appears high. Another risk is associated with the fact that they are susceptible to external factors, such as weather, which can lead them to default on loans when due.

Another important aspect raised by banking institutions is that fishers do not normally participate in cooperatives that produce mutual aid among themselves; in which case, the cooperative should take responsibility for managing the loans and guaranteeing payment.

As mentioned in Section 2.3.2.1, the Directorate of Fisheries provides subsidies and credit to fishers to finance the purchase of fishing equipment or boats. However, this service is not continuous; for instance, Sy and Soares Diogo (2019) mention that because of low credit repayment rates, the public financing system was stopped in 2016.

Two main sources of informal credit currently exist in the country: (i) “chiquilá” and (ii) traders and/or fisher associations. *Chiquilá* is an informal scheme for group savings and loans that is most common among those sectors that develop activities with a quick and regular return (Bonfim, 2008). *Chiquilá* uses a rotational loan system in which participants pool together a certain amount of funding, which is successively loaned to each member and returned after a set time with no interest. The order of the loans is determined through a random lottery (Porriños, 2020a). On the other hand, traders and/or fisher associations also have group savings and loans schemes, although most of them show signs of significant functioning and financial problems, which, in many cases, have led to their inactivity (Nuno and Matos, 2017; Porriños, 2020a). In the case of the associations, credit is provided to each member on a rotational basis to be returned after a set time with interest. Most associations do not request collateral for lending the money, which may lead to conflicts among members and situations in which the loan was not returned and/or coercion was used against the debtors (Porriños, 2020a). On Principe, Abade’s trader association has completely formalized its credit scheme, with loanees signing a contract at a notary office and offering an asset as collateral (2020).

The (societal) enabling environment

Institutional elements

Table 5 presents the main national institutions which have a key role for the coastal pelagics value chain.

TABLE 5. NATIONAL INSTITUTIONS, POLICIES AND STRATEGIES

National institutions or strategies	Role and objectives
Ministry of Agriculture, Fisheries and Rural Development	
Directorate of Fisheries	Responsible for: (i) the coordination and implementation of national fisheries policies, including formulation, and implementation of fishing regulations and laws; (ii) the collection of statistical data and training of maritime personnel; (iii) the management of fisheries agreements and the collaboration with other regulating bodies in the waters of Sao Tome and Principe's exclusive economic zone (EEZ); and (iv) the conduction of sanitary control of fishery products.
Ministry of Planning, Finance and Blue Economy	
Responsible for proposing, formulating, conducting, executing and evaluating the government's financial policy. It promotes a rational management of public financial and patrimonial resources and maintains the internal and external balance of public accounts, conducting also a general inspection of public finances.	
Blue economy transition strategy for Sao Tome and Principe	Twofold objective: (i) make available a tool for decision-making on the challenges leading to the development of the blue economy, the implementation of necessary reforms, and the definition of priorities; and (ii) raise awareness among decision-makers about the blue economy concept and the implicit benefits for the adoption of an inclusive and transformational growth mode.
Ministry of Defense	
Port Captaincy	Responsible for collecting taxes for boat registration. The small-scale fisheries sector is largely undertaxed and operates in an open and almost free access, i.e. only a tax exists for boat registration by the Port Captaincy.
Coast Guard	Responsible for fishers' control and surveillance.
International agreements or initiatives	
Sustainable Fishing Partnership Agreement	The agreement sets the terms for the industrial fishing fleet of the European Union to fish within Sao Tome and Principe's EEZ.
Fisheries Transparency Initiative (FiTI)	FiTI is a partnership that seeks to increase transparency and participation for a more sustainable management of marine fisheries. In Sao Tome and Principe, FiTI restarted collaboration with local stakeholders in November 2020 after an initial government commitment in December 2018.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2023. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Besides the institutions mentioned in Table 5, two other institutions may be relevant for the development of the coastal pelagics value chain:

- The Directorate General of Educational Administration – National School Feeding and Health Programme (PNASE, in Portuguese), under the Ministry of Education and Higher Education. The mission of PNASE is to complement students’ nutritional needs and form healthy eating habits during their stay at school, contributing to the child’s physical and intellectual development. PNASE has included coastal pelagics in its menus.
- Business Incubators and Accelerators Network of Sao Tome and Principe (REINA, in Portuguese), under the Ministry of Youth, Sports and Entrepreneurship. REINA provides individualized technical support for business owners and entrepreneurs regardless of the stage at which the business or business idea is at. The service includes mentoring and follow-up on business development and growth, business analysis and strategic growth plans. Despite not having worked extensively with coastal pelagics actors, this network represents a good opportunity to participate in sector development.

Fishery regulation

The regulating framework for the fisheries sector was set by Fisheries Law No. 9/2001 and Decree No. 28/2012 establishing the General Regulation on Fisheries and Halieutic Resources. Together, these two documents determine, among others, the requirements and processes for obtaining fishing licences, define sanctions for illegal activities, set requirements for vessels and fishing gear, and define the institutional setting for the enforcement of the regulations (Assamblea Nacional, 2001, 2012). As of June 2022, a new fisheries and aquaculture law (Law No. 09/2022) was approved at the National Assembly (Assembleia Nacional, 2022).

Sao Tome and Principe’s small-scale fishery is open access and, except for boat registration fees, fishers do not have to pay any other fee to the government. There is no control enforcement on the number of fishers, boats and catch size, and there is currently no limitation on the number of boats (Serkovic and Million, 2019). Furthermore, there is no fisheries management policy in Sao Tome and Principe that entails the risk of uncontrolled and unlimited fishing activities and the associated negative impacts on fish stock sustainability. The existing regulations are often not respected and common infractions include use of gear prohibited by the fisheries law and the decree on fisheries resources (e.g. nets with mesh sizes that are too small) (Sy and Soares Diogo, 2019). Control mechanisms to monitor compliance with the existing regulations seem to be weak, including a lack of coordination between the Directorate of Fisheries and the Port Captaincy (Belhabib, 2015;

Sy and Soares Diogo, 2019). Indeed, although fishing capacity is registered through fishing boats and landings through the Port Captaincy, this database is not maintained in real time, and the Directorate of Fisheries, in charge of the management of resources, does not have full access to these data. Thus, the management of fishing capacity for small-scale and semi-industrial fisheries is not fully controlled and the little data that are collected are not integrated for optimum use (Serkovic and Million, 2019).

Sustainable Fisheries Partnership Agreement

The first Sustainable Fisheries Partnership Agreement (SFPA) between the European Commission and the Democratic Republic of São Tomé and Príncipe was signed in 1984, and the partnership agreement currently in force was signed in 2007 (European Commission, 2007, 2020a). The protocols to implement the agreement are renewed every four years, and the current protocol covers the period 2019–2024 (European Commission, 2020b). Fisheries agreements with the European Commission are an important component of the fisheries sector in Sao Tome and Principe, constituting a key source of income for the respective fisheries administration and the public treasury. Under the current fisheries partnership protocol between the European Union and Sao Tome and Principe, 34 licences for tuna fishing in Sao Tome and Principe waters are available for European Union vessels (28 freezer tuna seiners and 6 surface longliners), of which 21 are allocated to Spain, five to France and one to Portugal (European Commission, 2019a). The catch is not landed in Sao Tome and Principe, thus not contributing to meeting the national demand for fish products, and no income is generated through port fees (Serkovic and Million, 2019). The reference catch for each year under the current protocol is 8 000 tonnes, which is 1 000 tonnes more than under the previous protocol. The annual financial contribution over the five-year period of the current protocol amounts to EUR 840 000, of which EUR 440 000 are reserved as sectoral support destined to improve the fisheries policy in Sao Tome and Principe (European Commission, 2019b). The contribution of the SFPA to total GDP in 2017 amounted to 0.2 percent (Serkovic and Million, 2019). In addition to the fisheries agreement, foreign boats are also allowed to fish in Sao Tome and Principe's waters under private licences. Data on catch and revenue generated under these private licences are not available (Serkovic and Million, 2019).

Under the SFPA, Sao Tome and Principe is responsible for surveying and monitoring the activity of European Union vessels in Santomean waters, as well as compliance with fisheries regulations (European Commission, 2007, 2019b). Currently, the Directorate of Fisheries has a functioning vessel monitoring system (VMS) and the Port Captaincy has an Automatic Identification System (AIS) for monitoring vessels in Sao Tome and Principe's EEZ; an integrated system (VMS and AIS) accessible for both institutions does not exist. The Department of Inspection, Control and Surveillance plans to cover coastal and artisanal fishing (KII Fisheries Directorate).

Organizations and cooperation

There have been numerous past and ongoing efforts aimed at improving sustainable management and conservation of fisheries resources as well as the value chain in Sao Tome and Principe while at the same time improving the well-being of local communities. Of particular interest for FISH4ACP are the following initiatives, which are still under implementation:

- **PRIASA II.** The second phase of the PRIASA project started in 2016 and will finish in 2023 after being extended. Fishing-related outputs are: (i) construction of a fibreglass canoe manufacturing unit; (ii) introduction of fish aggregation devices; and (iii) studies on the opportunities for development of semi-industrial fishing and further development of marketing infrastructure (AfDB, 2020). A third phase of the project is being planned as of September 2022.
- **Establishing a network of marine protected areas through a co-management approach.** Financed by the Blue Action Fund, this project follows up on the activities started by Kike da Mungú in southern Sao Tome and Omali Vida Nón in Principe island. Implementation started in 2018 and will end in 2023. The main implementing agencies are Fauna & Flora International, Oikos, MARAPA and Fundação Principe. The main objective is to support the designation of the first network of marine protected areas through participatory fisheries management (Blue Action Fund, 2019).
- **West Africa Coastal Areas Management Program (WACA).** This programme, implemented by the World Bank, runs from 2018 to 2023. It supports 17 African countries' efforts to improve the management of their shared coastal resources and reduce the natural and human-made risks affecting coastal communities. In Sao Tome and Principe, ongoing activities focus on natural-based solutions through community approaches, beach nourishment, drainage, breakwaters, and coastal and riverbank revetments. It also includes support to schemes for routine maintenance of coastal protection infrastructure in collaboration with district governments.
- **The Commercialization, Agricultural Productivity and Nutrition Project (COMPRAN).** This EUR 19.2 million project, funded by the International Fund for Agricultural Development (IFAD), aims to sustainably improve the incomes and food and nutritional security of small producers, especially women and youth. It has an implementation time of six years and was launched in 2020. One of the project's areas of intervention is improving the productivity and marketing of agricultural and fisheries products through a dual-purpose approach: (i) enhancing the institutional and financial viability of producer organizations; and (ii) improving food and nutrition security and building resilience.

A list of previously implemented projects is provided in Annex 4.

Infrastructure

Energy

Overall, the energy supply in Sao Tome and Principe is insufficient, unreliable and expensive, increasing production costs for private sector actors. These structural problems severely affect the fishery sector since it hampers, among others, the development of a well-functioning cold chain as well as the establishment of adequate processing facilities and improvement of overall life standards (VC actor interviews; Sy and Soares Diogo, 2019; World Bank, 2019).

Power is supplied by the state-owned water and electricity company Empresa de Água e Eletricidade (EMAE), and the electricity generation system is powered by diesel and hydropower (UNEP, 2017). Currently, 12 MW of power are produced, with 80 percent coming from thermal power plants and 20 percent from hydroelectric power stations (IBP, 2019). In 2016, electricity coverage in Sao Tome and Principe extended to 59 percent of the country and, in 2012, only 60 percent of inhabitants had access to electricity (UNIDO, 2018). In some regions, electricity supply is limited to certain hours of a day (e.g. from 17.00 to 23.00 in Porto Alegre) (Sy and Soares Diogo, 2019). Where there is no electricity coverage, energy requirements are met by biomass for cooking and kerosene and candles to generate light (UNEP, 2017). Additionally, businesses often have to use expensive diesel-power generators to ensure a constant energy supply (World Bank, 2019). Small-scale renewable energy solutions have so far not been introduced systematically, even though they have the potential to promote the productivity of key economic sectors, such as agriculture (e.g. solar water pumping for irrigation), fisheries (e.g. solar ice production) and tourism (e.g. solar thermal water heating) (UNIDO, 2018). Several development projects have attempted the development of the cold chain in the past and have equipped fishers and traders with conservation equipment such as freezers. However, due to high costs and insufficient resources, these projects failed to succeed (Sy and Soares Diogo, 2019).

Roads

FIGURE 10. ROAD ON SAO TOME ISLAND



Source: ©FAO

The spatial density of the road network in Sao Tome and Principe is low, with only three national roads connecting the capital to the northern, central and southern regions. Most roads suffer from poor maintenance, and road deficiencies have been considered a major growth challenge (World Bank, 2019). Nevertheless, the road to the south (Sao Tome to Porto Alegre) has been considerably improved over the past years (Sy and Soares Diogo, 2019) and road rehabilitation works have been financed to improve road infrastructure (ADF, 2017). However, regardless of these initiatives, the World Bank's Country Economic Memorandum highlights the need to secure funding for road maintenance and mentions that a significant deterioration of road quality has been verified since the European Union stopped funding the community-based groups that maintained the roads (World Bank, 2019).

Fish transport is generally constrained by the state of the roads (Figure 10). On Sao Tome, the state of the roads often constrains speed limits (causing delays) and constitutes a safety risk, especially on the roads to Neves and Santa Catarina (northern road), as well as Porto Alegre and Malanza (southern road). On Principe, the access to most fishing communities is through steep dirt roads, most of which suffer from seasonal rain erosion, creating gullies that often prevent transit. Indeed, Principe's palaiês must sometimes walk several kilometers until the next community to take a motorbike taxi to the city.

Market infrastructure

Traditionally, around 70 percent of the fish products in Sao Tome and Principe were sold at the Central Market. The Central Market was inadequate for fish commercialization due to the lack of appropriate conservation facilities (leading to post-harvest loss), poor organization (with no system in place to efficiently dedicate market space and stalls to traders) and poor hygiene conditions. Other markets in Sao Tome and Principe island face similar challenges: Conservation infrastructure is usually insufficient or inexistent and hygiene conditions are poor (Porriños, 2020a; Serkovic and Million, 2019).

Under the PRIASA 2 Project, a new market was built in Bobo Forro (outside the capital's city centre) to substitute the Central Market. The Central Market was decommissioned in 2020 to contain the spread of COVID-19, and all traders were relocated to Bobo Forro. This market has a special section for fish commercialization with adequate conservation and processing facilities (Porriños, 2020a; Serkovic and Million, 2019). However, during focus group discussions, fish traders reported a decrease in sales since their relocation to Bobo Forro and an increase in their commuting expenses. Additionally, although street sale of food products has been forbidden within the city centre, fish vendors at Bobo Forro reported that peddlers illegally selling food products at the city centre create an unfair competition (Porriños, 2020a).

Artisanal fleet landing sites and seaport

The country has 48 artisanal main landing sites (KII Directorate of Fisheries, 2021), which are generally beaches located at the fishing communities or close to inland communities with fishers (field observations) (Figure 11). Fibreglass boats are usually stored in the water, while dugout and outrigger canoes are stored safely on the beach, a few metres above the high tide line. When fishers arrive from fishing, people at the landing site help them push the canoe out of the water and, if the catch has been good, they will receive one or two fishes as a reward for their help (a practice known as "São Pedro") (Porriños *et al.*, 2021).

FIGURE 11. LANDING SITES



Porto Alegre (right); Praia Melao (Middle); and Santa Catarina (left)
Photo credit: ©Bernal Vilela López

For an island state, the ports and onshore support infrastructure are weak. Both Sao Tome island and Principe island have small harbours: the Port of Sao Tome and the Santo António Port on Principe island (World Port Source, 2022); however, only the Port of Sao Tome has a container terminal (SeaRates, 2022). In Sao Tome town, the main commercial area, the harbour area is shallow and small, allowing only relatively small vessels to enter (Carneiro, 2011). Moreover, the port has limited room for expansion and is constrained by a small hinterland area (World Bank, 2019). Imported and exported goods transported by larger ships must be transported by small vessels from the port to the larger ships, which must anchor offshore. This cumbersome and inefficient logistical process increases the cost of traded goods and hinders economic growth (FAO, 2021b; Global Security, 2022). The absence of adequate handling and storage facilities makes transshipment impossible in the port of Sao Tome, forcing larger fishing vessels (including European Union vessels) to transship offshore (Carneiro, 2011).

Sociocultural elements

Actors' interviews revealed that VC activities are not linked to any beliefs. Nevertheless, rituals or customs associated with fishing activities might exist in certain communities. Indeed, Santos, da Conceição and Bolingo (2017) describe that, in Neves, the opening of the scoop net (*voador panhã*) fishing season is marked by the "ritual of the *voador panhã* harvest". At the beginning of the *gravana* (dry) season, the oldest fishers choose "two generous fishers" to conduct the first harvest, who must spend the night outside their houses in isolation before going to the first harvest. Half of the catch will be hung at the church's door (for blessing) and at the cemetery entrance (so the deceased know the ritual has been completed), with the remaining half shared among the community to be feasted on.

Techniques employed in VC activities are embedded within a robust framework of traditional ecological knowledge. Most fishing and processing techniques are transmitted traditionally from one generation to the next, typically within the family, but also within the community (VC actor interviews; Porriños, 2020a). Purse seine and other net fishing techniques are an exception, since they were introduced in the 1980s by foreign actors (Santos, da Conceição and Bolingo, 2017). Most fishers use visual navigation, triangulating their position using

landmarks to find fishing grounds with an accuracy of tens of metres (field observations). While the exclusive reliance on this system (i.e. not using GPS) exposes fishers to risks such as fog or intense rains (World Bank, 2011), it also provides fishers with an exhaustive knowledge of the geography of the islands, as well as habitat distribution (field observations). Finally, processors and retailers' activities also allow them to gain sound understanding on fish properties and even aspects of their biology, such as diet, parasite infections and even reproductive biology (i.e. flying fish is processed in large quantities and the ovaries are kept for consumption).

While fishers tend to be secretive about their fishing grounds to avoid competition (field observations), VC interviews also revealed that they value working together, explaining that fishing activities require group work and a collaborative spirit. On the contrary, half of the interviewed palaiês distrusted working with other palaiês, which is consistent with previous findings (ADF, 2017). Nevertheless, a greater sense of mutualism can be found in some communities; for example, some palaiês in Porto Alegre described pooling resources together and working in informal groups, a system based on friendship and trust (VC actor interviews; Porriños, 2020a).

Women in Sao Tome and Principe do not fish due to sociocultural reasons (KII, 2021; Nuno *et al.*, 2015; Porriños, 2020a), and this VC assessment indicates that other social norms also disadvantage women. Findings on this study confirm previous reports of occupational sex segregation in Sao Tome and Principe, with women's occupations confined to activities more closely aligned with the traditional role of women in society (VC interviews; Kirkwood, 2019).

Food consumption habits are supportive of the value chain. As explained in Section 3.1.6, customers value coastal pelagics positively as an accessible source of protein and as an integral part of traditional Santomean cuisine. Indeed, some emblematic dishes (such as *molho no fogo*) are traditionally prepared with fresh or processed coastal pelagics.

The natural environment

The islands of Sao Tome and Principe have a coastline of approximately 209 km (143 km in Sao Tome and 66 km in Principe). The continental shelf is narrow in places, and the total surface area is 1 657 km² (440 km² around Sao Tome island and 1 220 km² around Principe Island (World Bank, 2019), with an EEZ of 160 000 km², which is 160 times larger than its terrestrial surface (1 001 km²) (Santos, 2017). All areas within 12 nautical miles from the coast are reserved for national fisheries; foreign fishing is prohibited except with special government permission.

Regional geography

Sao Tome and Principe volcanic islands are in line with two Equatorial Guinean islands, Bioko (at 300 km) in the northeast and Annobón at the southwest. These four islands create a line

with a north-northeast-south-southwest orientation, traced through the recent volcanic formations of the Mount Cameroon region and a succession of seamounts (noteworthy underwater are the Bioko Escobar Bank, the Chaillu Seamount and the Guinea Seamounts).

The coast is rocky and very steep, with a shelf break on both islands around 80–100 m depth and bottom depths typically greater than 1 000 m off the shelf. The shelf is relatively flat and hard with patches of coral and stones and with sandy substrate in between (EAF Nansen Project, 2010).

Biodiversity

Sao Tome and Principe has high marine biodiversity, with more than 180 species living in the waters surrounding the islands. A considerable share of these species has a high market potential, with 71 demersal species having market demand and 35 having a very high market demand. Likewise, 30 pelagic species have a good market potential, and 10 pelagic species have a high market demand (Sy and Soares Diogo, 2019).

The two islands group the more important centres of the coral ecosystem of the Atlantic coast of Africa with high biodiversity, including various endemic species (Rapac-Ecofac, UICN and EOS.D2C, 2015). However, the coral reefs of Sao Tome have been degraded by the extraction of materials to produce lime.

Climate

The climate of Sao Tome and Principe is tropical with one long rainy season lasting nine months, from September through May, and producing an annual average rainfall of 900 mm (up to 2000 mm in Principe). The rainy season is interrupted by a short period termed “gravanito”, which occurs during the months of December and January. During this short period, a decrease in rainfall and average air temperature is observed. The occurrence of this intermediate season is dependent on the intertropical convergence zone. A three-month dry season termed “gravana” lasts from mid-May through August or September. Mean temperatures vary a few degrees throughout the year, ranging between 22 °C and 26 °C. The lowest average temperatures occur during the gravana season, while the rainy season experiences higher temperatures.

Coastal pelagic abundance will depend on the species and the season, breeding season and/or the arrival of migratory species such as flying fish (Horemans, Gallène and Njock, 1994). During the gravana, there is a decrease in fishing efforts because of strong currents, waves and wind (Santos, 2017).

Ocean currents and water temperature

Water circulation in the Gulf of Guinea is dominated by the Guinea Current that flows parallel to the coast from Senegal to Nigeria and the Southern Equatorial or Benguela Current that

flows north along the coast of Sao Tome and Principe and then in a westerly direction along the equator.

The Guinea Current has a strong influence on the physical environment (EAF Nansen Project, 2010). This influence occurs especially around the island of Principe, where surface waters tend to have particularly high temperatures (28–29 °C) and a relatively low salinity (33–34‰). To the southwest of the island of Sao Tome, there may be an upwelling effect that creates a decrease in temperatures (down to 23 °C) and an increase in surface salinity (up to 36‰). Therefore, the overall conditions are not very favourable for intense primary productivity (Rapac-Ecofac, UICN and EOS.D2C, 2015), and assessments of chlorophyll production carried out in the framework of the N/O F. Nansen campaign in 2010 present some poor plankton activities.

Climate change⁹

Temperature: Sao Tome and Principe experienced an increase of 1.5 °C in average annual temperatures between 1951 and 2010. The island of Principe has experienced a faster rate of increase in annual average temperatures than the southern island of Sao Tome. Tadross (2011) forecasts a temperature increase, estimated at 2.25 °C, which would influence the reduction of surface marine resources in the coastal waters of Sao Tome and Principe in the time horizon of 2040–2060 (National Biodiversity Strategy and Action Plan 2015–2020 – NBSAP II, Ministry of Infrastructure, Natural Resources and Environment, 2016).

Precipitation: Mean annual precipitation decreased between 1951 and 2010 at a rate of 1.7 mm per year. March through May seasonal rainfall has significantly decreased since 1960 at an average rate of 10.5 mm per decade. October through December seasonal precipitation has also decreased but is not statistically significant. The extent of the dry season, the gravana, has lengthened in recent decades.

A study on the impact of climate change on fisheries in Sao Tome estimates that the maximum possible catch in Sao Tome and Principe may decrease by up to 40 percent in 2050 (Serkovic and Million, 2019; World Bank, 2019), and between 44 percent and 63 percent in 2050 (based on data published by Cheung *et al.* in Barange *et al.*, 2018). Other studies speak of a loss of artisanal fish catch that can reach up to 50 percent by 2040/2060 of the current catch level (Carrasco, Pinto da Costa and Séca, 2017).

Marine and coastal protected areas

In Sao Tome and Principe, the management of the environment and protected areas is governed by laws No. 10-1999 (Basic Environmental Law) and No. 11-1999 (Law on the

⁹ climate change knowledge portal of the World Bank (<https://climateknowledgeportal.worldbank.org/country/sao-tome-and-principe>).

Conservation of Fauna, Flora and Protected Areas). These general laws have been complemented by specific laws for the classification of national parks. The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat came into force in Sao Tome and Principe on 21 December 2006 with the designation of the Tinhosas Islands.

The following four protected areas are considered as having a marine and/or coastal footprint in Sao Tome and Principe (Rapac-Ecofac, UICN and EOS.D2C, 2015):

- Obo do São Tome Natural Park
- Obo do Principe National Park
- Tinhosas Islands Ramsar Site
- The Principe Biosphere Reserve

Governance analysis (linkages)

Vertical linkages

The coordination of actions across the value chain is an important element of governance. The relationships between the different actors and the decisions taken will make possible the product's journey from production to the final consumer. In the case of Sao Tome and Principe coastal pelagics VC, actors at different functions are linked to each other through diverse connections, though often highly informal and not well coordinated. The transactions in the VC are mostly conducted through spot market transactions and verbal agreements which fluctuate in accordance with capture's seasonal variability.

In general, the Sao Tome and Principe fishing sector is still informal (survey, 2021), with use of artisanal fishing and processing methods and basic sectoral organization. Production and marketing, as well as input supply, are not well structured. For instance, contracts are verbal and based on mutual trust (survey, 2021). Furthermore, there is no specific actor or stakeholder (from the public or private sector side) effectively managing the coordination of the whole value chain.

Most VC actors operate individually instead of in coordination with their buyers or suppliers (e.g. fishers go fishing without knowing how much quantity is needed by their potential buyers), following a non-structured product flow management. In the case of palaiês, they generally rely partly on regular providers, but operate without formal contracts and seem to be very flexible on fish species or even on product presentation (fresh or salted). Furthermore, none of the palaiês interviewed have contracts with their clients; they reach verbal agreements, accepting payment for their products mainly in cash but also with credit. However, some short vertical relation can be found between fishers and palaiês at the financial level. Indeed, even if it is informal, many palaiês will pay fishers once the product is sold, while others fund fishers in exchange for the fish caught to pay off the credit given.

Even if the general VC analysis shows a low level of vertical linkages, some projects have aimed to structure actor coordination. In the 1990s, within the framework of the International Fund for Agricultural Development (IFAD) funded programme Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme (PAPAFPA) (IFAD, 2019), around 29 associations of mixed fishers and palaiês were established and still exist today despite their limited activities. The creation of associations was a precondition for receiving support at the community level and to access credit. This has stimulated an initial development of associationism, also encouraged by the ownership of infrastructure. A national federation grouping these associations was created, but it was not active at the time of this study due to lack of leadership.

The wholesalers VC actors in Principe island can be presented as slightly different, having needed to develop a higher level of organization to ship dried fish to Sao Tome island. Fish is dried by wholesaler palaiês with support of external workers (no formal contract). A number of these wholesalers coordinate shipment and sell generally to Bobo Forro market retailers. This scheme, based on informal agreements, is followed by around 65 market retailers in San Tome. This case and a few examples of retailers organized to supply some restaurants are marginal examples of vertical coordination in a value chain where few coordinated links exist between supply and demand.

The public sector does not bring vertical coordination support; the survey shows that there is not a defined framework of collaboration between the public and the private sector. With regard to the VC of coastal pelagics, the connections between actors and the public sector are made with interactions at the landing sites and at the market levels. The fishers and palaiês complain about the low representation of public agents in the field for training, technical and financial support, and lack of governance in general. An estimated 74 percent of the stakeholders consider that public policies do not really support the development of the activities of the national VC coastal pelagic fisheries (social stakeholder interview, 2021).

This lack of coordination impacts standards and product quality since quality specifications for the supply are not required. When fish quality is compromised or not sold within the day, the fish is processed (salting/drying) or consumed by the actors in the value chain. As the supply of certain coastal pelagics depends on seasonality, the lack of vertical organization (and horizontal also; see next section) will increase the impacts on prices in the local market.

A temporally successful example of vertical linkages was established from 2014 to 2016 by the National School Feeding and Health Programme (PNASE, in Portuguese). PNASE developed contracts with some palaiê associations to supply fish to school canteens. However, the experience finalized after PNASE failed to pay the associations in due course because of long bureaucratic processes (KII, 2022).

Horizontal linkages

Interviews with VC actors suggest that horizontal coordination between the actors at the level of the value chain is uncommon. Of note, 77 percent of fishers do not belong to any association or organization. The efforts of the PAPAFA programme in the 1990s to organize the value chain was not followed and maintained by VC actors (see Section 2.4.1); the associations that were created still exist but with low levels of activity. Some projects such as the Project to Strengthen Civil Society for the Socio-Economic Development of the Fisheries Sector (PROFOPESCAS) have tried, and some NGOs (MARAPA, Oikos) are still aiming to revitalize associations while also providing them with legal entity guidance if necessary (Sy and Soares Diogo, 2019).

At the fishers' level, coordination and cooperation are limited to small clusters that share fishing material or boats. However, this does not apply to conflict resolution among different fishing communities, as evidenced by the existing conflict between fishers from the north and the south of the island of Sao Tome (see Section 2.3.1.1.) despite efforts by local NGO projects (MARAPA and Oikos) to facilitate dialogue and develop co-management initiatives (Le Douguet, 2018). Additionally, some development projects have partially failed to properly manage community infrastructure built to improve landing sites, the cold chain and the marketing system, whether due to such factors as poor management or a lack of community involvement and ownership (Serkovic and Million, 2019; ADF, 2017).

The weaknesses of horizontal linkages is also witnessed in the low level of organization of fishers at the economic and technical levels. Resources are mainly derived from community and family levels; no banking services are used, and only 11 percent of fishers have bank accounts (questionnaire analysis, 2021). At the technical level, traditional methods still dominate, especially with the use of dugout canoes (90 percent); poor equipment and engines prevent fishers from going far from shore in bad weather conditions and increase their security risk at sea. This lack of coordination between VC actors is also found at activity and food safety governance levels. Registration and monitoring of fishing activities are low, and no containing controls are applied to comply with national food safety requirements.

However, some examples of existing horizontal organizations are found in the relation between fishers and owners of fishing equipment and equipment (net, boat and engine). The owner will receive as income a percentage of the capture's value, while fishers can fish and keep the remaining income after having paid for the use of the equipment. This type of organization and coordination relies on a few individuals and remains informal without having an important impact on sector organization.

The commercial strategy adopted by palaiês and retailers can also illustrate the lack of horizontal coordination: Each palaiê prefers to process and individually transport the fish to market (Sy and Soares Diogo, 2019). There is no coordination and cooperation in using public transport, which affects sector efficiency and profitability. But this absence of coordination

when resources are available seems to change when the catch is not abundant; indeed, in the case of low supply, fishmongers do consider collective commercial actions, entrusting some to trade the fish for collective benefit (Sy and Soares Diogo, 2019).

The lack of horizontal linkages can also be found at the financial level where most palaiês rely only on family support, as few organizations provide access to loans or financial support. Furthermore, only one-third of the surveyed palaiês belong to an association, which also have limited activity. According to Bragança Gomes *et al.* (2018), this lack of horizontal linkage leads to important price volatility coupled with catch fluctuations due to seasonality and fish stocks.

2.4.3 Factors that influence governance

Market power

The market structure of coastal pelagics is one of the main drivers of value chain organization. The entire production is traded at the domestic level with no exports. The demand for coastal pelagics, considered an inexpensive food (Le Douguet, 2018), is high as the country's population is increasing. This high demand is one of the main factors influencing VC governance, as fishery products reach final consumers despite the lack of formalized and improved supply. Consequently, there are few requirements for improving supply quality and standards.

Most of the products lack special conservation measures even when some palaiês salt dry their fish after failing to sell them in a day to avoid spoilage, as described in Section 2.3.1.2. To bring about significant changes in terms of quality, professionalization and adoption of good practices, the issues of food safety and the organization of the cold chain in the value chain must be improved (Sy and Soares Diogo, 2019).

Most VC actors, palaiês and fishers, say they have a "small to a medium level" share of the market, just as their competitors do and, therefore, have a limited capacity to influence the price and market (interviews with VC actors, 2021). Most of the time, prices are negotiated between buyers and sellers based on the product quality and quantity.

Trust

As most of the sector relies on informal contracts and financial connections, the trust between VC actors is core and is extended in the VC. However, the survey reveals a few comments about internal VC actor trust challenges on payments, as well as issues with theft when transporting fish from Principe to Sao Tome or storing the fish overnight in the rooms of the market. Trust in public sector governance is impacted by its weaknesses, as there is little to no control on the number of fishers, boats and catch size. The national fishing sector has an open access policy (that is, no limitation on the number of boats). Though fishing capacity is registered through fishing boats at the Port Captainty/Coast Guard, the database is not maintained in real time: Most of the operators do not hold licences and permits, and data on resources, fishing effort, and product volume and quality are limited. Thus,

management of fishing capacity for small-scale and semi-industrial fisheries is not fully controlled and the little data that are collected are not integrated for optimum use (Serkovic and Million, 2019).

Social capital

Because the fisheries sector is a highly artisanal sector, social structure plays a major role in sector governance. It has been observed in the section on horizontal linkages that sector organization displays poor coordination and cooperation. Associations and economic grouping of actors still do not provide the important organization and effectiveness necessary for development of the sector. At the social level, community organization continues to constitute the main roots of the value chain structure.

In the fishing sector, the main providers of finance and labour are family and community support, which serve, for instance, to acquire canoes or find crew members, though the government also subsidizes some of the purchases and labour (see Sections 2.3.2.1.1 and 2.3.2.1.2). The same structure exists at the palaiês level, as most fish palaiês start their businesses with family support.

Formal and informal rules

Formal rules lack efficiency and enforcement. Weaknesses have been reported, including in the registration process as well as in the standards and conformity of fishing gear; there are also cases of probable corruption (expert interviews, FISH4ACP). Informal rules are important in the value chain structure as the relations between stakeholders are mainly informal and based on trust. The existing conflict between northern and southern communities in Sao Tome shows that the access to the sea and the use of traditional fishing grounds need to evolve from informal to more formal rules.

- Several incidents have occurred in the southern part of Sao Tome island. According to fishers, the incidents are almost always caused by fishing techniques used by fishers from the north (surrounding net fishing), which requires a large space to implement. Under current fisheries legislation, fishers from the south cannot prevent northern fishers from fishing in their areas. However, they have the right to ask the competent authorities to establish a DUTP (Direito Territorial nas Pescarias, a territorial law in fisheries) (Serkovic and Million, 2019).
- There are concerns about marine protection areas initiatives and their potential impacts on fishing activities. Reports of disrespect for marine areas and resource exploitation “irrationally” have been made in the 2019 International Union for Conservation of Nature (IUCN) and Global Environment Facility (GEF) reports.

3 Sustainability assessment

In this section, the analysis shifts from the structural and behavioural dimensions of the VC to its performance in terms of economic, social and environmental impacts.

Economic analysis (economic snapshot)

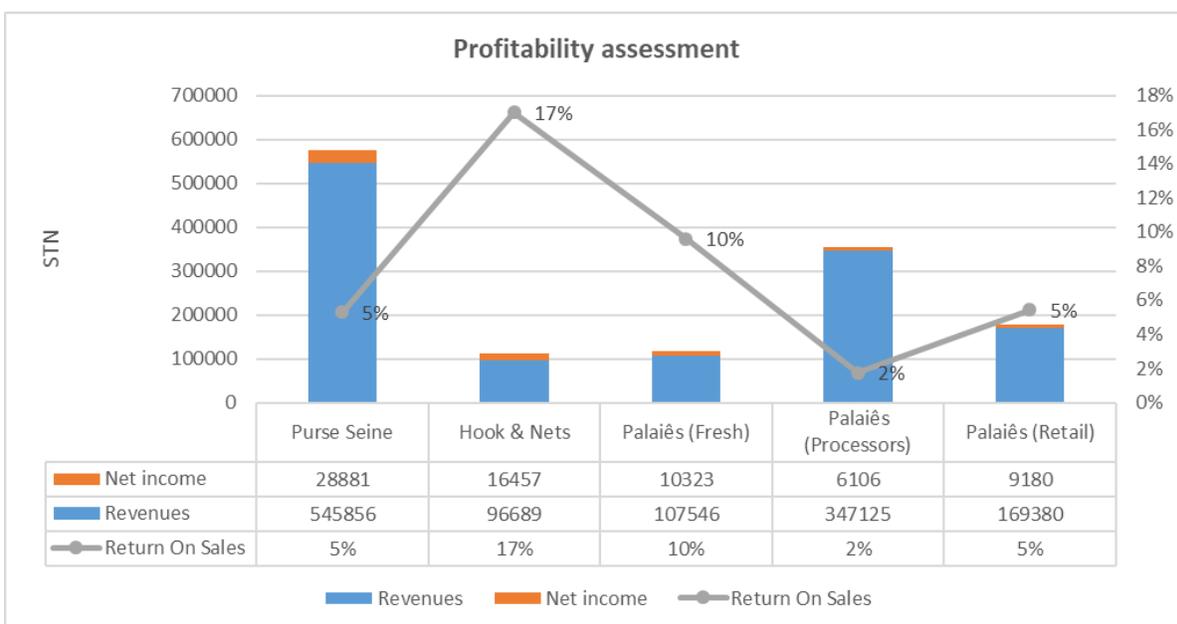
The economic analysis focuses on the actor level and value chain-level contributions to economic growth. It contains six main domains: (i) profitability (financial analysis); (ii) employment; (iii) value added; (iv) effects in the national economy; (v) international competitiveness; and (vi) value for end consumers. Each domain presents several sustainability impact indicators, which are later summarized in a sustainability heat map in Table 7.

The economic analysis is based upon primary data collected through detailed interviews with at least five actors for each actor type. The financial data are then formatted into an operating account to assess profitability, employment and value added. The operating accounts of each actor type are averaged to give indicators for each segment of the value chain, then multiplied by the total number of actors by actor type in the VC to provide indicators at the VC and national level. The limited but detailed data have also been cross-referenced through wider but less detailed focus group discussions, key informant interviews and surveys.

Profitability

As can be seen in Figure 12, the profitability analysis is highly focused on annual revenues, net income and return on sales for each typical (representative average) actor in the value chain. For fisherfolk, attention is focused on their share of volume catch of coastal pelagics, which amounts to 78.8 percent for purse seine and 49.5 percent for hook and line and gillnets. In their operations, they also catch other species, which would show an increase in revenues when compared solely with coastal pelagics. Operating accounts for both calculations, focusing only on coastal pelagics and also with other catch, can be found in Annex 3.

FIGURE 12. SUMMARY OF PROFITABILITY INDICATORS PER TYPICAL VALUE CHAIN ACTORS



Note: STN = Sao Tomean dobra.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Annual revenues, net income, return on sales

The actor capturing the most revenues in the value chain is the boat owner of the purse seine gear with STN 545 856 (USD 23 437). The boat owner has a high revenue, but also has many fixed and variable costs (boat, engine, gasoline, etc.), risks (days without catch, weather, fish stocks, etc.), a return on sales of 5 percent, and a yearly net income of STN 28 881 (USD 1 240). In comparison, fisherfolk with the hook and line and gillnets gear have a yearly revenue of STN 96 689 (USD 4 152), but also their expenses are lower, and they have a return on sales of 17 percent and a yearly net income of STN 16 457 (USD 706).

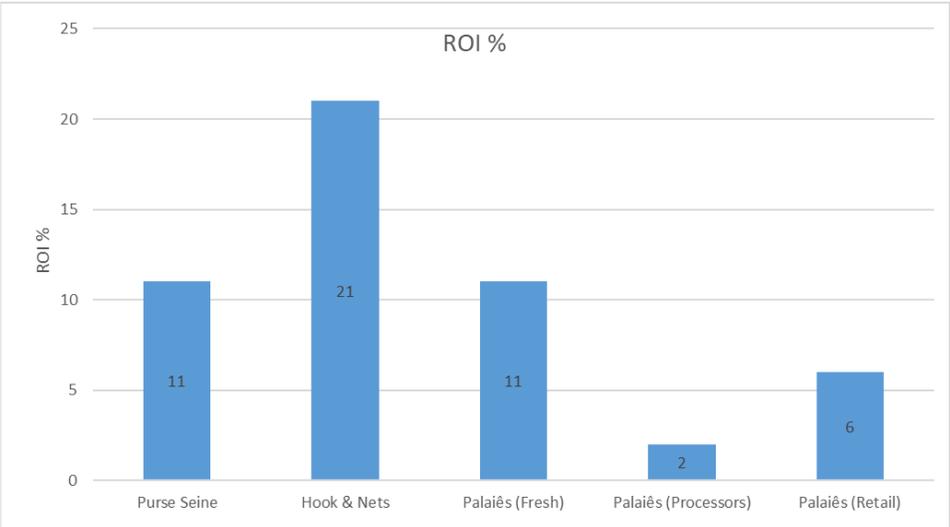
In the aggregation, processing and distribution sector, the palaiês who process and wholesale do not make much income from the operations. The majority of the processing is done on the island of Principe, and the dried fish is sent and sold in Sao Tome, which implies high transport costs and risks, even if a large amount of fish is shipped. The wholesale palaiês have a net yearly income of STN 6 106 (USD 262). These actors are below the national poverty line (STN 12 480 per year; STN 52/day = 2.2 USD/day) (INE, 2020) and the minimum wage of STN 13 200/year (USD 567) (USDS, 2017), but when accounting for their total catches other than coastal pelagics they rise above the line. Still, most of these palaiês only work in this activity part time, and therefore are able to farm or conduct other activities for their livelihood. Palaiês who retail also show a low net income. However, they also sell other bigger fish that have not been included in this analysis, which raises their yearly income. According

to field data collected, almost all the actors in the value chain talk about a declining profit in the last years because of more fishers and less fish in the sea (Survey, KII, Interviews 2021).

Return on investment

For the return on investment, Figure 13 shows a similar outcome to the return on sales, as the actors with the least investments and costs – namely the fishers using hook and line and nets and palaiês selling mostly fresh fish – have a higher return on investment.

FIGURE 13. RETURN ON INVESTMENT



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Employment

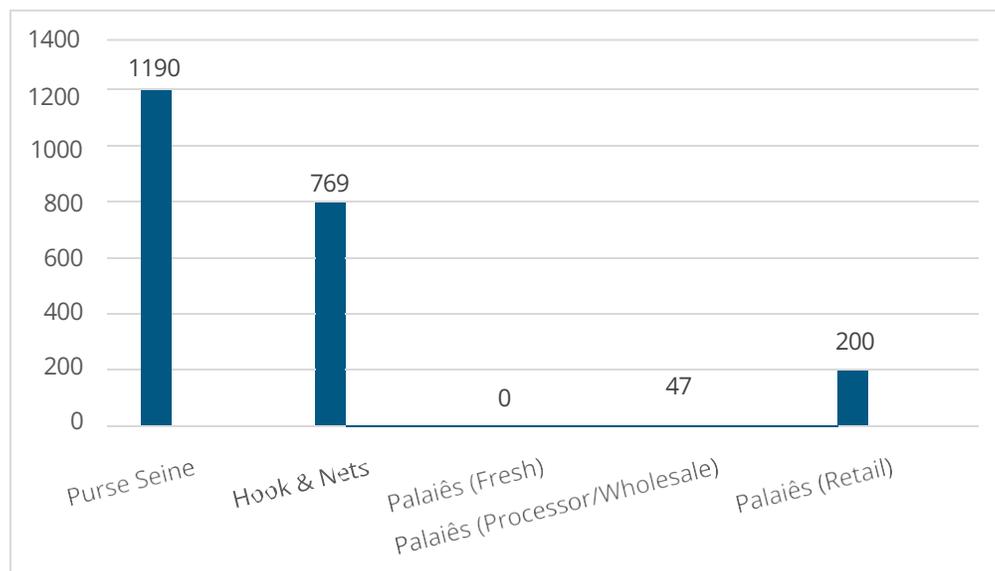
Because all the fishing gear target both coastal pelagics and other species, this section considers figures for the artisanal fisheries sector as a whole, not only information with regard to capture/process/retail coastal pelagics.

Number of jobs in full-time equivalent

The number of full-time equivalent (FTE) jobs created by all the core actors of the VC is 43 percent (2 206 jobs), while the numbers of self-employed actors in the value chain (5 087 jobs). At the individual actor level, the highest employment is on boats with the purse seine method, in which an average actor operates two boats with an average crew of 10 people working 10 hours a day. As for the hook and line and nets methods, it is usually undertaken by the boat owner when the boat lacks an engine, and with the help of a second fisher when the boat has an engine. However, at an aggregate actor level, as seen in Figure 14, because only 36 percent of the hook and line and nets employ a fisherfolk for the operations, the total hook and line and nets contributes 769 FTE jobs and 1 190 FTE, respectively.

For the palaiês, as the drying process is seasonal, the hiring of people to assist in the drying process comes to 47 FTE throughout the year, and fresh palaiês conduct the operations individually to squeeze in the most margin. The total number of jobs per year amounts to 2 206, with hook and line and nets contributing 34 percent of the jobs and purse seine 53 percent.

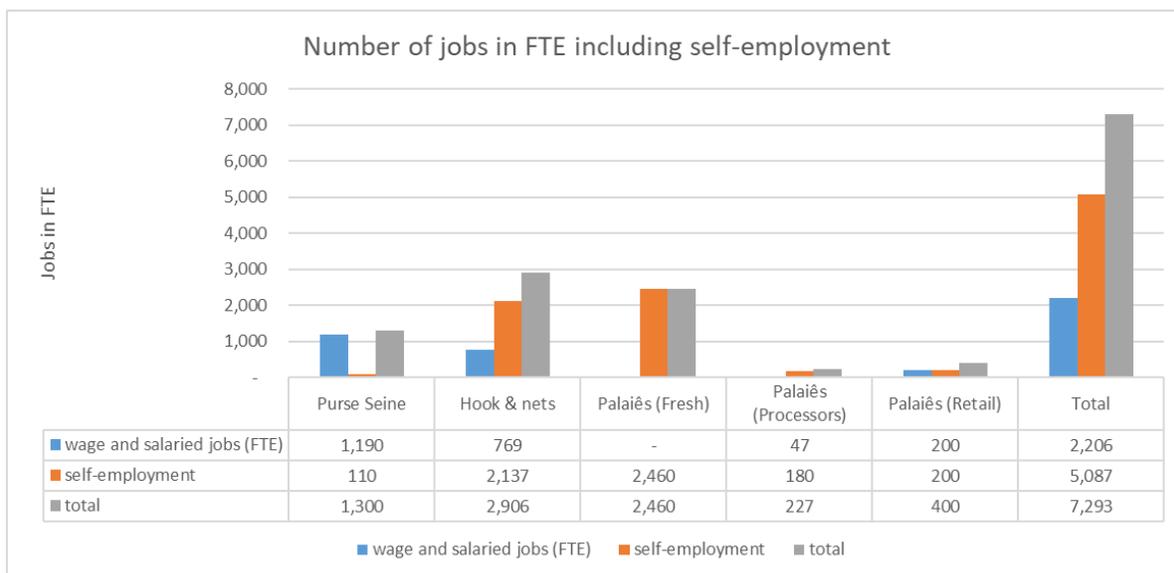
FIGURE 14. NUMBER OF JOBS IN FULL-TIME EQUIVALENT



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

If the self-employed are also taken into account, as seen in Figure 15, clear differences emerge between the self-employed (orange bars) and the employed (blue bars). With the fresh fish selling palaiês (2 460) all falling under the self-employed category, the sum of both self-employed and employed amounts to 7 293 people working in the VC.

FIGURE 15. NUMBER OF JOBS IN FULL-TIME EQUIVALENT (FTE) INCLUDING SELF-EMPLOYED



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

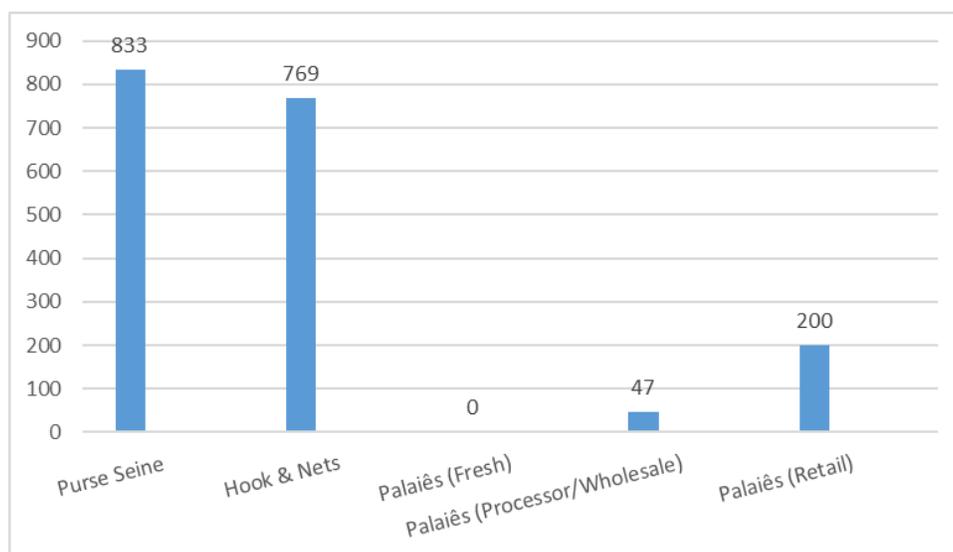
Number of full-time jobs

As the purse seine method hires 10 fisherfolk for its operations and only 36 percent of the hook and line and nets vessels consist of two fisherfolk, the number of full-time jobs created by the VC is 1 869, with 1 100 belonging to the purse seine and 769 to the hook and line fishery. Neither of the palaiês categories hire full-time, but they do offer sporadic and part time employment when the necessity arises.

Number of wage/salaried (hired) jobs

The total number of hired jobs in FTE in the VC is 1 849, or 83 percent of the total jobs (not considering self-employed) (Figure 16). Almost all of them come from the different methods of fishing because of the extensive workforce behind the operations.

FIGURE 16. NUMBER OF HIRED JOBS



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

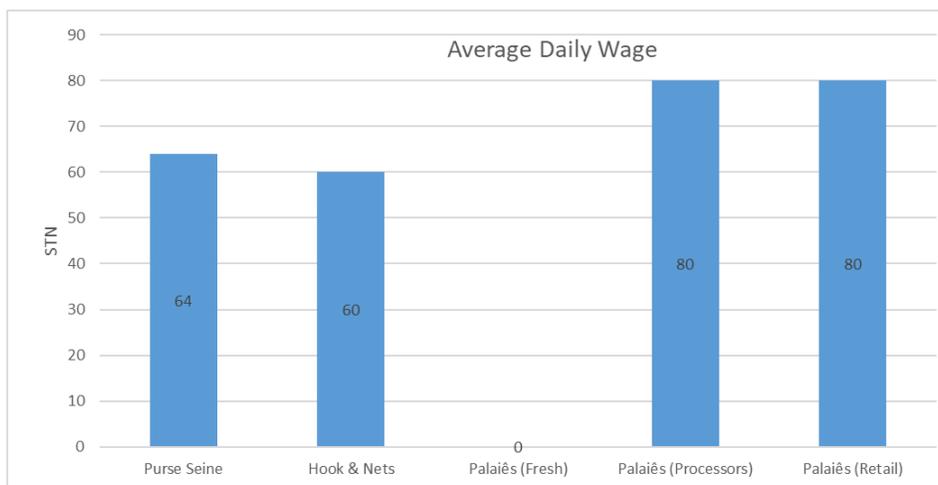
Number of wage/salaried family labour jobs

In the purse seine fishery, an estimate of 357 fishers were counted as family labour. Because much of the hook and line and gillnets are operated by one person and palaiês mostly operate individually, this analysis of family involvement does not apply to them.

Average gross wage paid to hired workers

Figure 17 shows the average gross wage paid to hired workers. On average, the fishing crew received between STN 60 (USD 2.6) and STN 64 (USD 2.7) per day, which is slightly above the minimum wage and the poverty line, as explained above. Although the amount the palaiês receives is slightly higher, STN 80 (USD 3.4), most of their jobs are sporadic and part time, and thus they are also able to earn their livelihoods in other ways. However, gathering stable and consistent data in this area was difficult, as the data are erratic and hard to quantify because of the nature of the payments, especially with hired fisherfolk.

FIGURE 17. AVERAGE GROSS WAGE FOR HIRED JOBS IN SAO TOMEAN DOBRA PER DAY



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A.& Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

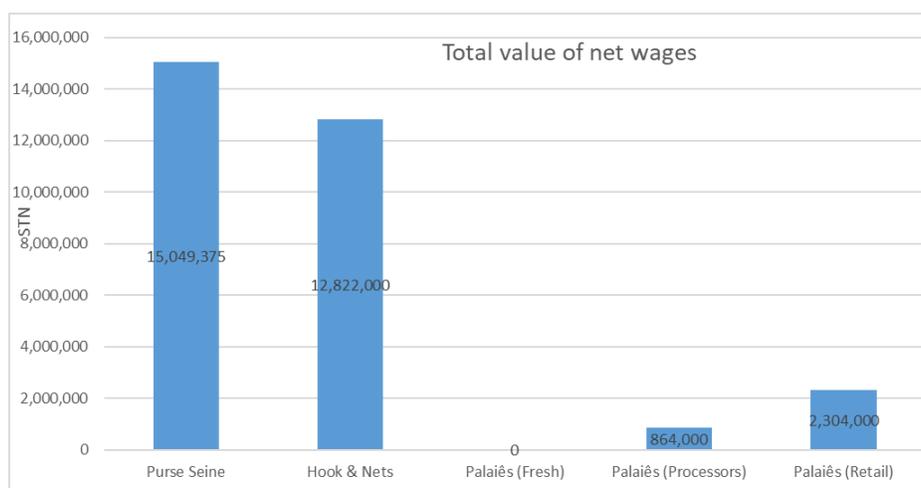
Average gross wage paid to family labour

In the limited data available, purse seine family labour wages were determined to be similar to those categorized as hired labour within the range of the previous hired labour wages, between STN 60 and STN 64 for fishing and STN 80 for palaiês.

Total value of net wages

Figure 18 presents the total value of net wages paid to both hired and family labour. The total amounts to STN 31 039 375 (USD 1 332 734) with purse seine contributing 48 percent.

FIGURE 18. TOTAL VALUE OF NET WAGES IN SAO TOMEAN DOBRA (STN)



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

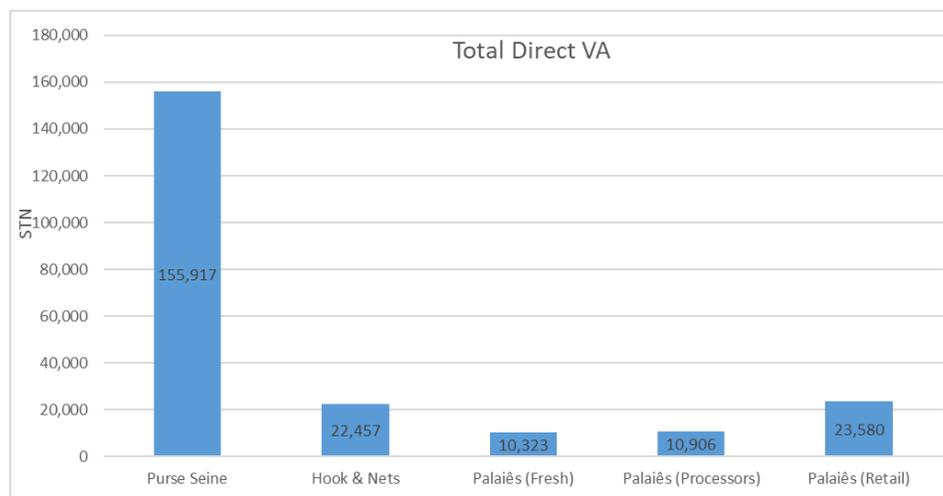
Value added

In the calculations for this section, only the share of coastal pelagics in the total catch was considered.

Direct value added

The total direct value added of the aggregated core VC amounts to STN 97 111 004 (USD 4 169 643). The direct value added is calculated by adding the gross operating profit to labour costs. Figure 19 shows the total value added at the actor level, where the purse seine is the highest contributor.

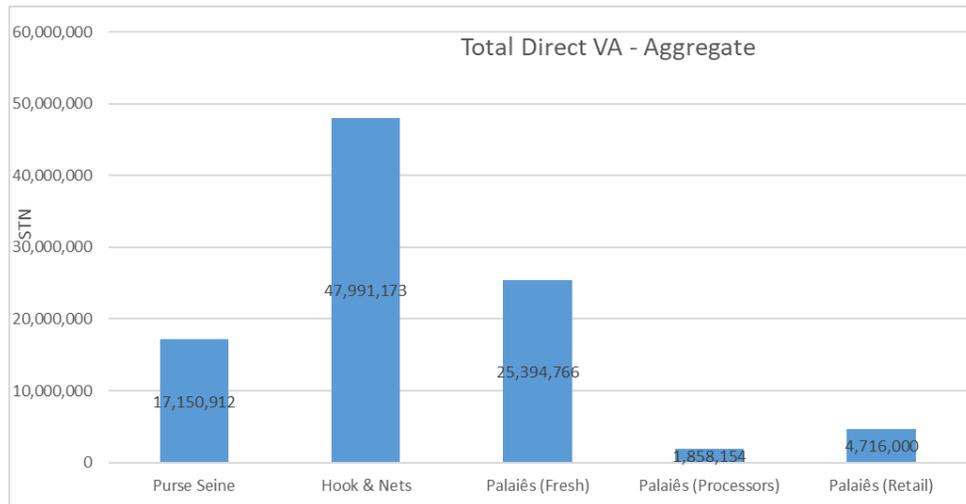
FIGURE 19. TOTAL DIRECT VALUE ADDED (VA) AT THE ACTOR LEVEL FOR EACH CORE VALUE CHAIN ACTOR IN STN CURRENCY



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

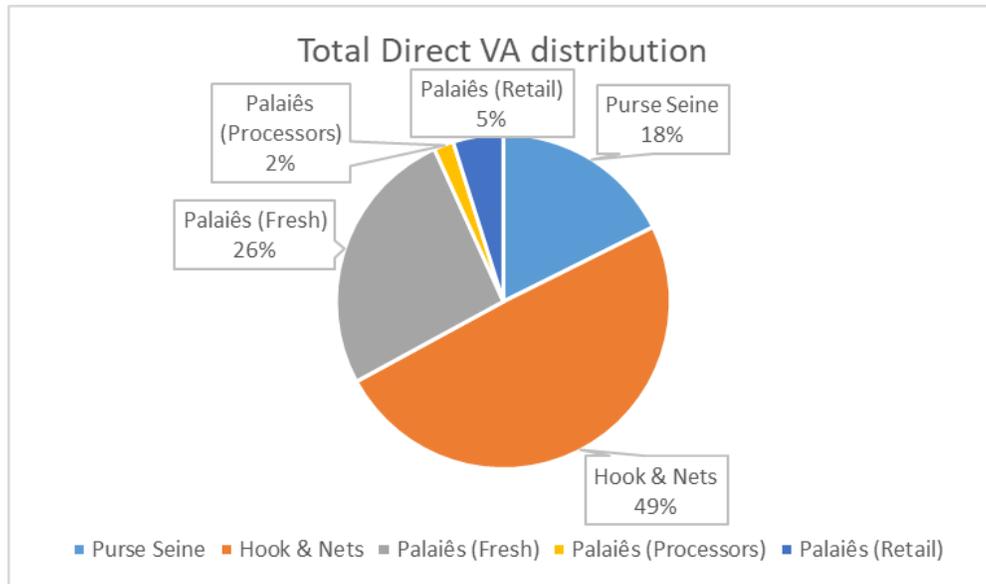
However, Figure 20 shows the total value added at the aggregate actor level and indicates that the biggest contributors are now the hook and line and nets fisherfolk, with 49 percent of the direct value added and the palaiês processors/wholesalers contributing the least. This results from the high amount of actors using this method of fishing.

FIGURE 20. TOTAL DIRECT VALUE ADDED (VA) AT AGGREGATE ACTOR LEVEL IN STN CURRENCY



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

FIGURE 21. TOTAL DIRECT VALUE ADDED (VA) DISTRIBUTION



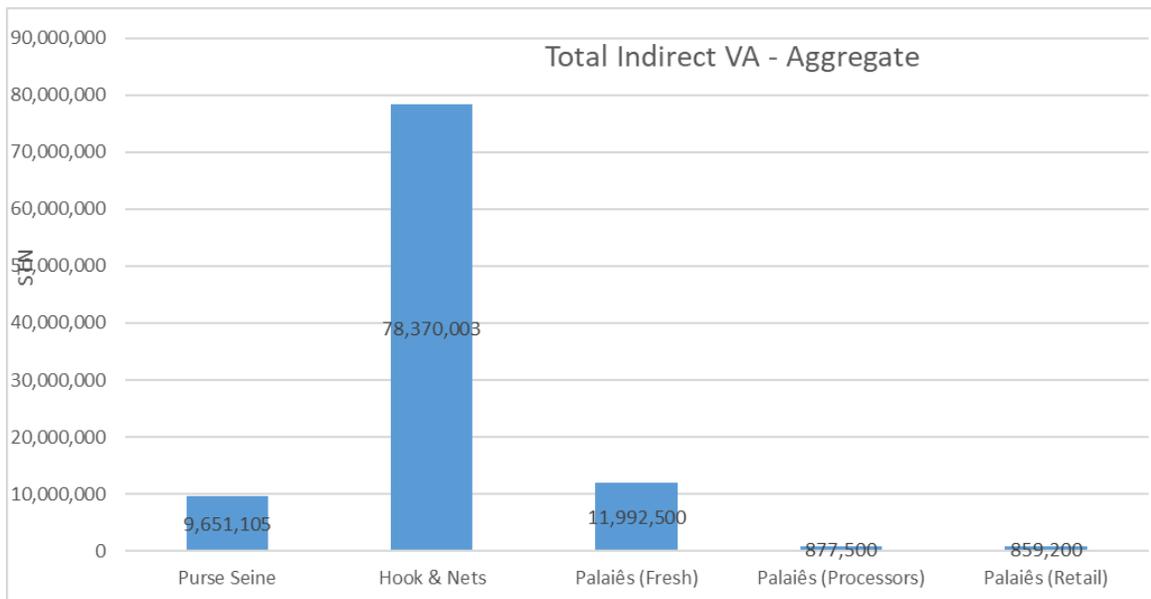
Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

In Figure 21, the pie chart shows the total direct value-added distribution within the value chain actors. Hook and line and nets fisherfolk make up the largest share of 49 percent in comparison to the lowest share of 2 percent from the palaiês processors.

Indirect value added

As for the indirect value added, it is calculated by taking into account the value added that is embedded in the intermediate consumables. The total indirect value added for all the VC actors amounts to STN 101 750 308, with hook and line and nets contributing the most with 77 percent and the palaiês retail the least with 0.8 percent (Figure 22).

FIGURE 22. TOTAL INDIRECT VALUE ADDED (VA) AT AGGREGATE ACTOR LEVEL IN STN CURRENCY

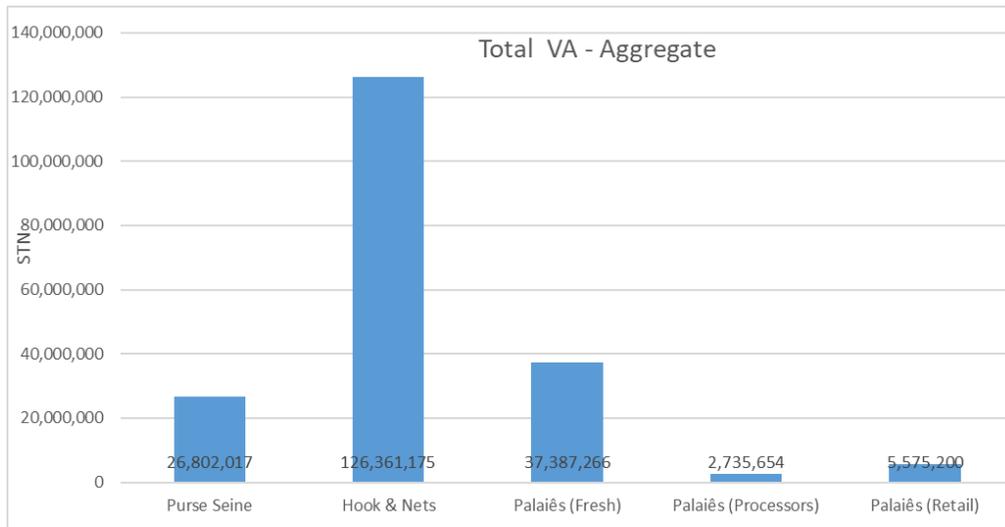


Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Total value added

The total value added is STN 198 861 312 (USD 8.53 million) and is simply the direct value added plus the indirect value added, with the highest contributor remaining the hook and line and nets (Figure 23). The analysis suggests that the production segment represents the highest share of value added (77 percent), followed by the commercialization of products, mostly the trading of fresh products. This is in line with the previous study conducted by Serkovic and Million (2019), which also indicated that the production segment is the highest contributor of value added.

FIGURE 23. TOTAL VALUE ADDED (VA) AT AGGREGATE ACTOR LEVEL IN STN CURRENCY

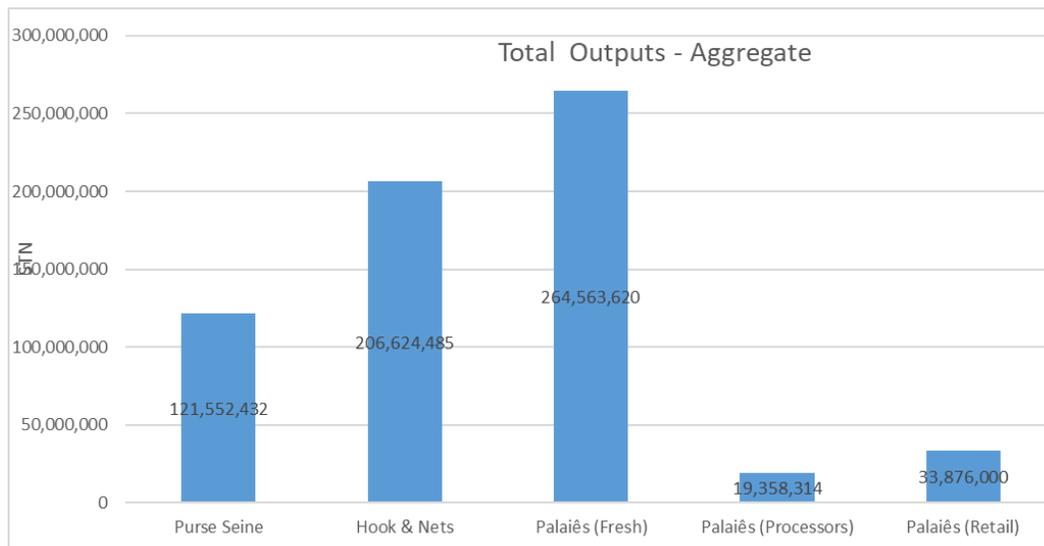


Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Total value of outputs

Figure 24 shows the total value of outputs in Sao Tomean dobra. The value is calculated by adding the sales of the product plus its self-consumption. The total for all the core VC actors is STN 645 974 850 (USD 27 736 146), with palaiês selling fresh fish contributing 41 percent.

FIGURE 24. TOTAL VALUE OF OUTPUTS AT AGGREGATE ACTOR LEVEL IN STN



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Effects in the national economy

Contribution to GDP

In 2020, the GDP in Sao Tome and Principe was estimated at USD 472 914 469 (World Bank Group, 2023). The total value added from calculations shows that it is contributing USD 8.53 million, which amounts to 1.8 percent. Notably, the operations that stem from the value chain of coastal pelagic provide an important livelihood for coastal communities as well.

Contribution to agriculture GDP

According to the World Bank, the GDP of agriculture, forestry and fisheries amounted to USD 66 208 026 in 2020 (World Bank Group, 2023). The VC contributed 12.9 percent.

Contribution to fisheries GDP

According to the National Assembly Diary (25 November 2021, II Series – Number 7), the fisheries GDP was estimated at USD 32 300 000, and the VC contribution was just over 26.4 percent.

Net impact on the balance of trade

Because there are no exports, though there are imported consumables, the balance of trade is negative.

Rate of integration

The rate of integration is 99 percent, which means that the majority of the VC is part of the national economy and the operations contribute to it.

Contribution to national budget

The contribution to the national budget is 2 percent (RTP Noticias, 2022), as there is much informal activity and many operations do not pay taxes.

Borrowing

Indicators related to investment and formal borrowing have not been calculated because of the low levels of investment and borrowing.

International competitiveness

According to the National Institute of Statistics, very minor quantities of fish were exported in recent years, around 8.3 tonnes in 2015 and 9.1 tonnes in 2016 (INE, 2017). Coastal pelagics are not exported from Sao Tome and Principe but instead are shipped and traded

between the islands; they are rarely imported, making them an important local resource of food and nutrition within the country.

The lack of general (sustainable) fisheries management, infrastructure facilitating build-up of a cold chain and hygiene standards verified by a competent authority hinders the country from entering the global marketplace of fish with its products.

Value for end consumers (domestic)

Consumer price benefit surplus

Fish is easily accessible for domestic end consumers, and the price is relatively inexpensive compared to direct substitutes. The actors in the VC take advantage of their role, and their catch contributes to their nutrition. Fishing for self-consumption represents around 18 percent of hook and line and nets fishing and 3 percent for purse seine fishing.

Number of annual food safety violations recorded in the VC

The number of food safety violations are difficult to measure because of the lack of data availability and the weak control system in place along the entire VC. However, interviews with value chain actors confirm that the general deficit of hygiene throughout the value chain leads to a poor safety level of fish products on the domestic market, increasing the health risks for consumers; this finding was also noted by Serkovic and Million (2019). There is an understanding that the food safety and quality of coastal pelagics need to be improved. This is especially relevant for palaiês who distribute and dry the fish, as in many instances they lack the necessary equipment and space for safeguarding health standards.

Consumer evaluations of the different fish products

As mentioned in the survey in Section 2.2, almost 60 percent of consumers indicated that coastal pelagics are the most popular commodity, followed by demersal fish, large pelagics, pork meat and chicken legs, showing how relevant fishery resources are in Sao Tome and Principe, particularly coastal pelagics.

As part of the survey, consumers were asked to rate five characteristics – taste, price, quality, convenience and nutrition – from 1 to 5 to indicate which ones were the most (1) and the least (5) important. Table 6 shows that price is generally the characteristic most valued and taste the least important, with quality, convenience and nutrition rating mainly 4. The general low rate given to four of the five characteristics analysed may be due to the comparison of coastal pelagics with large pelagics or demersal fish, which are generally more valued by local consumers. However, practically all respondents said that they would like to buy and consume more coastal pelagics.

TABLE 6. COASTAL PELAGICS CHARACTERISTICS RATING BY CONSUMERS

	Flying fishes	Little tunny and frigate tuna	Bigeye scad	Scadnei	Blue runner	Balao halfbeak	Skipjack tuna
Taste	5 (42.1%)	4 (45.8%)	5 (56.0%)	4 (40.7%)	5 (49.3%)	5 (48.8%)	5 (45.5%)
Price	3 (28.2%)	3 (32.1%)	2 (26.8%)	3 (33.0%)	2 (31.1%)	4 (32.1%)	2 and 3 (26.3%)
Quality	4 (41.6%)	4 (50.2%)	4 (48.3%)	4 (49.8%)	4 (47.8%)	4 (48.8%)	4 (54.1%)
Convenience	4 (48.3%)	4 (42.6%)	4 (46.9%)	4 (45.0%)	4 (41.6%)	4 (45.5%)	4 (53.1%)
Nutrition	4 (39.7%)	4 (35.9%)	4 (43.3%)	4 (38.8%)	5 (45.5%)	4 (38.3%)	4 (42.1%)

Note: Range: 1–5; a score of 1 indicates most importance and 5 least importance.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO. Legend: between parentheses the percentage of respondents providing that score.

Economic analysis overview

Based on the analytical assessment of economic performance as discussed above, and using the FISH4ACP economic tool, an overview of economic performance of the coastal pelagics value chain is provided in Table 7 and Figure 25. A score in the range of 1 to 3 – with 1 being “highly concerning” (red); 2 being “concerning” (yellow); and 3 being “not concerning” (green) – is given to each subdomain of the six economic sustainability domains (i.e. profitability, employment, value added, effects in the national economy, international competitiveness and value for end consumers).

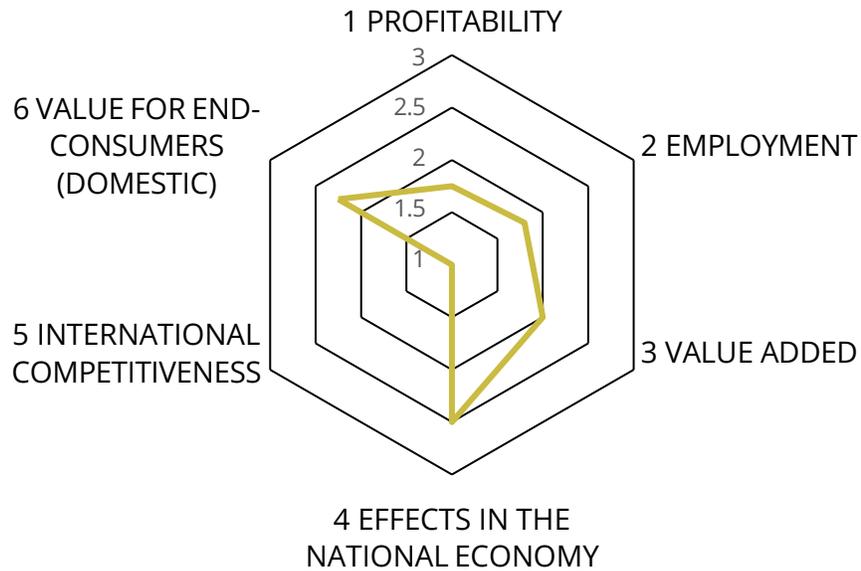
TABLE 7. ECONOMIC SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN

1. Profitability		
Net income	2	Concerning
Trend in net income	1	Highly concerning
Return on sales	2	Concerning
Return on investment	2	Concerning
Average	1.75	Concerning
2. Employment		
Number of jobs in full-time equivalent	2	Concerning
Number of full-time jobs	3	Not concerning
Number of wage labour jobs	2	Concerning
Number of family/self-employed jobs	2	Concerning
Average wage for hired workers	3	Not concerning
Average wage proxy for family labour	3	Not concerning
Total value of net wages	2	Concerning
Average	2.4	Concerning
3. Value added		
Direct value added at value chain level	2	Concerning
Total value added	2	Concerning
Average	2	Concerning
4. Effects in the national economy		
Contribution to trade balance	1	Highly concerning
Rate of integration	3	Not concerning
Public finances impact	3	Not concerning
Contribution to investment	3	Not concerning
Average	2.5	Concerning
5. International competitiveness		
International competitiveness	1	Highly concerning
Average	1	Highly concerning
6. Value for end consumers (domestic)		
Food safety violations	2	Concerning
Consumer evaluation	2	Concerning
Consumer preference	2	Concerning
Price relative to substitutes	3	Not concerning
Average	2.3	Concerning

Note: Scores range from 1 to 3, with 1 being highly concerning, 2 concerning and 3 not concerning.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

FIGURE 25. ECONOMIC SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Key issues, recommendations, risks and mitigation measures flowing from the assessment of performance are provided in Table 8.

TABLE 8. KEY ISSUES, RECOMMENDATIONS, RISKS AND MITIGATION MEASURES – ECONOMIC SUSTAINABILITY

Key issues	Main recommendations
<ul style="list-style-type: none"> • Negative trend and low level of economic performance of core value chain actors, making it a concern for the longevity of the sector, especially for palaiês • Low level of profit margins and high risks, but few alternatives in the job market • Perceived low trend in fish availability and competition with bigger boats • Palaiês have very low value-added contribution • Negative net impact on the balance of trade because of imports of inputs and no exports • High level of health risks attributed to lack of equipment, ice and refrigeration, and bad landing and selling practices • Lack of stock assessment, management and enforcement measures 	<ul style="list-style-type: none"> • Improve boats (capacity, safety, equipment), controlling the fishing capacity • Assist in making borrowing and financing available, also through cooperatives • Improve the ice and refrigeration chain; tackle the instability of electricity • General infrastructure creation/rehabilitation (roads, landing sites, markets, etc.) • Explore possible new taste/processing techniques to improve taste/higher pay of products • Improve the food safety of products by supporting better storage equipment and techniques (such as solar driers) • Assistance in creation of aggregation and coordination throughout the value chain • Conduct stock assessment and implement fisheries monitoring, control and surveillance (MCS) measures
Main risks	Mitigation measures
<ul style="list-style-type: none"> • Overfishing and depletion of stocks • Fierce competition and unregulated fishing grounds may lead to conflicts within the value chain • Informal sector, lack of contracts, regulations and taxes • Slim profit margins make the sector vulnerable to shocks 	<ul style="list-style-type: none"> • Stock assessment, management, MCS and enforcement measures • Formalizing the sector (with employment, taxation, enforcement of licences to support services to fishers and their safety and security) • New ways of increasing profits (through better quality products, innovation, cooperation, etc.)

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Social analysis (social profile)

Inclusiveness

Income and employment distribution

Wages in the VC are dependent on net profits and, therefore, dependent on the catch and sales (see Section 3.1.1). This VC assessment revealed that profits are highly inequitable (see Figure 12), with purse seine boat owners obtaining, on average, almost three times as much as the wages of fresh fish palaiês.

In total, the coastal pelagics VC contributes to 7 293 jobs, considering both core VC actors (5 087 FTE) and workers employed by the different firms (2 206 FTE) (Section 3.1.2). Given a population of around 210 000 people (INE, 2020), an unemployment rate of 8.9 percent (INE, 2017) and 48.8 percent of the population under 16 years of age (INE, 2017), this shows a total of 99 481 employed people in Sao Tome and Principe (assuming all those jobs are 1 FTE). Therefore, the jobs created by the coastal pelagics VC constitute 7.3 percent of the total jobs in the country.

Interviewed actors perceived that the coastal pelagics VC created equal-opportunity jobs for everyone. However, previous reports indicated that the VC activities might be affected by inclusiveness issues affecting other sectors of Sao Tome and Principe's economy. First, Sao Tome and Principe shows evidence of occupational sex segregation, with gender norms excluding women from fishing and restricting them to occupations with a lower income return. Second, sexual and gender minorities face discrimination and exclusion from the job market (USDS, 2017; World Bank, 2019). Additionally, Sao Tome and Principe shows deficiencies in facilitating access to people with disabilities at both the legislative and infrastructural level (see Discrimination, below).

Value-added distribution

The total aggregated annual net profit of all the actors in the value chain constitutes 34 percent of the total aggregated value added, and value-added distribution is inequitably distributed among VC actors. On the one hand, large differences exist between large and small producers, with the total value added at aggregate level captured by purse seine fishers (STN 26 802 017/year) comprising only 21 percent of the value captured by hook and line, gillnet and scoop net fishers (STN 126 361 175/year). Since the number of vessels using hook and line, gillnets and scoop net is much larger than that of those using purse seine, it appears that the purse seine method contributes less value added. On the other hand, these differences are even greater when compared with other actor types, as processors palaiês contribute STN 2 735 654/year of value added, fresh fish palaiês contribute STN 37 387 266/year of value added, and retail palaiês contribute STN 5 575 200/year. As mentioned in the previous subsection, net profit distribution in the value chain is also inequitably distributed.

Poverty and vulnerability

Sao Tome and Principe is classified as a lower middle-income country, ranking 137th out of 189 countries in the 2019 UNDP Development Index (UNDP, 2019). Two-thirds (67 percent) of the population lives under the national poverty line (STN 52/day = USD 2.2/day) (INE, 2020), and approximately one-third lives on less than USD 1.90 a day (World Bank, 2019). The last available census indicates that 47 percent of the Santomean population lives below extreme poverty conditions, with a per capita expenditure below the cost of a food basket containing minimum caloric needs. Most of these households are composed of couples with children and extended families, which indicates restrictions to children and elderly well-being (INE, 2020). In the coastal pelagics value chain, 65 percent of the surveyed fishers and palaiês households live below the national poverty line, and 43 percent of the households below the international extreme poverty level (USD 1.90). The incidence of extreme poverty was significantly lower in households with a fishing vessel (34 percent) than in households without one (45 percent). Income diversification of actors living below the poverty line was moderate, with 52 percent of actors conducting other activities. This was also true in agriculture (men and women); trading and/or crafting other products, such as food, clothes or basketry (only women); and welding or carpentry (only men).

Discrimination

The labour law prohibits discrimination in employment and occupation based on race, sex, religious belief, political affiliation, colour, age, disability, language and sexual orientation, although it does not prohibit discrimination based on gender identity and HIV-positive status (Código do Trabalho, Lei 6/2019, Art. 17, Assembleia Nacional, 2019). The law is enforced (USDS, 2017), and surveyed participants of the VC did not witness or experience discrimination in the workplace. However, at the national level, women, sexual and gender minorities, the elderly and people with disabilities still encounter obstacles and exclusion in Sao Tome and Principe. Although the constitution and legal framework provide women with the same legal status and rights as men, these are not explicitly recognized as they pertain to the family, child custody, labour, employment, owning or managing businesses or property, nationality or inheritance (USDS, 2017). Kirkwood (2019) says that women, particularly the elderly, still face significant discrimination (see Section 3.2.2). Although discrimination against people with disabilities is prohibited by law, the installation of accessible infrastructure in most buildings or transportation services are not legally mandatory; and most children with disabilities attend the same schools as children without disabilities (USDS, 2017). The law does not criminalize consensual same-sex activity, but antidiscrimination laws do not explicitly reference lesbian, gay, bisexual, transgender and intersex (LGTBI) persons. Sexual and gender minorities suffer discrimination in education, healthcare and labour market, and many live in poverty or without stable work (USDS, 2017; World Bank, 2019).

Gender equality

Women's economic involvement

Women comprise 42 percent of the jobs in the core VC occupying fish trading (2 687 fish palaiês) and food retailing jobs (400 food palaiês). However, the share of the total value added that women in the core VC capture is 30 percent to that of fishers, both purse seine and hook and line and nets (STN 153 163 192 per year), with STN 37 287 266 per year for the fresh fish palaiês, STN 2 735 654 per year for the processor palaiês and STN 5 575 200 for the food palaiês.

Although women surveyed in the value chain did not feel discriminated against in the workplace, Sao Tome and Principe shows important gender gaps that prevent it from achieving the Sustainable Development Goals (SDG) in gender (Kirkwood, 2019; UN Women, 2020). Women's access to assets, especially agricultural land, might be more restricted (Kirkwood, 2019) and, currently, only a small proportion of women own fishing vessels (KII, see Gendered access to productive resources, below). Likewise, there is evidence of occupational sex segregation (Kirkwood, 2019), with women tending to occupy less skilled and lower remunerated jobs and also working in sectors that are more closely aligned with traditional ideas of women's role in society (Kirkwood, 2019). Cultural norms prevent women from occupying fishing jobs (KII, 2021; Nuno *et al.*, 2015; Porriños, 2020a) and, in the extended VC, women were not part of a fishing crew or in transport jobs, but rather occupied jobs as a repairperson for fishing nets or ice and salt providers.

Gendered division of labour

Capture activities are typically the exclusive responsibility of men. They also carry out the first sale, which typically takes place on the beach upon arrival from a fishing trip. From this stage onward, women typically take care of all processing and commercialization of fish products (Carneiro, 2011; Nuno *et al.*, 2015; Porriños, 2020a).

Focus group discussions revealed that domestic work is conducted exclusively by women, including cooking, cleaning and child caring. Exceptionally, if women are not available (i.e. returning from the market), men might assume some domestic tasks, but never surpass more than three hours per week, on average.

None of the actors in the core VC have contracts of employment or contribute to social security. This makes fishing and fish trade equally informal for men and women. On the other hand, an equal share of surveyed fishers and palaiês (50 percent and 57 percent, respectively) declared having registered their activities at the Directorate of Fisheries (see Section 3.2.6). However, in the extended VC, the share of women with formal jobs was lower due to occupational sex segregation, as only fishing crew and transport jobs had contracts of employment (practiced exclusively by men).

Gendered access to productive resources

The coastal pelagics VC can be accessed in three ways: (i) fishing; (ii) purchase of fish (trade); and (iii) boat ownership (Porriños, 2020a). In terms of fishing, women in Sao Tome and Principe do not fish due to sociocultural reasons (KII interviews; Nuno *et al.*, 2015; Porriños, 2020a), except for some forms of subsistence fishing inland or line fishing from the shore, outside of coastal pelagics VC (Porriños, 2020a). In terms of purchase of fish, while women can still access the VC through trade, actor interviews revealed that the lack of alternative sources of income might restrict their access because of financial difficulties in starting their activities. In terms of boat ownership, women can access fishing tenure through boat ownership, since they have the same legal rights as men to register vessels in their name (KII Captaincy, 2021). However, the number of women boat owners remains low; approximately 30 percent of boat owners have been reported to be women (the exact percentage is unavailable).

Formal sources of financing do not offer credit to the fisheries sector, except, on occasion, for the purchase of fishing vessels. Likewise, only a low percentage of actors in the core VC had bank accounts, with no significant differences between men and women (11 percent and 9 percent, respectively). Informal financing was deemed scarce by men and women, and most VC actors funded their businesses with their own money. Only some palaiês had received credit from their association or from group savings and loans schemes (“chiquilá”, see Section 2.3.2.4). Cultural norms regarding asset ownership might restrict women’s free access to formal financing. Notably, 75 percent of agricultural land in Sao Tome and Principe is registered in the name of one spouse only, and in accordance with other countries of the region, it is likely to be in the man’s name (Kirkwood, 2019). This may hinder the capacity of women entrepreneurs to obtain credit and offer their land as collateral (Kirkwood, 2019). Moreover, Porriños (2020a) mentions that, in Principe, the only trader’s association that has formalized its credit system (see Section 2.3.2.4) requires that a woman trader, when offering an asset as collateral, must have the husband (if married) co-sign the loan contract.

Fish palaiês had similar access to non-financial support services as fishers and men boat owners (54 percent and 57 percent, respectively). However, none of the interviewed food traders (100 percent women) had received any technical training. Finally, both palaiês (traders) and fishers (men) reported difficulties accessing materials they needed for their activities (45 percent and 42 percent, respectively), such as ice and/or cooling facilities, and (in the case of fishers), GPS, first aid materials and safety equipment.

Women’s decision-making and leadership

Surveys revealed that in 63 percent of interviewed households the decision on how to spend money is made by the male head of the family, while in the remaining 37 percent the decision is made jointly. Women’s involvement in associations is slightly higher than men’s involvement, around 33 percent for women and 23 percent for men, which may not be representative because of the lack of activities of most of the associations. Additionally, while

the leader of an association explained that women have equal representation in decision-making processes, recent studies indicate that women still lack decision-making power within the mixed fisher and trader associations (Sy and Soares Diogo, 2019).

Food and nutrition security

Availability of food

Key informant interviews (KIs) with government representatives indicate that the current production of coastal pelagics does not satisfy national demand because there is not enough quantity nor the means to preserve the fish. Focus group discussions (FGDs) conducted in Principe island indicated that coastal pelagics are consistently available throughout the year, although their price might change due to seasonal abundance. However, in Sao Tome, customer surveys revealed geographical differences in fish availability. In coastal towns, suburbs and villages, coastal pelagics were perceived as consistently available throughout the year (80–100 percent of respondents), while for inland populations this percentage was lower (67 percent). At Bobo Forro, Sao Tome and Principe's main market and distribution point (located inland), 90 percent of consumers perceived an inconsistent supply of fresh coastal pelagics. This might indicate that the existing transport routes and networks negatively affect fish availability inland.

Accessibility of food

The population of Sao Tome and Principe depends heavily on fish for its protein consumption (Lövin, 2011). Coastal pelagics were consumed in all surveyed households and, in 97 percent of households, coastal pelagics were consumed by all members of the family. KIs revealed that the amount of fish is distributed equally among family members. However, FGDs and KIs also indicate that young children find coastal pelagics difficult to ingest because of the bones in the fish, which limits their nutrition. Currently, between 32 percent and 41 percent of children in Sao Tome and Principe suffer from malnutrition (Silva *et al.*, 2017). Moreover, discussions with experts indicate that 60 percent to 80 percent of consumers report difficulties buying fish (including coastal pelagics), resulting in an insufficient consumption of fish per capita.

Utilization of food

Expert interviews revealed that traditional cooking practices in the country contribute to food safety, as cooking at high temperatures kills most pathogens. However, fish preparation contributes to hypertension due to excessive use of salt. Additionally, salt is added to smoked fish, and salt-dried fish is often not entirely desalted before cooking. Currently, the sodium/salt consumption in the country is 6 g/day, which is 4 points higher than WHO recommendations (WHO, 2018). Moreover, high rates of Vitamin A, zinc and iron deficiencies indicate that there is a lack of dietary diversity (World Bank, 2015).

Fish contributes to 50 percent of the animal protein consumed in the archipelago (Le Douguet, 2018; Sy and Soares Diogo, 2019), with significant differences in the amount of fish consumed between inland and coastal communities (Belhabib, 2015; Carvalho *et al.* 2015). The consumption of fish and coastal pelagics per capita obtained in this VC assessment (consumer surveys, 2021) exceeded the total production of fish and was therefore discarded. Nevertheless, FAO (2019) estimated a fish consumption per capita of 29.3 kg per year, which is significantly higher than the average of sub-Saharan African countries. Applying the share of coastal pelagics present in the total catch (57 percent, see Table 2) to fish consumption per capita, this would return a consumption per capita of 16.7 kg per year of coastal pelagics.

Trends of food stability

FGDs and KIIs revealed that salt drying fish, the most common form of fish preservation, strongly contributes to stabilizing the supply of fish, and salt-dried coastal pelagics are consistently available throughout the year. However, the supply of fresh coastal pelagics is inconsistent because of seasonality. This is exacerbated by a lack of cold storage and ice production facilities, an intermittent energy supply, and a lack of resources for timely reparation and maintenance. Discussion with experts confirm previous findings by Porriños (2020a), which indicate that prices of fresh fish are higher during the rainy months from September to December and from March to May, when catches are lower. Moreover, FGDs and KIIs indicate that fish prices have risen over the past 5 to 10 years, and a KII reported a perceived decrease in catches as the cause of the rise in price.

Decent employment

Respect of labour rights

Low contract enforcement is strongly prevalent on Sao Tome and Principe, and the country's performance in this aspect is among the lowest in the world (ranked 185 out of 190 in the Doing Business 2020 Report, World Bank, 2020b). Indeed, actor interviews revealed that artisanal fishers and fish traders are informally self-employed and, therefore, do not have contracts of employment. Among the service providers, contracts were only held by the crew of fishing boats (25 percent had written contracts) and van or motorbike drivers (20 percent had verbal contracts). In total, only 14 percent of the men service providers had written or verbal contracts, while none (0 percent) of the women service providers had any type of contract (see Section 3.2.2).

Santomean law provides for the right of workers to form and join independent unions, conduct legal strikes and bargain collectively. However, there are no provisions governing collective bargaining rights, and the right to strike is strictly regulated, also allowing firms to hire replacement workers without consultation. On the other hand, workers in the public sector (the main source of formal employment) do not have collective bargaining rights, so these rights remain relatively weak (USDS, 2017).

Sao Tome and Principe's labour laws establish that normal working hours cannot exceed 8 hours per day, nor 40 hours per week, with 1.5 days off per week (Código do trabalho, Lei 6/2019, Art. 148, Assembleia Nacional, 2019). However, empirical evidence indicates that a significant proportion of VC actors and service providers exceed the maximum working hours decreed by the labour law. In the case of the fishers, surveys by Nuno (2019, 2021) indicate that fishers go to sea an average of 19 days per month, with fishing trips lasting, on average, 8 hours. However, Nuno (2019) also mentions that almost 50 percent of fishers reported fishing over 20 days per month. Moreover, unpublished research by Porriños (2022) shows that 75 percent of *voador panhã* (scoop net) trips and 50 percent of hook and line trips last 9 to 13 hours.¹⁰ In the case of fish traders, Nuno (2019, 2021) concluded that palaiês sell fresh fish, on average, 16 days per month; and actor interviews revealed that palaiês spend 8 to 10 hours selling fresh fish, with some palaiês reportedly working 6 days a week. Additionally, traders also reported during actor interviews that cleaning and salting fish for drying normally takes two to three hours per working day, although the frequency with which this activity is conducted was inconclusive. Finally, during FGDs, service providers reported working 8 hours a day every day while also working in other activities to support their families.

Child and forced labour

The Labour Code (Lei 6/19, Assembleia Nacional, 2019) sets the minimum age for working at 15 (Art. 268, *ibid.*), and includes a comprehensive and detailed list of Worst Forms of Child Labour (Annex IV, p. 293, *ibid.*), which represents an advancement over previous legislations (USDS, 2017). However, it also allows for children of age 14 to conduct light work, and for children younger than age 14 to work under certain circumstances, which is not consistent with international standards (USDL, 2020). In 2019, the prevalence of child labour in Sao Tome and Principe was 22.6 percent (versus 15.4 percent in 2014), and children are frequently employed in agriculture and the fishery sector, performing dangerous tasks such as hook and line fishing (USDL, 2014, 2020). Actor interviews confirm these findings, showing that children are frequently employed in VC activities. While employing children under 14 from outside households was not common (7 percent of all respondents), 32 percent of all fishers and traders reported employing their children in VC activities, including tasks such as cleaning and salt-drying fish or selling fresh fish; and organizing and repairing fishing nets, a task that is listed under the "Worst Forms of Child Labour" (Annex IV of the Labour Code) and, therefore, forbidden by law (Article 274 of the Labour Code). It was unclear whether these interfere with school hours. Finally, forced or mandatory labour was not witnessed by any of the VC actors or service providers, which aligns with findings from previous reports (see USDS, 2017).

¹⁰ Previously unpublished data were gathered by Guillermo Porriños under the auspices of the Eurasia Programme of Fauna & Flora International (FFI), working with Fundação Principe, Oikos and MARAPA with funding from FFI, the Blue Action Fund and Arcadia, a charitable fund of Lisbet Rausing and Peter Baldwin.

Job safety

The fleet used in the VC has been considered old, inadequate, unsafe and unable to ensure the safety of fishers at sea (World Bank, 2019), and seine fishers have none (or very limited) means of safety and survival on-board (Le Douguet, 2018). Furthermore, some fishers consider motorization as a form of improved safety rather than a means to increase productivity (Carneiro, 2011). Indeed, actor interviews reveal that only 30 percent of the interviewed fishers and boat owners applied safety standards on-board (such as wearing safety jackets or carrying first aid kits), and 54 percent of fishers had not received or applied safety training before conducting their activities. Only 4 percent of the interviewed fishers used a phone and only 9 percent carried a GPS, which means that the majority (91 percent) of fishers in Sao Tome and Principe still rely on visual navigation (triangulating their position using landmarks, field observations). This exposes fishers to risks such as fog or intense rain and, as a result, Sao Tome and Principe lost an average of 4.8 fishers per year from 2006 to 2011 (World Bank, 2011). Current data show a similar trend and, in 2021, the Captaincy registered 11 accidents at sea, four of which were fatal (2021 records of the Port Captaincy). The latter value is almost three times higher than the 2011 average reported by the International Labour Organization for fishing as an occupation (World Bank, 2011).

The prevalence of work-related injuries was high, with 34 percent of fishers reporting one or more injuries in the workplace during the past year (it was unclear whether these resulted in loss of workdays). In the case of traders, 46 percent of the interviewed actors reported more than five work-related injuries per year in the workplace, mainly related to handling fish and extremely hot materials without any type of safety equipment. Indeed, none of the palaiês applied any type of safety equipment (such as gloves), and only 7 percent had received safety training. Moreover, the use of public transport by palaiês to transport the fish to markets has also been considered a health and safety risk (Sy and Soares Diogo, 2019). Among the service providers, the highest incidences of occupational injuries were found among the crew of fishing boats and people who repaired nets (2.8 and 3 accidents/person per year, respectively), followed by public transport drivers who transport fish (1.5 accidents/person per year).

Interviews revealed that turnover in the VC was perceived low for all actor types, excepting seine fishers, among whom 66 percent of the respondents perceived a high turnover. This low turnover, however, might be related to the lack of alternative sources of livelihood (see Attractiveness, below). Among the service providers, the tasks with the lower turnover were crew of fishing boats, net repair and transport of fish (practiced, on average, for 21, 17 and 16 years, respectively), while the salt providers and ice providers had a higher turnover (practice for 4 and 7 years, respectively).

Attractiveness

The minimum wage for public workers (including civil servants) in Sao Tome and Principe is STN 1 100 per month (USD 47.2/month) (USDS, 2017), which is below the threshold of the national poverty line (STN 1 560/month, see Section 3.2.1). The social insurance system covers employed persons (including civil servants) and household workers, and provides benefits such as retirement, maternity and sickness pensions, among others (SSA, 2019). In 2014, the law was expanded to increase contribution rates and include self-employed workers, but these provisions have not been applied (*ibid.*). Since fishers, fish traders and service providers are self-employed and/or lack contracts, their activities are effectively excluded from the social security system and not eligible for its benefits (INPIEG, 2019).

Service providers indicated in FGDs that they are paid for the tasks they are hired to conduct and do not have fixed wages. Likewise, VC actors do not have a set wage, and their remunerations are dependent on catch and sales (VC actor interviews; Porriños, 2020a). The estimations conducted within this study indicate that the average earning of a purse seine boat owner is STN 2 406/month (USD 103/month) and for a purse seine fisher hired by the boat owner STN 1 059/month (USD 45.5/month), which are obtained within one full-time equivalent (FTE). For hook and line, nets and scoop net the amount is STN 1 370/ month (USD 58.8/month). Except in the case of the purse seine boat owner, these values are around the threshold of the national poverty line and the national minimum salary, which makes fisher wages concerning within the national context, also considering the volatility and the risks of the sector.

However, this study returned an average wage of STN 1 060/month (USD 45.5/month) for the palaiês, which is obtained within 0.72 FTEs. Therefore, while the palaiês invest 72 percent of the legal working time on VC activities, their average earnings are below the national minimum salary of STN 1 100. In the case of the surveyed service providers, approximately 60 percent of respondents considered their salary competitive, with an average degree of satisfaction between 3 and 4 (out of 5).

Among the interviewed actors, the main reason for entering the artisanal fisheries sector was to provide income and subsistence (32 percent, 39 percent and 40 percent of fishers, palaiês and boat owners, respectively), as well as unemployment and/or lack of alternative sources of livelihood (37 percent, 36 percent, 40 percent). Eleven percent (11 percent) of fishers also perceived their activities as lucrative, and 7 percent of palaiês explained that fish trade provided them with economic independence. Other reasons for entering the VC were lack of scholarship (4 percent of the palaiês) and family influence (7 percent of the fishers). Serkovic and Million (2019) mention that, in recent years, a growing number of young people are turning to fishing, sometimes moving from inland villages to the coastal areas of Sao Tome. Interviews with VC actors confirm these findings, with 75 percent of fishers and boat owners perceiving a growing interest in fishing. Additionally, 98 percent of fishers and boat owners perceived that young people were interested in fishing, mainly because of unemployment and lack of alternatives (65 percent). Contrarily, 58 percent of the palaiês

perceived that the interest in fish trade was decreasing. Moreover, while 52 percent of the palaiês perceived that young people were drawn to this activity because of unemployment and lack of alternatives, the remaining 42 percent perceived that young people avoided this activity because of the low income it generates and its overall difficulties (including starting the business).

Social and cultural capital

Sao Tome and Principe shows a weak aptitude to associationism, which is also affecting the VC. By 2019, there were 29 fisher and/or trader associations covering the coastal zones, most of which were created in the 1990s under the framework of different development projects as a prerequisite for receiving support and credit at the community level (Nuno and Matos, 2017; Sy and Soares Diogo, 2019). Most of the associations either have not performed an active role after the initial period of their creation or show significant structural, financial and functional problems; and many of them still lack legal entity (ibid.). VC interviews and Porriños (2020a) indicate that, while still having legal entity, many have ceased their activities.

In some communities, there is evidence of a lack of will to manage resources and infrastructure collectively, preventing the development of a clear and formalized management framework for community infrastructure (ADF, 2017; Nuno and Matos, 2017; Porriños, 2020a). Porriños (2020a) observes that, on Principe, the success of certain associations (i.e. those that established a functioning credit system) is more related to the individual leadership of the president rather than the collective action of the members of the association. However, some other communities are characterized by a stronger spirit of mutualization, ownership and care of collective infrastructure (Sy and Soares Diogo, 2019).

Collective action (horizontal linkages)

According to the FISH4ACP survey, the share of actors that belonged to an association was low, with a lower share of men belonging to an association (23 percent) than processing palaiês (33 percent). The benefits of belonging to an association were variable, and dependent on the association, which aligns with findings from previous studies. For example, processing palaiês explained during FGDs that their association helps them diversify their activities, and the president of the fishers' and traders' association of Porto Alegre explained during a KII that belonging to their association provides the members with credit, as well as a subsidy in case of accident, sickness or death of a family member. However, in FGDs, members of other association reported numerous internal problems (including transparency problems), explaining that the association does not accept new members and only works to benefit some. Among the interviewed actors, all the traders considered that their association represented their interests, although it provided them with no benefits, despite regular payment of the association fees by members. In the case of fishers, 60 percent considered that the association did not represent their interests, with 16 percent explaining that the association gives them access to fishing materials. These findings align with previous reports that indicate that many associations are still seen merely as a way to

obtain credit and materials from development projects and other external sources (Nuno and Matos, 2017; Sy and Soares Diogo, 2019).

Willingness to work together shows important differences by gender and role in the VC chain. Ninety percent of the fishers mentioned working together with other fishers, explaining that they cannot conduct their fishing activities on their own. However, only half (50 percent) of the fish traders and none (0 percent) of the food traders reported working together with other traders due to lack of trust or explained that collaboration is not easy. This aligns with previous reports by the African Development Fund (ADF, 2017), which state that individualistic practices in the value chain, such as the individual commercial strategy of fish palaiês, jeopardize the ownership of collective goods and community actions.

Coordination of transactions (vertical linkages)

In total, 40–60 percent of fishers and traders had verbal contracts with their service providers and clients, with no significant differences between them. Most traders and fishers (60 percent and 88 percent, respectively) report having relations of trust and cooperation with their competitors (other fishers and traders), and fishers explained discussing with each other to agree on selling prices. However, they also reported the existence of power relations between bigger and smaller producers (reported by 22.5 percent of actors), as well as alliances between actors to create pressure groups (20 percent of actors). Only 15 percent of fish and food traders reported relations of mistrust with their competitors.

Over 80 percent of all core VC actors reported good relations with their service providers, describing long, trustworthy and continuous relations with timely payments. Likewise, all actors indicated long, trustworthy relations with their clients, with some of them also indicating relations of friendship. In a situation of conflict with the buyers, most fishers, traders and boat owners indicated that conflict-resolution mechanisms are in place. Reporting to the police was the most common solution among all actors (30–50 percent) or, in a smaller proportion (20 percent), reporting to the Captaincy (only reported by fishers and traders). Nevertheless, a large share of the VC actors also explained solving the conflicts internally through dialogue among the involved parties until reaching a solution (30 percent) or having a facilitated meeting (i.e. with the association, 20–30 percent).

Social cohesion

Information sharing between VC actors was relatively common among fishers (50 percent engaged in information sharing), but less so among fish traders (35 percent) and food retailers (0 percent). Actor interviews revealed that VC actors do not contribute to fisheries-related decision-making, besides their participation in associations. Given the low level of involvement of the associations, this implies that VC actors have little or no participation in fisheries-related decision-making.

Regarding the relations with the public sector, representatives of the National Captaincy, the Directorate of Fisheries and the Coast Guard perceived their relations with VC actors as positive and collaborative. However, most of the fishers and traders did not have direct relations with the public sector (45 percent and 38 percent, respectively), or had bad relations (23 percent and 36 percent), reporting issues of mistrust or corruption, or explaining that they did not have relationships because they did not belong to an association. Nevertheless, another 36 percent and 38 percent of traders and fishers, respectively, reported having good, trustworthy relations with the public sector, highlighting their role in community building and the need to set an example for the community. On the other hand, all boat owners reported having good relations with the public sector, which might be related to the yearly campaigns conducted by the Captaincy to register fishing vessels (KII, 2022).

Cultural traditions

Actors' interviews revealed that VC activities are not related to any specific belief. However, fish in general, and especially coastal pelagics, play a predominant role in Santomean cuisine, as they are an essential part of some traditional dishes (i.e. *molho no fogo*, prepared with smoked *fulu fulu*) (field observations; FAO, 2021b) . Likewise, after field observations, VC activities provide actors with extensive knowledge on the seasonality of the fish and even aspects of their reproduction (i.e. mature ovaries of flying fish are extracted during processing and kept for consumption). Visual navigation using landmarks also allows fishers to understand the geography of the islands and distribution of different habitat types, allowing them to navigate their location to specific fishing grounds and rocky reefs with an accuracy of a 100 metres.

While the commodity is appreciated in the country, moderate concerns regarding VC practices exist (KII 2022; FGDs 2021; Porriños, 2020a). These are mainly related to the interruption or lack of cold chain due to infrastructure deficiencies and lack of proper management, and unsafe processing practices such as drying fish in the open. The latter includes drying fish on open, unprotected racks or directly on the ground, selling processed fish that is not entirely dried, or processing coastal pelagics that are not entirely fresh, producing a product that "stings" the mouth. These indicators of bad practices can also reveal ways to save money by reducing costs caused by fish scarcity.

Institutional strength

Policy, regulations and standards:

Legislation and regulations exist, but there is little enforcement. There is no vision nor priorities of intervention established for the fisheries sector. Furthermore non-observance is prevalent, and public institutions have limited capacity to monitor and control the fisheries sector (Sy and Soares Diogo, 2019). There is no exclusive fishing rights allocation for small-scale fisheries, which can be considered an open access fishery. Currently, core issues affecting the public sector include poor interinstitutional coordination, a strong hierarchical structure, limited delegation of responsibilities and little emphasis on monitoring outcomes or delivering results (World Bank, 2019). Overall, these create difficulties in enforcing

fisheries rules and monitoring their compliance, affecting both artisanal and international fisheries (Le Douguet, 2018). The number and catches of foreign vessels are regulated by a computerized licensing system, which has been considered inefficient and prone to human error (Serkovic and Million, 2019). Indeed, errors on license numbering, monitoring license validity and processing of payments are common (ibid.).

Most VC activities are still not formally registered at the finance services for tax purposes (see Section 3.2.4). On the contrary, most fishing vessels (80 percent) are formally registered at the Captainty (KII Captainty, 2021). The Port Captainty promotes yearly campaigns at fishing communities for boat owners to register their fishing nets and vessels to avoid paying a fine (ibid.). In 2020, The Directorate of Fisheries also initiated a process for the voluntary registration of fishers and traders, which allows them to obtain an identification card and number. By January 2022, approximately 50 percent of palaiês and 57 percent of fishers had registered their activities through this process (KII Directorate of Fisheries, 2022). Therefore, an estimated 59 percent of all core VC actors and fishing vessels would be formally registered at the Directorate of Fisheries or the Captainty, respectively. However, as part of the palaiês registration process, an official regulatory framework for palaiês was proposed in the framework of the FAO project TCP/STP/3603, but no legal text was adopted (KII, 2022).

Most (74 percent) actors considered fisheries policies and regulations unsupportive of their activities, explaining that current policies and regulations restrict their activities without providing any support in exchange. Nevertheless, an additional 25 percent considered these restrictions supportive since they protect the natural resources on which they rely (for example, protecting nursery areas in bays).

Sao Tome and Principe presents a difficult regulatory environment for business, ranking 170 out of 190 countries, and performing worse than the sub-Saharan average on contract enforcement, registering property, protecting investors from minority and vulnerable groups, and obtaining credit (Doing Business 2020 ranking, World Bank, 2020b). Indeed, most actors considered business regulations unsupportive and/or restrictive (50 percent) or did not know which policies were in place or how they affected their business (29 percent).

Access to finance

As mentioned in previous sections, access to banking services remains low in the core value chain with only 10 percent of actors having bank accounts and none of them using mobile banking. Formal sources of credit are typically not available for the fisheries sector (see Section 2.3.2.4), and the interest rates are considered too high for the margin of profit obtained in VC activities (FGDs; Porriños, 2020a). Moreover, VC actors explained in FGDs that offering an asset (such as their house) as collateral for the loan is risky, as revenues from fishing and fish trade are not consistent. Of all the interviewed actors, only 25 percent of boat owners described receiving a loan from a bank to start their business, and none of the fishers or palaiês interviewed had ever received or applied for a loan with a bank (which is consistent with other findings in this study; see Section 2.3.2.4).

Most fishers (79 percent) and palaiês (70 percent) started their activities with their own money. Most actors did not report using informal sources of financing to start their business (associations and *chiquilá* group savings and loans; see Section 2.3.2.4). Furthermore, a trader explained that, although her association has a functioning credit scheme in place, it is not sufficient to reach all traders in a timely manner. Indeed, only 5 percent of traders reported receiving loans from *chiquilá* groups, and another 5 percent from their association. In the case of fishers, 29 percent reported financing their fuel or borrowing materials from traders or boat owners and repaying their debt with fish.

Informal sources of credit do not have any mechanisms to reduce the risk of lending to actors. As explained in Section 2.3.2.4, this leads to conflicts when the debts are unpaid and, in some cases, it has led to the dissolution of associations. In some cases, debtors might be forced to refund the loan through coercion (Porriños, 2020a). In Abade, in Principe, the traders' association has completely formalized its group savings and loans scheme, and the loans are offered under a written contract, signed by a notary, in which the loanee offers an asset as collateral (*ibid.*).

Access to natural resources

On Sao Tome and Principe, access is only regulated for semi-industrial and industrial vessels, and artisanal fishers are explicitly exempt from a fishing licence (Assembleia Nacional, 2022, Art. 30) but need to have fishing authorization. Therefore, access to fishing is free for artisanal fishers, which leads to a lack of control for the catch size and the number of fishers and boats, hindering the capacity of the relevant authorities to control fishing efforts and avoid overexploitation (KII, 2021; Le Douguet, 2018; Serkovic and Million, 2019).

Until mid-year 2022, Santomean fisheries had been regulated by Law 9/2001 of Fishing and Fisheries Resources (Assambleia Nacional, 2001), which provided for few fisheries management measures, particularly for domestic fisheries (Serkovic and Million, 2019). In June 2022, the new fisheries law was approved by the National Assembly and aimed to fill some of the gaps of the 2001 Fisheries Law (Assembleia Nacional, 2022). The new law includes marine protected areas under its provisions and gives more power to the Coast Guard to conduct inspections at sea. Although it does not include specific fisheries management measures for domestic fisheries, it gives power to relevant ministries to restrict catch, effort and fishing gear, as well as establish closed areas for fishing.

Access to information

Previous reports have considered the human and financial resources of the Directorate of Fisheries and the Port Captaincy insufficient to generate proper fisheries statistics in the country (Belhabib, 2015; Le Douguet, 2018). Nevertheless, landing data are currently being collected by the Statistics Department of the Directorate of Fisheries six days a week in 48 landing sites by 12 extension workers from fishing villages. Data are collected at different times, and the total number of vessels departing from each landing site is recorded as well

as to allow estimations of total catch; however, the encoding of this information into the Directorate’s database is not regularly performed (KII, 2021). Fishing capacity is registered through fishing boats at the Port Captainty/Coast Guard, but the database is not maintained in real time, and the Directorate of Fisheries does not have full access to the data (Le Douguet, 2018; Serkovic and Million, 2019). The last two available censuses of the artisanal fishing fleet are from 2014 and 2019 (see Direção das Pescas, 2014, 2019).

This VC assessment revealed that extension services of the Directorate of Fisheries, Captainty and NGOs (see Section 2.3.2.3) reach more than half of the core VC actors. Indeed, 54 percent of the surveyed palaiês and 57 percent of the surveyed fishers had received technical training from these sources. TV and radio were also important sources of technical information, and another 26 percent and 28 percent, respectively, had received technical information through these channels. Nevertheless, none of the food traders interviewed had received any technical training.

Social analysis overview

Based on the analytical assessment of social performance as discussed above, and using the FISH4ACP social tool¹¹, an overview of social performance of the coastal pelagics value chain is provided in Table 9 and Figure 26.

TABLE 9. SOCIAL SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN

Dimension	Count	Score level
1. Inclusiveness		
1.1 Wages and employment distribution	1.80	Concerning
1.2 Value-added distribution	1.40	Highly concerning
1.3 Poverty and vulnerability	2.00	Concerning
1.4 Discrimination	1.40	Highly concerning
Average	1.65	Highly concerning
2. Gender equality		
2.1 Women’s economic involvement	2.00	Concerning
2.2 Gendered division of labour	1.30	Highly concerning
2.3 Gendered access to productive resources	2.20	Concerning

¹¹ FISH4ACP methodology scores for the social profile are classified into five categories: (i) no concerns (> 4.5); (ii) minor concerns (3.5 ≤ < 4.5); (iii) moderate concerns (2.5 ≤ < 3.5); (iv) concerning (1.5 ≤ < 2.5); and (v) very concerning (<1.5). The analysis team has matched the social scores to the ones used in the economic and environmental domain, using the following formula to convert scale 1–5 to 1–3 (highly concerning: 1; concerning: 2; not concerning: 3) $y = (((x-1)/(5-1)) * (3-1)) + 1$ with x = score from 1 to 5 and y = score from 1 to 3.

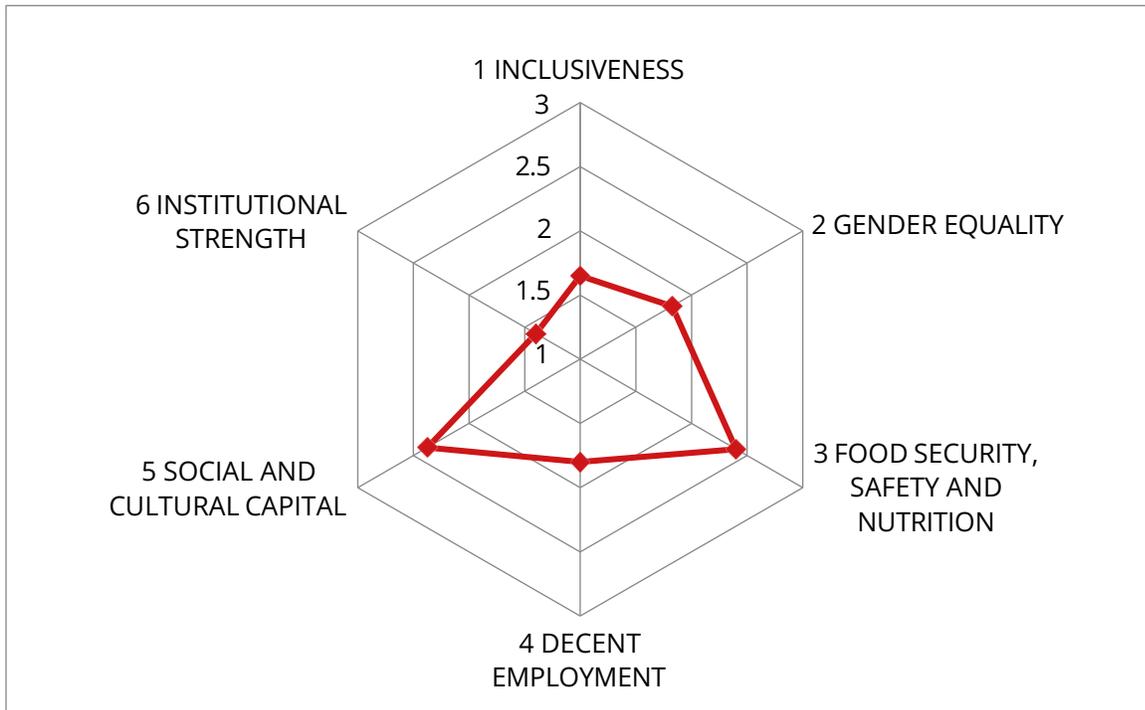
2.4 Women's decision-making and leadership	1.80	Concerning
Average	1.82	Concerning
3. Food security, safety and nutrition		
3.1 Availability of food	2.80	Not concerning
3.2 Accessibility of food	2.40	Not concerning
3.3 Utilization of food (nutrition, safety)	2.20	Concerning
3.4 Stability of food (trends)	2.20	Concerning
Average	2.40	Not concerning
4. Decent employment		
4.1 Respect of labour rights	1.40	Highly concerning
4.2 Child and forced labour	2.20	Concerning
4.3 Job safety and security	1.80	Concerning
4.4 Attractiveness	1.80	Concerning
Average	1.80	Concerning
5. Social and cultural capital		
5.1 Collective action (horizontal linkages)	2.20	Concerning
5.2 Coordination of transactions (vertical linkages)	2.50	Not concerning
5.3 Social cohesion	2.00	Concerning
5.4 Cultural traditions	2.80	Not concerning
Average	2.38	Not concerning
6. Institutional strength		
6.1 Policy, regulations and standards	1.60	Highly concerning
6.2 Access to finance	1.00	Highly concerning
6.3 Access to natural resources	1.00	Highly concerning
6.4 Access to information	2.00	Concerning
Average	1.40	Highly concerning

Note: See footnote 10 for details about performance scores and the five categories.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Key issues, recommendations, risks and mitigation measures flowing from the assessment of performance are provided in Table 10.

FIGURE 26. SOCIAL SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

TABLE 10. KEY ISSUES, RECOMMENDATIONS, RISKS AND MITIGATION MEASURES – SOCIAL SUSTAINABILITY

Key issues	Main recommendations
<ul style="list-style-type: none"> • Unequal income distribution between men and women • Women’s access to fish, financing and alternative sources of income and livelihood is more restricted • Low implementation of safety measures in the workplace • Free access to fish • Most associations have structural, financial and functioning problems • Lack of financing sources (formal or informal) • Non-formalized employment, not contributing to taxes and excluded from the social security system 	<ul style="list-style-type: none"> • Promote women’s access to income-generating activities • Promote the implementation of safety equipment on-board. Ensure regular supply of safety equipment into the country • Strengthen fishers’ and traders’ associations • Explore alternative trade schemes to promote collaboration among formal or informal groups of palaiês • Develop microfinancing systems within or outside associations • Explore solutions to promote formalization of value chain activities
Main risks	Mitigation measures
<ul style="list-style-type: none"> • Possible depletion of fish resources because of unregulated artisanal fishing effort • Lack of resources to monitor and control fishing effort • Strong informal economy 	<ul style="list-style-type: none"> • Development and implementation of a management plan for the coastal pelagic fishery • Increase the capacity and resources of relevant institutions to monitor and control fishing effort • Explore solutions to increase formalization and taxation of value chain activities

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Environmental analysis (ecological footprint)

Climate impact

Electricity and renewable clean energy use

Actors in the value chain barely use electricity from the national grid for their activities. Most of the fishers will not use electricity in their activities related with the value chain. At the level of palaiês, the higher use of electricity is due to the use of refrigerators (mainly personal refrigerators or freezers) to keep the fish fresh in case of unsold stocks. In general, electricity consumption is low, with an average of 0.17 kWh/kg of fish produced for the value chain.

The country is generally faced with structural insufficiency of its electricity supply, in quantity or with a supply of only couple of hours a day, which is aggravated by the high cost of selling this energy. This problem penalizes the fishing industry, whose electricity needs are crucial (FAO, 2019). Thanks to foreign cooperation, several fishing sites have been equipped with freezers, which are not used because of lack of access to electricity or the applied tariffs. The country's share of hydroelectric production is estimated to be at 5 percent from hydroelectric power (Neto, Cravid and Maquengo, 2020) and represents the main part of a renewable energy source for the value chain. Due to this low rate of renewable energy, the country has a degraded scoring on the renewable energy section of the FISH4ACP sustainability assessment.

Combustible

The use of combustibles represents a significant source of energy for fishing activity. Combustible consumption is dominated by fuel consumption with the use of petrol, gasoline and motor oil. Indeed, the motors used by fishers are mostly one of the main sources of combustible use. Purse seine fishers will use more fuel for their activities than other value chain actors, with an average of 24 000 litres (of gasoline and petrol) per year per boat. The petrol, being cheaper, is often used for running gasoline motors. For the other actors after harvest in the value chain, combustibles are mentioned almost exclusively for transport.

All drying activities are done without the use of energy. Salt and sun-dry method is dominant with the use of brine to reduce drying efforts. Some use of charcoal, wood or coconut skins is found in some smoking activities.

The use of combustible in the value chain is evaluated to be just under 75 megajoules per kilogram of coastal pelagics captured, processed or not, and sold.

Greenhouse gas production

The most important part of the production of greenhouse gases comes from fishing activities and, more precisely, from the use of fuel. Indeed, thermal power is the major source of greenhouse gas emissions of the value chain, representing 93 percent of emissions.

Fishing activities represent 63 percent of greenhouses gas emissions; palaiês of fresh products have an individually small emission (mainly because of charcoal and wood consumption), but with more than 2 500 actors in the value chain the impact of their activity represents 33 percent of kilogram equivalent CO₂ emissions of VC activities. The total equivalent greenhouse gas emissions of the value chain per year is estimated to be under 10 million tonnes of equivalent CO₂, representing an average of less than 1.1 kg of equivalent CO₂ per kg of fish.

For the present study, the calculation was conservative, as the greenhouse gas emissions do not consider equipment and materials used (mainly the boat, canoe production and fishing gear CO₂ equivalent gas emissions that must be shared according to their longevity to evaluate their impact on product emission), nor the refrigerant gases that have a high impact on emission even with a limited use in the studied value chain.

The sector is dominated by low-intensity harvest activities and the use of simple fishing techniques that combine with low use of cold chain for the product after harvest. Greenhouse gas emissions will increase because fishing further offshore increases transport energy use as well as upscaling from canoes to boats and using ice or cold storage to conserve freshness of fish.

Water footprint

Quantity of water used by the value chain

Water consumption is limited, even for cleaning or washing operations and product preparation for sales. In general, seawater is used in fishing activities for product cleaning and keeping it “wet”. Post-harvest actors (for fresh products and processing and wholesalers food retailers) will mainly use more water for product cleaning. The information collected by FISH4ACP states the following: less than 0.8 cubic metre per year of water is used per VC actor in capture activities; this consumption increases to more than 22 cubic metres, on average, per year per actor after harvest. This amount can reach almost 100 m³/year for actors who are salting fish, as the activity has extra water cleaning stages. At the level of the value chain, this consumption per kilogram of fish is low and represents a use of less than 3 litres of water per kilogram of fish sold.

Sustainability of the water source used

According to the 2021 WHO/UNICEF Joint Monitoring Programme for Water Supply Sanitation and Hygiene data (UNICEF/WHO, 2021), 36 percent of the population in Sao Tome and Principe has access to safely managed drinking water. The lack of available freshwater can be one of the explanations for this limited use; indeed, 83 percent of respondents (palaiês of fresh products and processing and wholesaling palaiês) have irregular access to or difficulty accessing water. Strategies are employed to limit water consumption and store water when it is available.

Quantity of ice used by the value chain

The consumption of ice is limited for fishing activities, with only 19 percent of fishers using ice (and half of them with a consumption of less than 10 kg per day). Ice consumption is more frequent after harvest; 20 palaiês out of 24 interviewed used ice for their activities but in the low quantity range of 50 kg to 300 kg per month. Even though palaiês are few, some of them may have a range of ice consumption that could reach more than 1 tonne per month.

At the level of retailers and wholesalers, most only use ice as a means of preservation, but also to keep products fresh when they are unsold or to prevent products from spoiling in refrigerators or freezers when power goes out. The average ice consumption calculated is 0.44 kg of ice per kilogram of product. During the interviews, interviewees believed the existing ice supply facilities, such as the one in Bobo Forro market, support their activities.

Wastewater treatment and water pollution

All the water used is discharged without treatment. Both the water used for products and the water used for activities are not considered sources of pollution either at sea or on land by most respondents. Pollution linked to wastewater is mainly linked to organic waste that is discharged. Another form of accumulation and impact produced by land-based activities can be considered, but the volume of water used is limited.

Since there is no use of chemical products, none will be discharged with water except salt in some processing activities. The salt coming from the washing process of salting and drying fish can cause salinization of the soil. This is considered a minor issue except for some palaiês who during the salt-drying processes have not developed wastewater evacuation routes to minimize this impact.

Therefore, it is considered that the country has low general water pollution issues or risks from VC activities.

Fish stock sustainability

Stock status

The status of the stocks of coastal pelagic resources in Sao Tome and Principe waters exploited by the domestic fleet is largely unknown and there is no reliable information to assess the stocks status of species mentioned in this study. No research is regularly performed in the country by national authorities, mostly because of the lack of funding and research assets. There is also no regular and historic data collection, such as catch data from the national fleet that would allow stock assessment to be done or stock status indicators to be developed to provide reliable information on resources (Serkovic and Million, 2019).

Studies done in 1980 indicated a fishing biomass potential of 12 000 tonnes per year (9 000 tonnes around Principe, 3 000 around Sao Tome), with 8 500 tonnes of pelagic species and 3 500 tonnes of demersal species (Serkovic and Million, 2019). Surveys conducted by the Institute of Marine Resources in Norway (2004–2010) estimated overall biomasses of some selected coastal species groups between 1 500 and 2 500 tonnes (World Bank, 2019). Although relatively old, these assessments underline the relatively limited catch potential of fisheries resources in the Sao Tome and Principe EEZ due to the low productivity of Sao Tome and Principe waters, which are limited both by the narrowness of the continental shelf (1 459 km²) and the scarcity of plankton. However, given the time elapsed since then and the probable decrease of fish populations, it is essential that these data are reviewed and updated (National Biodiversity Strategy and Action Plan 2015–2020 – NBSAP II, Ministry of Infrastructure, Natural Resources and Environment, 2016).

In 2015, as part of an FAO project and after 10 years of interruption, fisheries data collection resumed in Sao Tome and Principe. The current system relies on a network of 12 investigators spread over four dozen landing sites identified as the most important in terms of artisanal fleet and quantities landed, as presented in Section 3.2.6 on “Access to information”. The catch data collected is joined with the frame survey data (census of the number of vessels) undertaken in 2014 and updated in 2019.

Some indicators show that the stock is either fully or overexploited, especially around Sao Tome island. These indicators are not quantified but include conflicts of use between fishers of different communities, territorial expansion of traditional fishing activities, remoteness of fishing grounds, reduction in catch size for some high commercial value species, and localized decline in abundance and scarcity of some species. It is reported that some small-scale fishers are fishing up to 40 nautical miles from the shore, harvesting in fishing grounds between 100- and 250-metres depth (World Bank, 2019). Some artisanal fishers use fishing nets of over 1 km in length, while others use circling nets that are used as seine nets in different ecosystems (in rocky or coral areas, for instance). Additionally, fishers from the northern part of Sao Tome have moved to the fishing grounds in the south of the island, which has created conflicts with certain communities, as resources have “disappeared” from their traditional fishing areas.

In Principe, 66 percent of interviewed fishers in a different study perceived an additional decrease in the overall number of fish (Nuno and Matos, 2017). In informal interviews, fishers have also mentioned that sharks are less abundant now than in the past and that large predatory fish, such as snappers, are further away (Porriños, personal communication). This information might suggest that the fishing effort in Principe is affecting fish stocks negatively. There is, however, no information specific to coastal pelagics.

The 2010 EAF Nansen project survey shows, for the area 0 to 100 m, that the biomass estimation around Sao Tome reflected a relatively high abundance of fish species, with the highest recorded during the surveys with Dr Fridtjof Nansen since 2004. A lower than

previous abundance was recorded in Principe (mainly because of the low occurrence of seabreams during the survey, which may reflect the prevailing environmental conditions, with strong influences from the water masses from the Gulf of Guinea that have low salinity and elevated temperature according to the authors). This Nansen survey, which focuses on demersal fishes, is another indicator of an ecosystem and fish stock situation for species of the FISH4ACP study.

In conclusion, the World Bank background notes for 2019 on the fisheries sector of Sao Tome and Principe states: “Fish stocks in coastal waters are showing signs of full or overexploitation”. FISH4ACP environmental experts’ consultation have reached the same conclusion; they perceive the existing stock to be decreasing, while the captures seem to be stable (34 percent of respondents) or reducing (66 percent of respondents).

Stock dynamics

As seen above in the stock evaluation, there are several perceptions and indicators that can be used to evaluate the stock dynamics. However, Serkovic and Million (2019) consider that “demersal species seems to be at levels of full or overexploitation, leaving little room for increased productions, while the catch of pelagic species could be further developed”.

The stocks around Sao Tome island seem to decrease more than the ones of Principe island. This tendency is confirmed by the studies on the catch per unit effort (CPUE, indirect measure of the abundance of a target species) of jig handlines and demersal gear showing that the results in Sao Tome are lower than in Principe (Porriños *et al.*, 2021). Additionally, the percent of the coastal pelagic *Caranx crysos* (blue runner) in the catch using the jig handline in Sao Tome was significantly lower, indicating that the effort levels for this species might be above the regenerative capacities of the fish stocks (*ibid.*). There was, however, no differences in CPUE of flying fish caught with surface gillnet, which might indicate that these species are caught within sustainable levels (*ibid.*). These data remain scattered and not representative of the coastal pelagic fishery in general. However, they do provide indications of stock dynamics.

Climate change, with effects already registered for the area (see Section 2.3.4), is expected to have substantial implications for marine ecosystems and fish stocks. Changes on upwellings, currents and season characteristics may already have an impact on the dynamics of the stock, the distribution of fishes, their habitats and the seasonality of the resources.

This scenario of increasing surface temperature of ocean waters results, according to experts (fisheries campaign carried out in the Gulf of Guinea and studies as part of the FAO/UNDP/Project GLO 92/013 in 1999, Mehl *et al.*, 1999), in a decrease in fish production in the coastal waters of Sao Tome and Principe.

To analyse the stock dynamics and manage fisheries resources, there is an urgent need to establish a register of fishing vessels. Keeping such a registry up to date would make it possible to monitor the evolution and trend of artisanal fishing. It also is an opportunity to improve a registration/licensing approach for artisanal fisheries (Le Douguet, 2018).

Fishing pressure

Pelagic species, i.e. small pelagics and tuna and tuna-like species, make up 70 percent of catches in Sao Tome and Principe. These catches increased steadily over the past 20 years and have more than doubled since 2010. Large pelagic species are found in the vast EEZ of Sao Tome and Principe with seasonal high abundances and are exploited not only by artisanal local fisheries but also by foreign industrial vessels operating under private licences or fisheries agreements. Demersal and small pelagic species are mainly exploited by artisanal local fisheries on the narrow continental shelf of Sao Tome and surrounding areas (Serkovic and Million, 2019).

There is no control on the number of fishers, boats and catch size. The national fishing sector is operating with open and free access (that is, no limitation on the number of boats), as presented in Section 3.2.6 in “Policy, regulations and standards”. Though fishing capacity is registered through fishing boats at the port authority/Coast Guard, the database is not maintained in real time, and the fisheries department, in charge of the management of the resources, does not have full access to these data. Thus, the management of fishing capacity for small-scale and semi-industrial fisheries is not fully controlled and the little data that are collected are not integrated for optimum use (Serkovic and Million, 2019).

Several secondary data sources consider that the halieutic potential of Sao Tome and Principe has suffered a certain degradation because of the lack of official control of fishing activities by foreign companies and local fishers. For artisanal fisheries, however, the number of fishers is growing, which leads many of them to use illegal methods, but which allows for an increased amount of catching in less time (explosives, fine mesh nets, “brisa” nets used as circling nets, etc.), contributing to the destruction of habitats and the decline of marine population (National Biodiversity Strategy and Action Plan 2015–2020 – NBSAP II, Ministry of Infrastructure, Natural Resources and Environment, 2016).

A significant increase in the number of fishing boats and a gradual decrease in fish stocks are observed, as confirmed by the fishers themselves (FISH4ACP, actors’ interview, actors’ survey and KII, 2021). The increases in fishers and boats are evaluated to be around, respectively, 22 percent and 18 percent between 2007 and 2010 by the Directorate of Fisheries in 2014. Furthermore, there are many elements that illustrate a probable increase in fishing pressure: those mentioned in the previous paragraphs on the indicators of stock status and dynamics, but also the increase in the motorization of vessels, mainly developed during the past decade, as in 2013 all vessels were considered to be mostly non-motorized pirogues (COFREPECHE *et al.*, 2013).

For the area of Sao Tome and Principe, a study in 2018 concluded that “Marine ecosystems are globally threatened by overfishing” (Maia *et al.*, 2018), but this study was limited to coral and rocky areas. Based on fishers’ experience, the study reported changes in catches composition over time (for 81 percent of fishers) and concluded that the main causes were the increasing number of fishers, use of non-restrictive practices and industrial fisheries.

This fragmented information points towards an increase in fishing effort in terms of the number of fishers, the evolution of fishing techniques and the indicators of pressure on resources and the impact on catches. The main factors accentuating these pressures are lack of monitoring, control and management of the artisanal sector and lack of sustainable management measures for fisheries resources, such as, for example, fishing effort limitation, minimum catch size, total allowable catch, regular stock assessment, marine protected areas, biological recovery and enforcement of existing regulations.

Response to illegal, unreported and unregulated (IUU) fishing

The licensing process for industrial fisheries is detailed in the fishery law. But there is no licensing required for artisan fisheries. Only a boat registration at the Port Captainty office is needed. This absence of registration and the limited monitoring of the activity are considered as “irregulated and uncontrolled capture” by some environmental experts consulted during the FISH4ACP study.

The IUU Fishing Index for Sao Tome and Principe has a score of 2.4 in general, but the detail of the index shows higher scores in coastal fisheries, which is at 3.38.¹² The reasons for a lower index score for coastal fisheries are linked with such factors as “authorizing foreign vessels to operate in EEZ”, “agreement over all maritime boundary”, and “absence of Marine Stewardship Council (MSC) certified fisheries”.

There is a bilateral agreement with Gabon to strengthen fisheries monitoring, control and surveillance (MCS) for industrial vessels since 2016. Sao Tome and Principe also participates in the Port State Measures Agreement (PSMA); and a national strategy and priority action plan have been developed with FAO support to comply with the PSMA in 2018.

Fisheries MCS activities and enforcement capacity in the Sao Tome and Principe EEZ is supported by several actions, as presented in Section 2.3.3.1 with the Sustainable Fisheries Partnership Agreement.

The lack of adequate monitoring and enforcement capabilities limits the ability of the government to properly regulate the fisheries, and it can be assumed that much unregulated

¹² The index provides an IUU fishing score for all coastal states of between 1 and 5 (1 being the best, and 5 the worst); <https://iuufishingindex.net>.

fisheries activity is conducted (survey of the fish resources of Sao Tome; FAO project: CCP/INT/003/NOR; EAF Nansen Project, 2010). Foreign industrial IUU fishing is likely to have increased, as artisanal fishers regularly complain that industrial vessels operate in the 12 nautical mile zone reserved for artisanal fishing.

Biodiversity and ecosystems

Impact on other species

The lack of information on artisanal fisheries landings (in particular, the activity of purse seines) does not allow for a detailed analysis of the composition of bycatches. A study conducted in 2017 on 642 fishing trips from Principe island shows that 27 percent of the catches were not pelagic fishes (Porriños et al., 2021). A FISH4ACP field questionnaire showed bycatch figures of around 50–55 percent, with an average of 39 percent for VC fishers, but lacked detailed information on the species of the bycatch fish.

According to questionnaire answers, even species without commercial value will be used for consumption in Sao Tome and Principe (expert interview, 2021).

The study of FISH4ACP considers “bycatch” all species that are not species of the study (following the environment assessment methodology). In this context, in Sao Tome and Principe, “bycatch” includes mainly species with commercial value. Indeed, fishing techniques (hook and line, surface gillnets, scoop nets and purse seine) will present a ratio of species considered as “bycatch” in this study but are part of the catch objectives of fishers (for example, *Lutjanus fulgens*, a small demersal snapper comprises 15 percent of the catch for jig handline fishers). Fishers target habitat, not species.

A special concern about demersal fishes, which seem to be declining, is the lack of details on “bycatch” species, making it difficult to figure out the exact percentage of demersal fish caught and if fishing with seines has an impact on other fisheries (Le Douguet, 2018). Nevertheless, information and evidence are reported about the impact on the following associated species:

- Juvenile demersal species (locally called “biquinhas”)
- Species ETP (endangered, threatened or protected)
- coral reefs
- Juvenile demersal

The use of the net “brisa”, circling net, was initially targeting the maxipombo (*Hemiramphus balão*), but the use of the gear has changed over time, transforming it into a purse seine net. Today, some fishers use this type of net to encircle shoals and bottom species of unauthorized size. Juvenile demersal species (known locally as “biquinhas” or “desastre”) are harvested through these purse seine techniques. Juveniles have not reached reproduction

stage, and their harvest increases impact on species that are already considered as declining. Furthermore, these catch techniques are destroying feeding and breeding areas of these species (Santos, 2017; Le Douguet, 2018).

“All fishing nets with extremely tight meshes (illegal) are causing ecological disasters”, according to a KII expert interview in 2021. These nets capture growing specimens, such as the black seabream (*Pomadasys rogeri*) of the family Haemulidae. Young fish of the species measure from 2 cm to 5 cm in length (weighing less than 30 g), while adult fish grow to a length of 20 cm to 25 cm (weighing 400–800 g). The IV National Biodiversity Report (Ministry of Infrastructure, Natural Resources and Environment, UNEP and GEF, 2019) considers that the measure for the conservation of demersal species is deficient.

According to Vaz and Oliveira (2007), the use of small mesh nets most likely stems from impoverished fishers being unable to fish far from the coast.

- ETP (endangered, threatened or protected) species

ETP species are mentioned during information collection conducted by FISH4ACP. Turtles, sharks and dolphins (including species registered on the IUCN Red List) are captured by artisanal fishers (FISH4ACP expert interview, 2021). Capture of these species, including sea cucumbers and molluscs, can be important in quantities (Table 11). Interviews with fishers report captures, by boat, of up to 20 turtles per month (with an average of 5.6 per month for purse seine fishers); up to 30 sharks per month (with an average of 4 per month for purse seine fishers); up to 10 dolphins per month (with an average of 2.46 per month for purse seine fishers); and up to 50 sea cucumbers per month and 200 molluscs.

TABLE 11: PERCENTAGE OF FISHERS CATCHING AT LEAST ONE ETP SPECIES OR CORAL (PER MONTH OF ACTIVITY)

	Turtles	Sharks	Dolphins	Rays	Corals	Sea cucumbers	Molluscs
Purse seine (%)	77	54	38	69	46	38	69
Hook and line, gillnet and scoop net (%)	100	100	71	14	-	-	-

Note: ETP = endangered, threatened or protected.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O.4. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

All these ETP species (or species that are from the same family of ETP) are mostly consumed, traded or used as bait by some fishers. Most of the respondents from the FISH4ACP fieldwork stated that turtles are not consumed; however, several studies and projects show that these species are traded as a consumption good on the island (Ministry of infrastructure, Natural Resources and Environment, UNEP and GEF, 2019; Veríssimo *et al.*, 2020). For dolphins and

sharks, more than half of the FISH4ACP actors interview answers mentioned consumption and sales (dolphins are not surviving at the catches according to fishers). In a study conducted in 2019, sharks and rays are considered as two of the species with higher prevalence of consumption and are a conservation concern (Porriños, 2020b).

- Coral

The catches of coral and species living in coral reefs contribute to increased impact on threatened ecosystems (see the following sections).

Measures in place to limit bycatch

Some fishing practices are known to have more impact on ETP species and non-commercial bycatch. The first is the non-selective purse seine. The mesh sizes are mentioned, as well as the areas of harvest (low depths and coral reef areas), as factors of ETP species and other bycatch increases, including other fishing practices such as fishing at night using light attraction devices to attract fish.

The existing regulations are often not respected and common infractions include use of gear not allowed by the fisheries law and the decree on fisheries resources (e.g. nets with mesh sizes that are too small) (Sy and Soares Diogo, 2019); see Section 2.3.3. Control mechanisms to monitor compliance with the existing regulations are weak, and there are few controls on and enforcement of the methods of capture and catches. In addition, except in protected areas, regulations defining fishing method restrictions according to ecosystem or bathymetry do not exist.

Few measures are in place to limit bycatch and capture of ETP species even if some catches of dolphins or sharks damage nets. The impact on ETP species from value chain activities has been considered as important by all environmental experts consulted.

For turtles, some ongoing projects seek to raise awareness of the impact of harvesting turtles and to discourage the consumption of turtle meat and turtle eggs, which are highly valued in Santomean traditional kitchens (Veríssimo *et al.*, 2020).

During FISH4ACP interviews, respondents revealed that turtles were the only animals that were released and that some actions were made to avoid their capture, such as releasing them at the surface or during net closing.

Other ongoing NGO activities (Oikos, MARAPA, etc.) are aimed at increasing awareness about fish stock sustainability and the use of sustainable practices (i.e. fish aggregation devices to create areas of fishing with lower impact and managements good practices) to reduce negative impacts on turtles and ETP species.

Impact on vulnerable ecosystems

According to expert consultations, artisanal fishing activities and post-harvest activities contribute to threatening some vulnerable ecosystems. Serkovic and Million (2019) note, "Vulnerable habitats that have been negatively impacted by human disturbances and on

which the fish stocks depend for their recovery and healthy development include mangroves, coral reefs and seagrass beds". Most of the impacts considered are caused by fishing activities in vulnerable marine ecosystems. One fishing activity was designated as the major cause of ecosystems degradation: the use of purse seine nets and their physical impact.

- Coral reefs

Damage to coral populations increases the vulnerability of these ecosystems that have suffered from liming extraction and dynamite fishing. These coral ecosystems have low diversity but high endemism and include the endemic species *Montastraea cavernosa guineense* and *Porites bernardi*. The IUCN report in 2015 mentions: "It should be noted that these reefs in Sao Tome are probably the most important regionally, while these corals have been used as raw material for the manufacture of lime, a very worrying situation which means that these stands can be considered as threatened with extinction (...). Their preservation and possible restoration are certainly a priority".

- Seagrass beds

Another vulnerable ecosystem that suffers from seine netting fishing is seagrass beds. The physical damage takes years to recover, and the increase of grubbing and root removal disturb the ecosystem and its associated fauna. The damage is noticeable, as seagrass beds in general are not very well developed in the area and tend to form isolated patches (Polidoro *et al.*, 2017), such as those located between Ilhéu das Cabras and Lagao Azul.

- Role of ETP species in ecosystems

With the catches of ETP species, the fishery sector contributes to the threat to local ecosystems. According to a study in 2017, between 36 and 50 species on the islands are considered as threatened and are listed on the IUCN Red List (Polidoro *et al.*, 2017).

- Mangrove ecosystems

The mangrove ecosystem has also been considered by one expert interviewed as an ecosystem impacted by VC activities, as fishers use the wood for domestic purposes and for smoking fish activities. Another activity damaging mangrove forests regards dyeing gillnets using *rede gonga*; fishers use the mangrove bark to dye nets a brown colour. Removing the bark from trees causes them to die (Le Douguet, 2018).

All these mangrove impacts increase pressure on an ecosystem already considered as "one of the most threatened habitats in Sao Tome and Principe" (Lima *et al.*, 2016; Haroun, Herrero Barrencua and Abreu, 2018; Heumüller *et al.*, 2018). These fragile ecosystems are among the most biodiverse in the country and provide critical services, including natural

protection against coastal erosion and spawning grounds for fish and other marine species. In turn, the reduction of fish stocks from mangrove degradation has a negative impact on the livelihoods of artisanal fishers (GEF, 2015).

- Protected areas

Although Obô Natural Park of Sao Tome and Obô Natural Park of Principe, the Tinhosas Islands, a Ramsar Site, and the Island of Principe Biosphere Reserve are preserved ecosystems, they still suffer as a result of fisheries activities. In 2019, the IUCN and GEF reported, “Much of (Biosphere) Reserve’s biological diversity resources [are] still exploited irrationally (...) (and boundaries of the 2 Obô national parks) are always disrespected”.

Animal health and welfare

Diseases and aquatic animal health

During the field investigation conducted by FISH4ACP, fishers were unaware of any aquatic animal diseases because they did not see any visible problems. Coastal pelagic diseases are not well studied and monitored at the world level; it is not a criterion impacting fisheries activities.

Animal husbandry and slaughter

Fish slaughter should be avoided, except in the case of some large animals. The coastal pelagics harvested will die in the boat or canoe, but often some water will be used to keep them alive and to ensure longer freshness.

None of the fishers in the VC apply the appropriate slaughter techniques as defined by the World Organisation for Animal Health (WOAH). However, according to a local expert, the WOAH-approved slaughter techniques are considered unfeasible for Santomean coastal pelagic fisheries operations.

Toxicity/pollution

Chemical source of pollution

Value chain actors do not use chemicals for their fishing activities, including in processing and sales. The main sources of chemical pollution that have been mentioned during FISH4ACP actor interviews are the use of salt and the use of engine fuel and oil for fishing boats. Salt pollution is linked with the management of wastewater (see Section 3.3.2 “Water footprint”) and handling and the storage of salt bags.

Engines can be a source of pollution with bad handling and storage of petrol, diesel, oil or with the leaking of these consumables. An environmental expert noted that there are engine cleaning practices that can be done to manage and control this source of pollution.

Air pollution

Two sources of air pollution can be considered in the Sao Tome and Principe coastal pelagics value chain: (i) fishing boat engines; and (ii) smoking fish process. Boat engines do not use good quality fuel; often, some petrol will be used to reduce the fuel cost. Moreover, engines are often old, producing more exhaust gas with higher pollution impact. The smoking process uses a large quantity of coconut seeds, wood and charcoal with significant smoke released. Smoking methods could have more efficient methods to reduce the quantity of combustibles used (Mindjimba and FAO, 2020b). Another source of air pollution is plastic waste destruction (see the next section on inorganic waste management).

According to experts consulted, there is a lack of clearly defined standards and monitoring capacity to comply with recommendations from the government. It is also believed that existing official recommendations for air pollution prevention do not apply to VC activities.

Inorganic wastes

In the study, 64 percent of VC actors mentioned that plastic waste is the main inorganic pollutant. Palaiês use a significant amount of plastic in all stages of processing and selling fish. The top sources of plastic are bags used for selling fish and for ice transport and salt packaging. The quality of the plastic used in bags is low, as it presents low resistance to load and sun exposure. In the FISH4ACP questionnaires, respondents mentioned other sources of plastic, such as drums, bottles, rigid plastic items and fishing gear. Another source of plastic pollution in the VC has been the use of inappropriate material (plastics of low quality) for solar tents developed in previous projects (the former PROFOPESCAS project), which may have led to possible pollution risks (FAO project report TCP/STP/3603 Support for Improved Marketing Fishery Products in the Sao Tome and Principe Markets, 2020).

For the management of plastic wastes, less than 50 percent of VC actors bring their waste to public waste containers. Around 20 percent of people interviewed burn the plastic, and more than 25 percent throw the waste directly into the sea or the beaches and/or bury it.¹³

Some value chain actors are reusing plastic waste: 36 percent of the palaiês, processing or wholesalers of purse seine fishers and 50 percent of the hook and line fishers reuse some plastic bags after washing them. Nets are also reused as cleaning items or used for repairing other nets. Plastic bottles and containers are often reused to store water.

As a general concern, plastic waste in the environment (sea and land) has been presented by key informant experts as a main issue for Sao Tome and Principe, and 80 percent of the people interviewed have mentioned this source of pollution as a problem for their activities in the future. It is important to know that alternative solutions exist in the value chain.

¹³ In the public waste management system, there is no special management of plastic wastes; the system has the same management process as other solid wastes (landfill or controlled burning).

Instead of using plastic bags, some actors are using Kraft paper from cement bags or banana leaves to wrap products for customers.

Organic waste

Most organic waste comes from fish viscera, gills, heads, fins and the transformation process. Depending on fish species, viscera can represent 7–15 percent of fish waste. Most of this organic waste is thrown directly into the sea or onto the beaches (often buried); only the palaiês sometimes use the wastes after cooking them to feed pigs or domestic animals. As for fishers, less than 10 percent of them use the organic waste to feed animals.

Regarding organic waste management, the questionnaires revealed that 69 percent of palaiês have issues about the management of organic waste, especially when decomposing fish create odour problems for their activities.

Regulation, control and enforcement

For all aspects of pollution (water, air or waste management), Sao Tome and Principe has a legal framework that covers most of the questions that may emerge on the consequences of the actions of value chain actors. The regulatory texts to consider are:

- Law No. 13/2007 on the regulation of maritime safety and the prevention of marine pollution.
- Law No. 4/2003 on the management of cultural and natural heritage and its registration.
- Decree No. 36/1999 on the management and disposal of waste in the country.

A regulation also exists for the management of plastic, one of the main concerns of this value chain; the regulation goes beyond Decree No. 36/1999 because it concentrates on plastic waste management (“A adequada gestão dos resíduos”, No. 10/1999), which was reinforced in 2003 by legislation on packaging management and environmental impact (Decreto Lei No. 64/2013).

However, these legal texts have little impact on the ground, especially for activities such as those in this value chain. According to the experts consulted, “They are not fully implemented and enforced”.

Food loss and waste

Loss of product

Fish losses are estimated at around 3 percent for fishers, the main actors after fishing will have losses of around 6 percent for fish palaiês (fresh and processed products) and 1.2 percent for market retailers. According to actor interviews, the main loss of product is linked to loss of freshness and to processing operations.

These figures concern losses in relation to the resource as measured in live weight. Indeed, if the figures consider the differences in product weight, the values are very much impacted

by processing activities. Smoking and drying operations cause an average of, respectively, 20 percent and 30 percent loss in product weight (up to 70 percent in some cases), and gutting will reduce 7–15 percent of the weight of the product depending on the fish. Total losses in the value chain are estimated at 739 tonnes of fresh production.

The absence of a cold chain to preserve freshness is the main cause of product losses. Quality loss is particularly important for fresh fish traders (FAO, 2020), and poor hygienic transport (palaiês using public transport for transporting fresh fish to markets) and handling can cause substantial quality as well as physical post-harvest losses (Sy and Soares Diogo, 2019).

In conclusion, post-harvest loss is high across the entire VC. Physical, quality and market losses occur mainly because of the lack of conservation facilities (Serkovic and Million, 2019).

The different actors of the value chain will use different strategies for keeping products fresh, so they can consume or sell them. As mentioned previously, the use of salt and drying and smoking products are the traditional ways of conservation, and practised widely in the value chain.

Food waste

The consumer survey responses show that there is an average of 0.75 kg of waste per month and per household for the edible part of the fish bought, mainly linked with the freshness of fresh fish but also with the way fish is processed. These quantities make the estimation of total waste difficult to determine at the last stage of the value chain. A general estimation of 4 percent has been considered. Naturally, the losses from gutting are considered in the case of fresh products.

A more in-depth study of the quality of products at the end of the value chain could provide more information on the possible wastage linked to freshness.

Summary of the environmental analysis

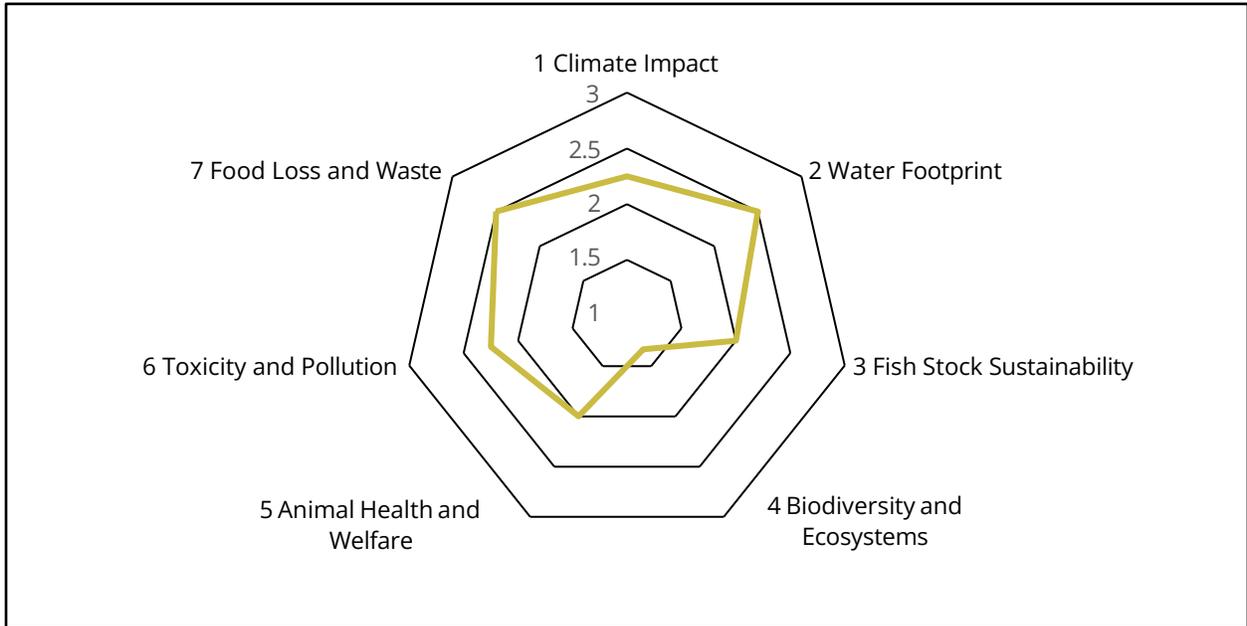
Based on the assessment indicators of the FISH4ACP project, which uses a set of 33 criteria grouped into 19 subcategories and 7 sustainability characteristics for the coastal pelagic fishery sector environmental assessment in Sao Tome and Principe. The findings that were obtained are shown in Table 12; see also Figure 27. FISH4ACP methodology scores are classified into three categories: (i) no concerns (> 2.5); (ii) concerning ($1.5 \leq < 2.5$); and (iii) very concerning (< 1.5).

TABLE 12. ENVIRONMENTAL SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN

1. Climate impact	Count	Score level
1.1 Electricity use	3	Not concerning
1.2 Fuel consumption	2	Concerning
1.3 Carbon footprint	3	Not concerning
1.4 Renewable clean energy use	1	Highly concerning
2. Water footprint		
2.1 Water and ice consumption	2	Concerning
2.2 Water pollution and wastewater treatment	3	Not concerning
3. Fish stock sustainability		
3.1 Stock status and stock dynamics	2	Concerning
3.2 Fishing pressure	2	Concerning
4. Biodiversity and ecosystems		
4.1 Impact on associated species	2	Concerning
4.2 Status of vulnerable ecosystems	1	Highly concerning
4.3 Status of endangered, threatened or protected species	1	Highly concerning
5. Animal health and welfare		
5.1 Application of biosecurity measures	2	Concerning
5.2 Appropriate animal husbandry and handling	2	Concerning
6. Toxicity and pollution		
6.2 Responsible use of drugs and chemicals	3	Not concerning
6.3 Air pollution	3	Not concerning
6.4 Inorganic solid waste pollution	1	Highly concerning
6.5 Organic solid waste pollution	2	Concerning
7. Food loss and waste		
7.1 Food loss	2	Concerning
7.2 Food waste	3	Not concerning

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

FIGURE 27. ENVIRONMENTAL SUSTAINABILITY PERFORMANCE SCORES FOR THE VALUE CHAIN



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Key issues, recommendations, risks, and mitigation measures flowing from the assessment of performance are provided in Table 13.

TABLE 13. KEY ISSUES, RECOMMENDATIONS, RISKS, AND MITIGATION MEASURES – ENVIRONMENTAL SUSTAINABILITY

Key issues	Main recommendations
<ul style="list-style-type: none"> • The status of the stocks of demersal and small-pelagic resources in Sao Tome and Principe waters is largely unknown and there is no reliable information to assess the status of stocks • Several indications and field investigations are showing signs of full or overexploitation of fish stocks with augmentation of fishing pressure • Lack of control of the number of fishers, boats and catch size • Illegal fishing practices with impact on ecosystems • Impacts on vulnerable ecosystems (coral reef, seagrass beds and mangrove ecosystems) and protected areas • Important rate of catch of endangered, threatened or protected species linked with fishing methods and no measures in place to limit bycatches • Poor management of waste, with potential pollution impacts (plastic and organic) • Low implementation and control of existing legislation (i.e. on fisheries or wastes) 	<ul style="list-style-type: none"> • Improving fisheries monitoring, control and surveillance • Independent research on the evolution and status of stocks • Improvement of enforcement capability and capacity development in regulation and capture techniques • Measures to reduce endangered, threatened or protected bycatches, and improve release and action to raise awareness to reduce impact of fishing activities and discourage their consumption • Measures to control fisheries techniques and their impact on vulnerable ecosystems • Waste management action to reduce plastic use and to control plastic and organic waste fate • Implementation and control of existing regulations • Strengthening the popularization (training and communication) of existing regulations and standards and their application on the ground to support and secure the development of the sector
Main risks	Mitigation measures
<ul style="list-style-type: none"> • The main risks of intervention would be to limit and slow down the development of the sector with restrictive or unsuitable regulations, or with environmental obligations that are too restrictive in relation to the risks identified 	<ul style="list-style-type: none"> • The need to reconcile actions with actors on the ground is essential for their effectiveness and implementation

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Resilience analysis

Main relevant shocks

According to secondary research and interviews with VC stakeholders, in the coastal pelagics VC of Sao Tome and Principe, there are four types of shocks, as listed below, that are considered most relevant based on their likelihoods of occurrence (or re-occurrence) and the (potential) severity of their impacts.

- **Climate change shock:** water temperature changes, current changes, and changes in fish reproduction areas and/or feeding areas.
- **Environmental shock:** ecosystem pollution or irreversible degradation (e.g. petrol offshore extraction).
- **Socioeconomic shock:** decline in fishery captures and incomes because of the increased number of actors and subsequent fishing pressure due to the open access nature of the fishery.
- **Health shock:** (i) such as the COVID-19 pandemic resulting in declined markets, with fewer clients because of mobility restrictions and reduced purchasing power; and (ii) food safety issues because of poor fish handling, conservation or processing, which have negative consequences for consumers' health.

Resilience of the VC to shocks

Following the FISH4ACP methodology, the VC's resilience to shocks is assessed based on six domains: redundancy, diversity, connectivity, collaboration, and governance, learning and adaptation, and participation and inclusion. A summary of a qualitative assessment of these domains is provided in Table 14, with further details of each domain below.

TABLE 14. RESILIENCE ASSESSMENT OF THE VALUE CHAIN

Resilience domains		
Structural resilience domains		
Redundancy	Diversity	Connectivity
Behavioural resilience domains		
Collaboration and governance	Learning and adaptation	Participation and inclusion
Hotspot classification		
Not concerning	Concerning	Highly concerning

Notes: Structural domains evaluate the presence and nature of certain structural elements that may contribute to resilient value chains. Behavioral domains refer to how actors and other stakeholders' behavioural patterns interact in ways that may contribute to resilient value chains (FISH4ACP methodological guide, 2021, Internal project document).

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Redundancy: According to actor interviews, there is little excess capacity and backup systems to maintain the essential functionality of the coastal pelagics chain in the event of shocks because of various reasons, including: (i) the unpredictability of the quantity of fish caught; (ii) the nature of VC products, fresh or processed, both easily perishable goods; and (iii) limited equipment and technology (cold storage and ice but also fishing materials and equipment) to support the VC; and (iv) limited financial resources and sources of finance to maintain some level of excess capacity. Consequently, in the event of shocks that disrupt the supply of fish, VC actors do not normally have stocks to sustain their operations.

Diversity: The level of diversity in the VC is low. All production is consumed nationally with no regional or international fish products trade, which makes VC products completely dependent on local demand. Most of the fish is traded fresh, a highly perishable product, with smaller quantities dried salted and very minor quantities of smoked fish, which all easily deteriorate in terms of quality, especially given the general lack of proper storage equipment and facilities, particularly cold-chain facilities. There is a rampant inexistence of a variety of processing techniques and value-added options, relying exclusively in traditional processing methods largely dependent on weather patterns. Furthermore, VC actors' production and marketing processes are largely similar at each VC function. The same applies for input and service suppliers, with few specialized business trading fisheries material and equipment and few shops offering these products; there is a complete dependence on imported goods, and items may be out of stock due to infrequent supply or disrupted in case of a shock. There are very few mechanics, builders of quality vessels and cold-chain specialists in the country. This overall low level of diversity implies there is little capacity for the VC to resist to shocks because when a shock hits almost all the actors (at certain VC functions) and/or all the support service providers (of certain types of input/service) would suffer from similar impact, and thus, the whole VC will be affected, as none of the actors or service providers would be able to sustain their normal business operations.

Connectivity: The level of connectivity in the VC is low. VC actors have established informal and formal connections among them and with stakeholders. Most of the connections are informal and based on trust, others are more formal, such as the ones established through the fisher or palaiê associations. Many of the informal connections are based on long-established relationships and/or personal networks that are expected to hold up in case of a shock. On the other hand, local associations are active when they are backed by external funds but tend to be inactive without this kind of support, offering limited services to their members. Hence, their support in case of shock will largely depend on the existence of external aid at that given time, conditioning their capacity to support recovery from shocks. The connections among the VC actors are characterized by informal verbal agreements, which makes them easier to collapse in case of a shock. There is also a general lack of regular energy supply in the country, affecting ice availability and cold-chain functioning. Existing

infrastructure, particularly in Principe, are underdeveloped with some landing sites only being reachable by motorbike. Also, Principe VC processors rely on the irregular operativity of the vessels covering the transect between the two islands to send their dried fish to Sao Tome, their main market. In general, terrestrial transport services are not always reliable, making it unpredictable to know when they are going to reach the market, conditioning the level of connectivity across the country.

Collaboration and governance: There are various forms of collaboration between VC actors and stakeholders, ranging from exchange of information to, in some cases, coordination in the conduct of VC activities. However, as reflected in Section 2.4, most of the actors work individually, with highly informal and not well-coordinated connections. For instance, during the interviews a general complaint from the palaiês was having issues with clients' payments due to delays or, sometimes, lack of payment or thefts when storing the fish in public places. This lack of coordination between actors limits responsiveness, planning and cooperation between supply and demand. Furthermore, different attempts to organize the sector in associations were not too successful, with only 23 percent of surveyed fishers and one-third of the palaiês belonging to an association, which are not especially active. Furthermore, coordination between public authorities needs to improve (e.g. need to update and share the vessels register [Port Captaincy] with the Directorate of Fisheries, responsible for fisheries management). The described collaborations can easily deteriorate in times of shock with a low potentiality to share and manage risks among stakeholders. Besides, the absence of actors' coordination will prevent the sector from being more resilient and responsive to the effects of external disruptions.

Learning and adaptation: The level of learning and adaptation in the VC is extremely low. Along the VC, there is a very low level of technology and innovation adoption by VC actors, with most actors using traditional methods and techniques in conducting their VC activities and with limited options for training (interviews with VC actors, 2021). VC stakeholders show their willingness to adopt better means and technologies, as is the case of fishers who want to switch to better vessels or palaiês requesting more training. However, the unavailability and high costs of modern equipment/inputs and alternatives for training, together with limited financial capacities of VC actors, prevent them from benefiting from them. With the use of largely traditional methods (for fishing, processing and trading) and the constraints they face in adapting/improving their techniques, VC actors struggle to deal with the impacts of shocks and to prepare for future shocks.

Participation and inclusion: As interpreted from interviews, there are no specific mechanisms or plans applicable to the VC actors to deal with shocks, with VC actors not being connected to any shock recovery support mechanism either among them or provided by other stakeholders such as government organizations. Furthermore, as indicated, VC actor associations – that could serve to better connect the actors to these kind of mechanisms –

are not always active and the majority of the actors do not belong to one. In terms of the distribution of risks among actors, all of them are similarly exposed and could be equally affected by shocks given that almost every actor is highly vulnerable to them.

Sustainability heat map

A sustainability heat map (Table 15) provides a synthesis of the economic, social and environmental sustainability assessment and resilience analysis.

TABLE 15. THE SAO TOME AND PRINCIPE COASTAL PELAGICS SUSTAINABILITY HEAT MAP

Economic sustainability	Social sustainability	Environmental sustainability
Net income	Wage and employment distribution	Electricity use
Trend in net income	Value-added distribution	Fuel consumption
Return on sales	Poverty and vulnerability	Carbon footprint
Return on investment	Discrimination	Renewable clean energy use
No. of jobs in full-time equivalent	Women's economic involvement	Water and ice consumption
No. of full-time jobs	Gendered division of labour	Water pollution and wastewater treatment
No. of wage labour jobs	Gendered access to productive resources	Stock status and stock dynamics
No. family/self-employed jobs	Women's decision-making and leadership	Fishing pressure
Average wage for hired workers	Availability of food	Impact on associated species
Average wage proxy for family labour	Accessibility of food	Status of vulnerable ecosystems
Total value of net wages	Utilization of food	Status of endangered, threatened or protected species
Direct value added at value chain level	Stability of food	Application of biosecurity measures
Total value added	Respect of labour rights	Appropriate animal husbandry and handling
Contribution to trade balance	Child and forced labour	Responsible use of drugs and chemicals
Rate of integration	Job safety and security	Air pollution
Public finances impact	Job attractiveness	Inorganic solid waste pollution
Contribution to investment	Collective action	Organic solid waste pollution
International competitiveness	Coordination of transactions	Food loss
Food safety	Social cohesion	Food waste
Consumer evaluation	Cultural traditions	
Consumer preference	Policy, regulations and standards	

Price relative to substitutes	Access to finance	
	Access to natural resources	
	Access to information	
Resilience		
Redundancy	Diversity	Connectivity
Collaboration and governance	Learning and adaptation	Participation and inclusion
Key		
Not concerning	Concerning	Highly concerning

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Economic sustainability score:¹⁴ **59.1%**
Social sustainability score: **43.7%**
Environmental sustainability score: **55.3%**
Resilience score: **8.3%**
Overall sustainability score: 48.6% (17 of 71 green, 35 of 71 yellow)
Number of highly concerning hotspots (red): 19 of 71

The main conclusions to be drawn from the heat map when viewed in totality are that VC performance in terms of sustainability is mixed, with several areas (18 of 71 indicators) being highly concerning. With respect to the different dimensions of sustainability, social sustainability is assessed as the weakest, accounting for 7 of the 18 highly concerning red hotspots. These hotspots relate to a variety of “access” issues (to finance, to resources or policy and regulations), as well to the uneven levels of value added between individual actors, discrimination, gender division of labour or respect to labour rights.

Environmental sustainability performs better than the social sustainability domain, but some of its indicators, such as renewable clean energy use, status of vulnerable ecosystems and ETP species, and inorganic solid waste pollution are of high concern.

Regarding the analysis of economic sustainability, the overall performance of the VC is slightly positive, although the sector is highly informal and has no exports. The actors in the VC make enough income to cover their costs and live above the poverty line if all catches are considered. However, the economic trend is downwards, as more fishers are fishing and lowering the supply of fish stocks. Employment in the VC is entirely informal, leading to very little contribution to the national budget and trade balance, and loose ways of contracting

¹⁴ According to the FISH4ACP methodological guide, “the (sustainability scores) indexes are calculated by adding up across subdomains (1 for green, 0.5 for yellow, 0 for red) and dividing this by the number of subdomains, expressed as a percentage”.

and remuneration of workers. In general terms the VC contributes, although limited, to the creation of value. Food safety is also concerning, as there is a lack of infrastructure (cold chain, roads, electricity, markets, landing sites, etc.) and preservation methods, such as salt drying, which can affect the quality and safety of fish for consumers when it is not stored correctly.

When considering resilience, the VC performs poorly. Five of the six domains are highly concerning. This is mainly due to the small-scale nature of all the VC actors, coupled with their limited or lack of technical and financial resources and unfavourable conditions in the enabling environment (e.g. energy, roads, transport). It is also a consequence of the low level of diversity of products and with all sales at the domestic market level, the high level of informality in commercial relationships, and the weak services input and service providers offer.

4 Upgrading strategy

This section of the report describes the transition from the analytical work (functional analysis and sustainability assessment, Sections 2 and 3) to the planning phase. To start this process, in May 2022 a stakeholder workshop was organized in Sao Tome to present the VC analysis results and to discuss, receive feedback of stakeholders and their validation of the analysis, and initiate the development of a shared vision and basic strategic options for the value chain.

The discussion processes resulted in a list of agreed priorities, stated as follows:

- (i) VC actors' access to finance;
- (ii) improvement of infrastructure (safer and better equipped fleet, cold chain, and transforming and distribution, etc.);
- (iii) capacity development; and
- (iv) stock assessment for better regulations and management.

And to a lesser extent:

- (v) implementation of cooperatives;
- (vi) certification and export of fishery products; and
- (vii) means of monitoring and maritime surveillance.

An overall objective for the upgrading strategy was developed in the form of a vision statement informed by a strengths, weaknesses, opportunities and threats analysis (Section 4.1), a sustainability heat map (Section 3.5), VC mapping (Section 2.1), and varied stakeholder interests. The vision statement includes concrete targets and will be achieved through four main outcomes of an upgrading strategy, brought about by a range of activities and outputs that are presented graphically in a theory of change.

Section 4.3 presents assumptions about factors that will change under the upgrading strategy, and discusses business models, the enabling environment and governance arrangements under the baseline situation and after upgrading. Section 4.4 builds on the preceding subsections to develop an assessment of the sustainability impact the upgrading strategy is expected to have.

Strengths, weaknesses, opportunities and threats (SWOT) analysis

Based upon the functional and sustainability analyses carried out previously, a SWOT analysis was undertaken as a first step towards identifying strategic options (Figure 28).

FIGURE 28. STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS OF THE VALUE CHAIN

<p>Strengths (internal)</p> <ul style="list-style-type: none"> • Coastal pelagics are an established and traditional product in the national market • Industry experience: existence of traditional know-how • Coastal pelagics are nutritious food and contribute to the country's food security and sovereignty • There are many active fishers and processors in the value chain (VC), which indicates little market dominance by a few actors and free competition in these VC segments • In Principe, there is more surplus catch because of the smaller population, with fish available for processing and supply to the Sao Tome market 	<p>Weaknesses (internal)</p> <ul style="list-style-type: none"> • Very informal nature of the value chain • An artisanal fleet composed mostly of dugout vessels, with safety risks and less fishing capacity • Lack of adequate physical infrastructure (i.e. roads, power grids, markets, landing sites) • Limited cold chain for fish conservation • Lack of service providers (such as financial, training, repair or logistical) and quality inputs (completely dependent on imports) • Limited financial resources of VC actors linked to lack of access to formal loans and other financial products • Lack of compliance with good product handling and hygiene practices in the VC • Low-performing sectoral associations with little activity, providing few services to their members • Lack of state control, management and supervision of fishing activities, as well as formal assessments of coastal pelagics an associated species (bycatch and endanger threatened or protected species). • Decline in fish availability and catches, forcing fishers to look for fish in more distant waters
<p>Opportunities (external)</p> <ul style="list-style-type: none"> • Gradual and consistent increase in the supply and use of solar-powered cooling equipment, including at the small user level • Increasing offer and capacities of vocational training, including entrepreneurship incubation mechanisms 	<p>Threats (external)</p> <ul style="list-style-type: none"> • Climate change impacts negatively on fishery resources: changes in water temperature, currents and in fish breeding and/or feeding grounds • Increase in the number of fishers, with actors coming from other productive activities

<ul style="list-style-type: none"> • National programmes, such as the PNAE (National School Feeding and Health Programme), are adopting more independent management procedures that will allow better efficiency and implementation • Demand for fish in Sao Tome and Principe, particularly from coastal pelagics, is high and is expected to continue, or increase, in the future because of population growth • Coastal pelagics are preferred by consumers over other fish or meat and are cheaper 	<ul style="list-style-type: none"> • Beginning of oil exploration and external pollution activities cause degradation of ecosystems and resources
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Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Among the strengths, it is worth highlighting that coastal pelagic fish constitute an element of high importance in the diet of the majority of the population, especially those with lower incomes (two-thirds (67 percent) and living under the national poverty line; see Section 3.2.1). As described in Section 2.2, the per capita consumption of coastal pelagics is estimated at about 16.7 kg/capita per year and, according to consumer surveys carried out as part of this study, almost 60 percent of consumers indicated coastal pelagics as the most popular commodity, followed by demersal fish, large pelagics, pork meat and chicken. These data reveal the high importance of coastal pelagics both for food sovereignty (which implies less dependence on imports and greater resilience facing global food crises) and for the country's food and nutritional security. Therefore, the increasing demand on the one side and the importance of the VC for national food security and sovereignty on the other constitute the principal strength of this VC. In addition, it relies on a significant number of fishers and palaiês who make up a large and solid labour force with noteworthy empirical and traditional knowledge.

On the other side, the main weakness of the VC is the informal nature of the value chain, which results in widespread disorganization, informality and opacity of commercial transactions, as well as the use of malpractices by some of the actors. This situation of informality is nursed by, at least, three key factors: (i) a general low level of education and training, both at elementary and technical levels; (ii) lack of suitable infrastructure, equipment and auxiliary services; and (iii) insufficient public enforcement of existing regulations on fishing and food hygiene and handling.

Even though slightly more than 50 percent of palaiês and fishers declared to have received some training, focused mainly on navigation, safety at sea or on post-capture handling and processing techniques, those trainings have generally been sporadic and without consistent

follow-up. Furthermore, the low level of education and training of most of the VC actors prevents them from using elementary management procedures or accounting operations to efficiently carry out their business or productive activities. Bearing in mind that most of the actors are self-employed and have no experience in managing everyday business operations, along with the absence of formal trade agreements, are weaknesses that restrain their economic profitability and hamper their access to microcredit from conventional financial institutions. Regrettably, training and guidance in business management, marketing, new product development, etc., have been usually too scarce (see Section 2.3.2.3). Training and guidance in associative management has also been traditionally insufficient, resulting in an inefficient organizational structure of both the artisanal fisher and palaiê subsectors.

Additionally, the effort of completing a training course and subsequently implementing good practices learned are generally not effectively rewarded, as the poor conditions of the required infrastructure or services for fishing, refrigeration, processing, selling and transport, etc., make it difficult to carry out VC activities in satisfactory and appropriate conditions. Moreover, there are significant shortages and/or difficulties in accessing some basic inputs, ranging from potable water to electricity, ice, fishing materials, refrigeration chambers and boat building materials.

The third factor that incites informality in the VC is the weak institutional capacity to enforce regulations or ensure good practices in both fishing and post-capture activities. Bad practices, such as fishing with illegal nets of very fine mesh size (*rede brisa*) or too close to the shore or drying the fish directly on the ground within the reach of domestic animals, are largely performed and have no direct consequences to the VC actor despite the damage it may cause to the environment or to the health of consumers. This institutional weakness is also reflected in the limitation to carry out more rigorous and efficient statistical follow-up of fish catches to assess the state and evolution of fishery resources and to manage them correspondingly.

All these “weaknesses” in the value chain indicate that many of the products marketed in the value chain do not comply with sufficient hygiene and quality conditions considered to be healthy and safe or, in the best of cases, suffer a deterioration in quality that significantly devalues the product. In addition, use of inappropriate fishing gear or techniques jeopardizes the sustainability of fishing resources. All these circumstances negatively affect VC actors, particularly women processors (palaiês), as they are the most economically vulnerable, as discussed in Section 3.2.2 and Section 3.1.1.

Finally, it is also worth noting that the inefficient organization of VC stakeholders must be considered a weakness when it comes to ensuring cohesion and the necessary representation to defend the interests of their members.

Among the opportunities, it should be noted that the country’s energy policy tends towards investment in and development of alternative energies, making it possible to consolidate supply through the general energy network, which is currently deficient and highly polluting

(it depends on 100 percent of fossil fuels), with continuous power cuts that hinder the stable manufacture of ice and the proper maintenance of the cold chain. In addition, it is becoming much easier to purchase and install solar panels for small businesses and individuals. This opens a demand for qualified technicians and professionals, who will be needed to ensure the operation and maintenance of new facilities and will in turn create new opportunities for developing and adopting different solar energy systems for private use, such as refrigerators and driers.

This demand will stimulate and increase the trainings and capacity of the already existing vocational schools and provide specialized workers to small enterprises, who are gradually working more and more in these areas. Other initiatives such as the REINA programme (funded by the United Nations Development Programme, UNDP) are stimulating entrepreneurship and facilitating mechanisms to incubate and create small microenterprises in different productive areas.

External threats include the general increases in temperatures caused by climate change, which may lead to changes in the reproductive, feeding and/or migratory behaviour of certain species that are part of the value chain. Since Sao Tome and Principe is located on the equator, the warming of seawater would force some species to seek colder waters without being replaced by other species seeking warmer waters. Additionally, the increased frequency of extreme climatic phenomena such as torrential rains, strong storms or periods of drought will negatively affect both fishing practices and the processing and preservation of fishery products.

The growing pollution residing on the coast is also a threat because of the progressive increase in plastic and other types of waste (oils, organic waste, chemical fertilizers, fishing nets, etc.) that are not properly treated because of insufficient treatment facilities and capacity. Added to this is the possibility of initiating prospecting and exploitation of hydrocarbons present in the oceanic subsoil within the EEZ of Sao Tome and Principe, which would cause serious alterations to the ecosystem and fishing activities adjacent to the prospecting and exploitation sites.

In conclusion, the upgrading strategy should:

- Build on the main strengths mentioned, namely (i) that there is a huge and growing demand for VC products and that these are of vital importance for the food and nutritional security of the population; and (ii) that there is an important labour force made up of more than 4 000 men and 2 600 women working in the VC, mostly self-employed, despite the difficulties and shortages mentioned with acknowledged empirical experience and a proven capacity for hard work.
- Assume that the main weakness to be counteracted is the general informality of VC actors, both for capture and commercialization activities, fueled by the lack of sectoral

organization the insufficiency of means and/or updated technical knowledge and the lack of a proper resources management.

- Consider the opportunities represented by the development of new energy sources and new technologies for alleviating some of the main problems in the post-harvest stages, such as energy shortages in market cold chambers. The appearance of new institutions, such as REINA, that can provide support to sector development or the reintroduction of coastal pelagics into PNASE's menus could guarantee a stable demand.

There is a real threat of a possible decline of coastal pelagic species due to the lack of ecosystem-based management aggravated by global warming. Consequently, a need exists for ecosystem-based management measures for sustainable use of these resources together with transforming and commercializing procedures oriented to better product utilization and fish waste minimization.

Vision, targets and core strategy

The vision for the coastal pelagics value chain was developed together with VC actors and stakeholders during the validation and planning workshop. This vision states:

In the year 2032 the main actors of the coastal pelagic value chain, women and men, are sufficiently organised, trained and employ adequate means and infrastructures to carry out their work in satisfactory conditions and apply correct practices that guarantee their resilience, economic profitability and the environmental sustainability, contributing decisively to national food security and sovereignty by providing the population with fish products in good quality and hygiene conditions.

In this statement, the vision is based on the actual importance of the VC as an employment-generating activity that contributes significantly to the food and nutritional security of the population (and to the food sovereignty of the country), but assuming that it is necessary and desirable to improve environmental, social and economic performance sustainability as well as the resilience of the main actors.

The proper functioning of the VC must guarantee the supply, sufficient and continuous over time, of food of high nutritional value under hygienic and quality conditions in accordance with the practices defined and recommended by international standards, ensuring the preservation and sustainable exploitation of resources and through fair trade rules that equitably distribute the value generated among the different actors in the chain.

Upgrading strategy and theory of change

The challenge of the upgrading strategy is to promote the change from an informal, precarious, inefficient and poorly valued structure of the VC – with no current ecosystem-based management measures and insufficient monitoring and control capacity – to one that is well organized, professionalized, socially recognized and properly managed for achieving its decisive role in meeting the nutritional needs of the population.

Accordingly, the overall upgrading strategy aims at:

- **Moving from informality, marginality and precariousness to professionalism, formality and higher profitability.** This professionalization process includes carrying out the necessary actions and procedures to improve status and build up the capacities of VC actors to ensure decent labour conditions and the quality of the services they provide. To this end, the upgrading strategy will contribute to the strengthening and improvement of ancillary services, infrastructure and equipment necessary for proper functioning of fishing and marketing activities, notably in terms of providing safer and more efficient vessels, improving the functioning of the cold chain for the handling and preservation of fresh fish, and upgrading the actual fish-transport services both by road and by boat. The strategy also envisages encouraging this process of professionalization by acting on the adequacy of the financial services available so that they are adapted to the particularities and needs of duly trained professionals to enable them to carry out their activities or business plans.

Trained and accredited professionals will be aware of and work in compliance with existing regulations on fishing, food health and hygiene, labour requirements, etc., adopting reasonable trading procedures. Professionalization will lead to the recognition of rights and obligations of the different VC actors, particularly the women palaiês.

- **Implementing necessary actions to ensure sustainable and rational exploitation of fishing resources by means of adoption of suitable management plans and control measures,** together with the assurance of hygienic and sanitary quality of VC products are positioned in the local market in accordance with internationally accepted standards, such as the FAO Food Codex.
- **Raising institutional and social acknowledgement of the high importance of VC products for the food and nutritional security of most of the population.** The valorization and recognition of coastal pelagic food products will require actions that are aimed at changing the current paradigm that coastal pelagics is a food preferably targeted at and consumed by the most economically disadvantaged population and promoting their nutritional and quality benefits. It is therefore necessary to carry out appropriate actions while assuring hygiene and healthiness for regular consumers, as well as essential conditions demanded by more exigent consumers. To this end, product

attributes should be highlighted and valorized, such as being “traditional or typical” products, having a healthy nutritional value, and being “eco-socio-sustainable”, as they are caught with responsible fishing methods and processed with good hygiene practices.

The proposed improvement strategy is oriented towards the achievement of specific and measurable targets that, complementing each other, will contribute to decisively improve the sustainable performance of the VC in its economic, social and environmental aspects for attaining the vision.

These targets are:

- By 2032, coastal pelagic fishing resources have well-defined and operational ecosystem approach management plans based on reliable collected and analysed statistical data (scientific evidence).
- By 2032, 90 percent of the artisanal fleet are registered and operate with authorization.
- By 2032, 25 percent of dugout canoes are replaced by prao-type or fibreglass vessels.
- By 2032, at least 75 percent of the palaiês carry out their respective occupations in a professional manner, with fitting technical capacities and the correspondent status and official accreditation.
- By 2032, 75 percent of fishers and 75 percent of palaiês working in the VC adhere to a professional functional and representative organization.
- By 2032, 75 percent of fishers and 75 percent of palaiês working in the VC have access to appropriate cold storage to carry out their work efficiently and in satisfactory health conditions.
- By 2032, at least 75 percent of the products of the coastal pelagic VC are processed and marketed in accordance with international standards of food hygiene practices.

These objectives are aligned with national needs and policies,¹⁵ which aim to safeguard ecologically and economically sustainable fisheries that ensure food and nutrition security for the population. They are also supported by the recommendations of the FAO Voluntary Guidelines for Artisanal Fisheries,¹⁶ particularly the training and support of small-scale fishing communities, the acknowledgement of the full range of activities along the small-scale fisheries value chain as economic and professional operations, and the promotion of professional and organizational development opportunities, especially for more vulnerable groups of post-harvest fish workers and women in small-scale fisheries.

¹⁵ Law No. 09/2022 Fisheries and Aquaculture Law; Decree Law No. 19/2011 on health and hygiene rules for foodstuffs.

¹⁶ FAO. 2015. *Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication*. Rome.

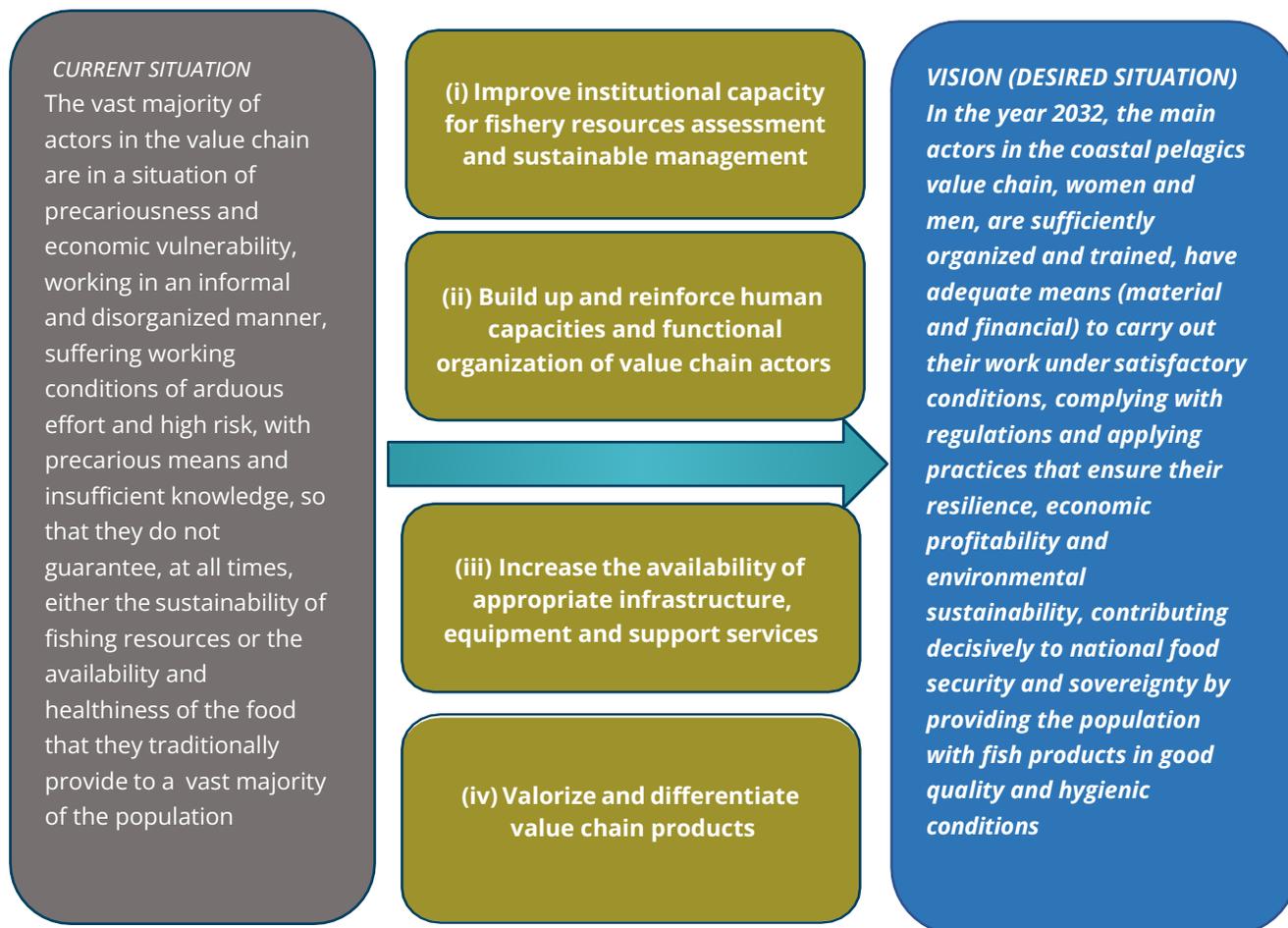
The vision is also aligned with the following 2030 sustainable development goals and targets:

- SDG 2: “End hunger, achieve food security and improved nutrition and promote sustainable agriculture and fisheries” (Targets 2.3, 2.a)
- SDG 3: “Ensure healthy lives and promote well-being for all at all ages” (Target 3.c)
- SDG 4: “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (Targets 4.3, 4.4, 4.5, 4.7, 4c)
- SDG 5: “Achieve gender equality and empower all women and girls” (Targets 5a, 5b, 5c)
- SDG 8: “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (Targets 8.2, 8.3, 8.8, 8.10)
- SDG 12: “Ensure sustainable consumption and production patterns” (Targets 12.2, 12.3, 12.a)
- SDG 14: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development” (Targets 14.1, 14.2, 14.4, 14.7, 14.a, 14.b)

The proposed upgrading strategy is centred on four outcomes based on desired behavioural changes for achievement of the vision.

- Improved management of the coastal pelagic fishery resources is increased for their sustainable exploitation.
- VC actors are organized and officially acknowledged as professionals.
- Service providers capacities are strengthened to improve VC actors’ working conditions and product quality.
- New value-added VC products are available in the market through new channels.

FIGURE 29. TRANSITION FROM THE COASTAL PELAGICS VALUE CHAIN CURRENT SITUATION TO THE VALUE CHAIN DESIRED SITUATION (THE VISION)



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

To achieve each of these outcomes, a series of outputs have been defined, which are in turn the result of the activities to be carried out (see Figure 30). Specific activities for the achievement of each output are detailed in Section 5 and, in general terms, they can be assembled into four different and complementary action lines (Figure 29), as described next.

(i) Improve institutional capacity for fishery resources assessment and sustainable management

This line comprises actions oriented to increase, update and process statistical information available on the state of coastal pelagics stocks, including the traditional and empirical knowledge of fishers, and to reinforce the technical and operational capacity of the fisheries administration in the formulation and implementation of appropriate fisheries management

and control measures (both MCS and food safety in fishery products) considering the interests and knowledge of the main actors involved.

(ii) Build up and reinforce human capacities and functional organization of value chain actors

This line comprises diverse training actions, at different adapted levels, aimed at achieving the professionalization of VC actors, namely fishers and palaiês – by undertaking training courses and learning validation procedures, they will gain the necessary knowledge to develop an activity with the minimum required skills.

These training actions, included in suitable training programmes and procedures, shall be previously defined upon detailed needs assessments; they should be accessible (by time, location, level of education, economy, family situation, etc.) and appealing to potential beneficiaries, particularly the palaiês.

(iii) Increase the availability of appropriate infrastructure, equipment and support services

This third line of intervention focuses on the improvement and availability of adequate and well-managed infrastructure, equipment and support services, with emphasis on services and equipment that guarantee the maintenance/use of the cold chain, so that VC actors can carry out their activity and develop their skills in satisfactory conditions of profitability, safety and hygiene. The philosophy that inspires the different activities conceived under this line of intervention is, whenever possible, to improve, reinforce and take advantage of the capacities already existing in the country, generating business opportunities that ensure the sustainability of the services promoted. Consequently, it will be necessary, among other actions, to improve the local offer and proficiency of support services and promote appropriate financial services to facilitate the creation of new service companies or cooperatives.

Infrastructure, equipment or support services targeted by these improvement actions are those considered to have a greater impact on the correct functioning of the value chain, namely those related to safety at sea, fishing, post-harvest activities and transport. It should be noted that the project is not intended to address the creation of new infrastructure, which is under the scope of the PRIASA – third phase programme development – but rather the adaptation and proper functioning of existing infrastructure by strengthening the capacities of technicians specialized in repair, maintenance and management.

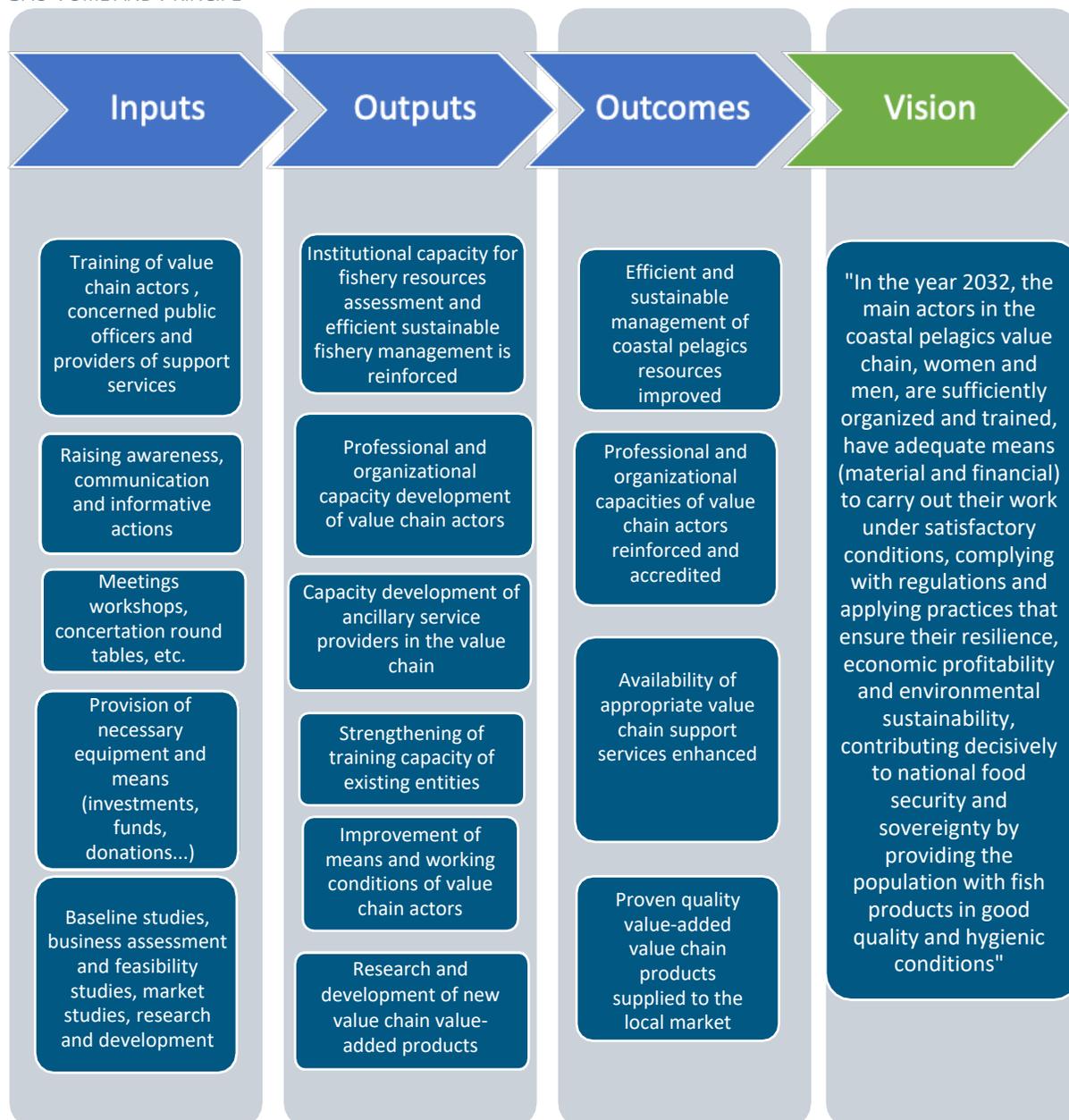
Similarly, the project will contribute to the reinforcement and increase of existing capacities for the construction of improved boats, which will be safer and more efficient for fishing activities than dugout canoes. The transition from dugout canoes to upgraded boats will be closely linked to fishing effort management to guarantee sustainable exploitation of resources.

(iv) Valorize and differentiate value chain products

Activities included in this component are oriented to increase local market supply with healthy and nutritious fish products, differentiated not only by their nature and quality but also by their attributes related to environmental sustainability, geographical origin and cultural traditions. This outcome aims to capitalize and make visible, in an efficient and demonstrative way, the results of actions carried out in the previous outcomes.

The valorization of products in the value chain has several objectives. On the one hand, the development of value-added products, manufactured with internationally accepted quality standards and properly differentiated from those manipulated without appropriate practices, will permit access to more demanding markets such as school canteens, hospitals and other public or private institutions, as well as restaurants and supermarkets. On the other hand, valorisation aims to increase the general awareness of the importance that VC products have for food security and nutrition of the population and will inspire actors in the value chain themselves to improve product treatment and preservation and to increase their own awareness of their responsibility as food suppliers. Finally, proper identification and differentiation of these products in marketing will contribute to increase general recognition of VC products, changing the paradigm that they are second-class products to that of being traditional, healthy and nutritious products.

FIGURE 30. THEORY OF CHANGE FOR THE OVERALL UPGRADING STRATEGY OF THE COASTAL PELAGICS VALUE CHAIN IN SAO TOME AND PRINCIPE



Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Upgrading plans

Upgraded business models

These considerations were taken into account when proposing to upgrade business models:

- International or regional markets. There is a high national demand for coastal pelagics, which have a relevant contribution to national food security and sovereignty. Hence, the development of these markets could undermine the country's food security; in addition, the low market value of these species does not facilitate their trade outside Santomean borders.
- Fishers. An increase in captures is not advisable since there are indications that fish stocks are fully exploited. Furthermore, fishers lose 3 percent of their catches, which shows already a quite effective process from capture to sale with few losses.
- The VC actor with the highest yearly net income are palaiês selling mostly fresh fish (see Section 3.1.1). Most of these palaiês trade fresh fish; they dry salt fish to preserve the fresh product only when the fish has been unsold and is beginning to deteriorate (15 percent of their sales). In this case, the dried product obtained is of low quality and is sold even below cost, as its sale represents a lower loss, but not a benefit over costs.
- There are also palaiês who specialize in the production of dried products from good quality fresh fish that needs to be immediately dried because the possibility of selling it fresh is too limited. This is normally the case of the palaiês in Principe, or in periods of fish abundance in Sao Tome. The practice of salt drying fish has a higher cost, mainly because of the loss of weight from dehydration and gutting (20–60 percent of loss depending on the type of fish and salting procedure) and to the use of salt (20–35 percent of fish weight), an imported raw material considered expensive in Sao Tome and Principe.

Taking into account the above, the following upgraded business models will be supported:

- **Reduce fresh fish palaiês product losses and percentage of fish that needs to be dried to avoid spoilage.** Operating profits of fresh fish selling can be significantly improved (+25 percent) by using more ice to preserve products and to avoid physical and quality losses, since fresh fish palaiês dry, on average, 15 percent of their product to avoid

spoilage. Table 16 summarizes the calculations of this upgrading business model.¹⁷ Thanks to the application of good handling and hygiene practices, together with the correct use of ice for the preservation of fresh fish, the percentage of spoiled fish would be reduced to 2 percent and the percentage of fresh fish would increase to 90 percent.

¹⁷ According to Table A3.3 in Annex 3, in the current situation, the annual operating profit of selling fresh coastal pelagics is STN 10 323. This calculation estimates that 6 percent of the fish bought by the palaiês is lost through spoilage and 5 percent is self-consumed, while for the fish marketed, 85 percent is sold fresh and 15 percent is processed and sold as salt dried.

TABLE 16. FRESH FISH PALAIÊS CURRENT AND POTENTIAL OPERATING ACCOUNTS AND PROFITS

Item: Value chain coastal pelagics except skipjack tuna	Current situation: marketed fish is 85% fresh and 15% dry; 6% of losses from fish inputs		With upgrading: marketed fish is 90% fresh and 10% dry; 2% losses from fish inputs	
	kg	Sao Tomean dobra	kg	Sao Tomean dobra
Revenues (received by actor)				
Total fresh sales	1 852	94 177	2 022	103 298
Total dry sales	245	13 369	165	8 232
Total revenues	2 097	107 546	2 187	111 530
Costs (paid by actor)				
Fresh fish inputs	1 972	76 338	2 065	80 270
Dry fish inputs	317	10 596	224	6 720
Salt (1.7 dobra/kg dry fish) (*)	2 289	539	2 289	381
Ice*		2 250		3 717
Transport, food, packaging (50 dobra × 150 days)		7 500		7 500
Total costs		97 223		98 588
Operating profits		10 323		12 942

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

- **Improving marketing to differentiate salt-dried high-quality products.** At the market, both low-quality and high-quality salt-dried products are sold without any differentiating label or arrangement, which renders quite difficult for the buyer to differentiate between products made from top-quality raw material and those made from already deteriorated or about to deteriorate fish. Thus, investing in marketing (labelling, branding, advertising or new forms of presentation) represents a clear opportunity for business improvement, particularly for those producers who produce their foodstuffs from first quality raw materials and need to sell it with a cost benefit.
- **Functional associations develop new products that open access to other markets.** During the past decade, some associations of fishers and palaiês have carried

out, with the support of cooperation projects (i.e. PAPAFA, PROFOPESCAS, PRIASA, etc.), the development of small businesses for processing fishery products (drying, smoking, filleting). Unfortunately, once the project support ended, these initiatives stopped working because of insufficient financial resources, improper equipment maintenance and/or organizational and managerial issues. In this sense, the proposed improvement actions are aimed at strengthening palaiê associations to have inclusive and sustainable management that will contribute to develop new products, create added value and promote efficient processing techniques. Examples of possible products to be developed are homemade preserves, ready meals, fish burgers, and well-packed dried or smoked fish. Still, there is scope to work in improving traditional dried fish products but incorporating “healthy” attributes such as low salt content. These products will be suitable for other markets, such as school feeding programmes (e.g. PNASE) or institutional canteens, and will be properly branded for the final consumer so they can choose these products over the ones that do not comply with the same quality and hygiene measures. Furthermore, the adequate treatment of by-products generated by new processing techniques could represent an opportunity for use in animal feeding.

With regard to the development of new products, reliable data are lacking to make an assessment, especially as the products to be developed have not yet been defined and will be identified from an ad hoc market study. However, directing these products towards food for children, complying with all the hygiene and health requirements to market them through an agreement with the PNASE, opens up a market of around 50 000 users who, on a regular and continuous basis, will demand these products. Such an agreement would allow the planning and organization of production and sales in the medium term and the elaboration of a business plan that would have a good chance of being financed by a financial or development entity. The project will support the product development phase and the establishment of product quality and manufacturing protocols with at least three pilot entities (associations or microenterprises).

Upgraded enabling environment

To ensure a favourable enabling environment, both in the sociocultural and the institutional dimension, required for attaining the expected outcomes, upgrading activities will be oriented to address the bottlenecks concerning organizations, equipment, infrastructure and institutions (policy and legislation) that govern and/or support value chain operations.

Improving the sociocultural enabling environment requires the active involvement of VC actors and, assuming that most of the VC actors are willing to improve their livelihood conditions, the project will enable the realization of activities dealing with the following issues:

- (i) Improving awareness and recognition, both at the institutional and social levels, of the importance of the coastal pelagics value chain in at least three aspects of special relevance at national scale:
 - (a) Its contribution to national food and nutritional security, as supplier, in sufficient and accessible quantity of nutritious and healthy fish products to a vast majority of the population.
 - (b) Its importance as maintenance and creation of employment, particularly for women, which must be carried out under adequate conditions of safety, hygiene and economic profitability.
 - (c) Its contribution to the country's food sovereignty, as it involves locally sourced food products that minimize imports of other foods and increase resilience in the face of food crises due to external factors.

This recognition should lead, at the political level, to the definition and adoption of measures and regulations that guarantee the formalization and adequate organization of the activity, guaranteeing adequate working conditions for VC actors and facilitating adequate access to financial resources.

- (ii) Improving the availability of efficient services, infrastructure and equipment indispensable for appropriate functioning of the VC. This will be addressed primarily by improving the local training capacity and local know-how, specifically aimed at the provision of specialized staff and services contributing to the modernization of the VC and providing local solutions to local problems commonly encountered in different areas of the value chain, particularly in those related with modern boat-building, cold chain facilities and equipment, and appropriate fish transport. The FISH4ACP actions are not aimed at the construction of new infrastructure, which is planned in the third phase of the PRIASA project, but at ensuring the proper functioning of both existing and future infrastructure.

Regarding the institutional dimension, in a first assessment, the fisheries administration has legislation and regulations that, if applied, would allow it to carry out a more efficient and orderly management of resources. However, a series of weaknesses have been identified that hinder the application of these regulations. Thus, upgrading the institutional enabling environment will require interventions aimed at strengthening fisheries administration institutional capacities to improve its performance in three fundamental functions:

- (i) Coastal pelagic fishing resources assessment and management. The operational and technical capacities of both fisheries inspectors and fishery statistics department staff and officials need to be strengthened and updated.
- (ii) The inspection capacity for monitoring, surveillance and control of both catch and post-harvest activities, assuring widespread use of both responsible fishing and good hygiene

practices. For this purpose, the operational and technical capacities of fisheries and health inspectors need to be strengthened.

- (iii) The review and updating of existing regulations, based on new scientific evidence, as well as the definition and elaboration of new regulations and resource management plans, based on ecosystem and best management approaches and oriented to both sustainable development of the activity and the preservation of biodiversity.

Upgraded governance

On top of institutional upgrading reported in the previous section, which will also benefit VC governance, upgraded governance activities will improve the organizational structure of VC actors and their relations with other relevant actors, such as markets, support service providers, financial institutions and government-dependent consumers, such as school canteens and hospitals. Accordingly, upgrading activities should be aimed at tackling the situation of widespread informality, which is considered a main weakness for the correct functioning of the VC. In this sense, as stated above (see Section 4.2), the professionalization of VC actors, and particularly in the case of the palaiês (considering the fact that fishing activity has slightly better regulations), is a must to recognize and enforce their rights for establishing and ensuring trading relationships based on fair trade practices, as well as their obligations to provide safe and hygienic food to consumers.

The professionalization activities are mainly aimed at strengthening the human capacities of VC actors, not only in essential aspects related to the professional activities they carry out (fishing, marketing, processing, etc.) but also in complementary areas that will help them to carry out these tasks in a functional and profitable way, such as accounting, business management, entrepreneurship and associative management. Furthermore, given the importance of efficient and operational professional organizations, activities aimed at strengthening and reactivating existing associations will be carried out, contributing to a more resilient VC.

The professionalization of the palaiês will effectively contribute to reducing the gender gap, as it will imply a greater and better organization of women in sharing and defending their interests, as well as a greater recognition of their work and status by society and institutions. This new status will also have a positive and decisive influence on their consideration as creditworthy subjects by financial institutions, NGOs and development projects.

Additionally, to reinforce the process of assuring the quality and hygiene of the products in the value chain, a series of activities aimed at improving the identification and appreciation of those products, both by consumers and producers themselves, will be carried out. This identification is necessary not only for differentiating the increased quality products from the others, but also for increasing the self-esteem of those workers in the value chain who are proudly convinced of their good practices and for attaining the social consideration they deserve. Those products will be marketed with a differentiating “quality brand” or “label” to

identify and differentiate products that meet a series of previously defined quality requirements, from capture to marketing.

4.4 Anticipated sustainability impact

To complete the upgrading strategy development, the upgrading strategy is linked back to the sustainability impact it is expected to have. Three questions lead the development of this section.

(i) Will the strategy lead to the realization of the vision and deliver impact at scale?

The key economic, social and environmental performance indicators under current and upgraded conditions are presented in Table 17. These indicators show the positive impacts of the upgrading strategy across the three elements of sustainability.

TABLE 17: KEY ECONOMIC, SOCIAL AND ENVIRONMENTAL PERFORMANCE INDICATORS UNDER CURRENT AND UPGRADED PRACTICES (AGGREGATED AT VALUE CHAIN LEVEL)

Economic indicators	Current situation	With upgrading
Total value chain direct value added	USD 4.17 million	USD 4.45 million
Social indicators	Current situation	With upgrading
Proportion (%) of actors who are part of community associations	23% fishers/33% palaiês	75%
Proportion (%) of vessels that are not dugout canoes	10%	32.5%
Proportion (%) of value chain actors (fisherfolk and palaiês) who are officially recognized as professionals	0%	75%
Proportion (%) of coastal pelagic products that are marketed following food hygiene international standards	TBD	75%
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 fishery management plans that are updated, implemented and improved annually	0 per year	1 per year
Proportion (%) of artisanal vessels that fish with authorization	0%	90%

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

(ii) Will the strategy generate important positive or negative economic, social or environmental externalities?

Potential externalities of the proposed upgrading strategy may be both positive and negative.

Potentially negative externalities include:

- Increase in general fishing effort due to fleet transition from dugout canoes to upgraded boats affects the sustainability of all fishery resources. This transition will be coupled with management measures to guarantee that fishing efforts are kept at sustainable levels.
- Increase in electricity/power/fuel use associated with the production of ice necessary to better preserve fresh coastal pelagic products and their transport to market. However, the use of cold chain equipment run with renewable sources of energy, such as solar panels, should minimize emissions of CO₂.
- Increased fuel/power associated with transitioning the fleet from dugout to upgraded boats.
- Use of plastics in the VC for packing and differentiation of products may harm the environment. The use of biodegradable materials should be favoured.
- Use of fuel associated with the implementation of project activities and associated contributions to greenhouse gases. Local consultants will be used where skills are available to reduce the need for international flights, and efforts will be made during implementation to ensure shared travel when using private vehicles and/or to use public transport where feasible.

Potentially positive externalities include:

- Successful activities related to the building of community associations, and the establishment/support of management arrangements plans could provide lessons for replication in other fisheries value chains.
- Successful professionalization of coastal pelagics VC actors could be replicated to formalize other sectors in Sao Tome and Principe.
- Critical habitat protection such as corals or seagrass, as well as reducing ETP captures, will increase the attractiveness of tourism in the country.
- Strengthening local service and input providers, such as the cold value chain to support coastal pelagic fishery products preservation, could benefit other sectors (i.e. agriculture or farming).
- Strengthening institutional capacity to conduct fishery products food safety controls can benefit control over other food products.

- Mechanisms created to favour VC actors' access to microfinance, and the formal banking finance sector may benefit other members of communities involved with other productive sectors.
- New market linkages established to supply coastal pelagic products to institutional canteens (schools, nursing homes for the elderly) may be an opportunity to trade other goods produced at the community level (vegetables, poultry, etc.), resulting in other gains for rural communities.
- The professionalization of the sector can lead to increased taxation of VC actors, which can help boost revenue for the government and in turn greater investments in the sector.

(iii) Will the strategy increase the resilience of the VC?

The strategy aims to strengthen the VC organization and its professional and technical capacity. When reflecting on the key domains of resilience discussed earlier in Section 3.4, resilience of the VC to potential market shocks will be enhanced through improving cold-chain services and equipment (refrigerators/freezers) for the storage of processed coastal pelagics, which will allow for increases in "redundancy", i.e. the ability of VC actors to store products.

The "diversity" of the value chain will also be enhanced, thereby increasing resilience to market shocks through new marketing channels (e.g. PNASE or other institutional canteens) and products (e.g. homemade preserves, ready meals, fish burgers) developed for the sale of coastal pelagics.

Actions in the upgrading strategy related to increasing and strengthening VC actor participation in representative associations will increase the 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. Training linked to the professionalization of the sector will also serve to increase the potential for "learning and adaptation" and thereby the resilience of VC actors.

5 Implementation plan

In this final section of the report, the upgrading strategy presented in Section 4 is translated into a VC upgrading implementation plan. This section includes three main sections: (i) a logframe for the entire upgrading strategy, which will be used to monitor and evaluate the implementation and results of the strategy; (ii) specification of activity and investment plans for sustainably developing the value chain (this also covers the whole set of activities all VC stakeholders will have to engage in, as well as those specifically proposed by the FISH4ACP project); and (iii) a risk analysis, which discusses the risks that could prevent the achievement of the envisioned impact, and which develops associated mitigation strategies affecting both the overall and project-specific plans.

Logframe for value chain upgrading

A logframe for VC upgrading is provided in Table 18. As with all logframes, it should be viewed as a living framework to monitor and evaluate progress towards achieving the stated vision and upgrading strategy.

The strategic interventions, based on key constraints identified in the VC analysis, are grouped into four outcomes and 20 outputs and are presented in the table.

TABLE 18. OVERALL LOGFRAME FOR VALUE CHAIN UPGRADING

Impact	Impact indicator 1	2022 baseline		2025 target	2032 target	Assumptions
The sustainable exploitation of coastal pelagics resources and the working conditions, professional organization and economic profitability of value chain actors are enhanced, supplying good quality coastal pelagic products that contribute decisively to food security and nutrition of the population	Tonnes of coastal pelagics commercialized (consumer level) in accordance with good food hygiene practices	No data	Planned	1 500 (25%)	4 500 (75%)	Actual amount of marketed coastal pelagics is estimated at 5.2 tonnes. Estimated values of value chain direct value added are based exclusively on the upgrading business model for palaiês and therefore should be considered as a minimum. Total expected direct value added should be higher, but it cannot be properly calculated with current data.
			Achieved			
			MoV*	Fishery sanitary reports		
	Impact indicator 2	2022 baseline		2025 target	2032 target	
	Total value chain direct value added	USD 4.17 million	Planned	USD 4.22 million	USD 4.45 million	
			Achieved			
			MoV	Independent assessment report in 2025 and 2032		
	Impact indicator 3	2022 baseline		2025 target	2032 target	
	Number of fishing accidents annually reported	14 (5 deaths) (number of accidents is probably underreported)	Planned	30 (0 deaths)	10 (0 deaths)	
			Achieved			
			MoV	Official fishery casualties register		
	Impact indicator 4	2022 baseline		2025 target	2032 target	
	Number of environmental sustainability hotspots improved	13 (4 red)	Planned	6 (3 red)**	6 (3 red)**	
			Achieved			
			MoV	Independent assessment report in 2025 and 2032		
Impact indicator 5	2022 baseline		2025 target	2032 target		
Number of social sustainability hotspots improved	20 (7 red)	Planned	8 (2 red)***	8 (2 red)***		
		Achieved				
		MoV	Independent assessment report in 2025 and 2032			

*MOV refers to means of verification.

**4 yellow: (i) stock status and dynamics; fishing pressure; impact on associated species (demersal juveniles); food loss; and (ii) 3 red: status of ETP species; status of vulnerable ecosystems; clean energy use.

***6 yellow: (i) women's economic involvement; women's decision-making and leadership; utilization of food; job safety and security; job attractiveness; collective action; and (ii) 2 red: policy, regulations and standards; access to finance.

Outcome 1	Outcome indicator 1.1	2022 baseline		2025 target	2032 target	Assumptions
Improved management of coastal pelagic fishery resources for their sustainable exploitation	Fisheries management plan implemented	0	Planned	1	3 (biannually reviewed)	The regulatory text elaborated with the technical advice of the project is approved and ratified by the competent authorities and implemented with sufficient financial and human resources based on government budgets
			Achieved			
			MoV	Fisheries management plan report Department of Fisheries records % of actions in plan completed Assessment report of the level of implementation in 2025 and 2032		
	Outcome indicator 1.2	2022 baseline		2025 target	2032 target	
	Fisheries sanitary inspection plan biannually updated implemented	0	Planned	1	1/year	
			Achieved			
MoV			Annual fisheries sanitary inspection reports			
Output 1.1	Output indicator 1.1.1	2022 baseline		2025 target	2032 target	Assumptions
1.1 Capacity development programme for collecting, processing and analysing fish stock assessment statistical data designed and implemented	Domestic fleet and palaiês frame survey conducted	1 From 2019	Planned	1	1 every 2 years	Fisherfolk are collaborative with enumerators and facilitate the conduction of the sampling programme
			Achieved			
			Planned	Frame survey report		
	Output indicator 1.1.2	2022 baseline		2025 target	2032 target	
	Number of data collectors (gender disaggregated) trained in effective data collection for fish stock assessment	12 enumerators are currently working for the government	Planned	TBD based on new sampling scheme (X/Y)	TBD based on new sampling scheme (X/Y)	The Department of Fisheries continues to engage data enumerators based on the landing sites. All the data collectors and data processing officers existing in 2022 are respectively trained.
			Achieved			
MoV			Training workshops report			

	Output indicator 1.1.3	2022 baseline		2025 target	2032 target	Fisherfolk are collaborative with enumerators and facilitate the conduction of the sampling programme. Data collection plans and stock assessment reports must be implemented and supported annually by the government once the initial project support has ended.
	Number of upgraded yearly data collection plans elaborated and conducted	1	Planned	1/year	1/year	
			Achieved			
			MoV	Annual data collection plans document and data forms submitted		
	Output indicator 1.1.4	2022 baseline		2025 target	2032 target	
	Number of officers (gender disaggregated) trained in fishery data processing and analysis to conduct stock assessments	0	Planned	4 (2/2)	4 (2/2)	
			Achieved			
			MoV	Document of training contents/list of trained officers (gender disaggregated)		
	Output indicator 1.1.5	2022 baseline		2025 target	2032 target	
	Number of annual stock assessment reports elaborated	0	Planned	1	1/year	
			Achieved			
			MoV	Stock assessment report		
Output 1.2	Output indicator 1.2	2022 baseline		2025 target	2032 target	Assumptions
A fisheries management plan is developed, biannually updated and communicated	Fisheries management plan developed and communicated	0	Planned	1	3 (biannually reviewed)	Biannual review of the fisheries management plan must be carried out by the fisheries administration after the project ends. Communication of the plan to value chain actors must be carried out by the fishery extension service and specialized NGOs.
			Achieved			
			MoV	Fisheries management plan report Communication material to disseminate plan content		

Output 1.3	Output indicator 1.3.1	2022 baseline		2025 target	2032 target	Assumptions	
Training of fisheries inspectors to develop operational fishery inspection plans completed	Number of inspectors trained in fishery inspection procedures (gender disaggregated)	4 fishery inspectors are currently working for the government	Planned	6 (3/3)	6 (3/3)	All the fishery inspectors and control agents existing in 2022 are trained and two additional inspectors are hired and trained. Trained inspectors have at their disposal the essential means to put their learning into practice and to carry out their work in an efficient and organized manner.	
			Achieved				
			MoV	Training workshops report			
	Output indicator 1.3.2	2022 baseline		2025 target	2032 target		Assumptions
	Operational fishery inspection plans with ad hoc inspection manuals are developed	0	Planned	2	2/year		Yearly review of the operational fishery inspection plan and manuals must be carried out by the fisheries administration after the project ends. Inspection manuals are updated after reviews and available in sufficient quantity.
			Achieved				
MoV			Fishery inspection operational plan report Inspection manuals				
Output 1.4	Output indicator 1.4.1	2022 baseline		2025 target	2032 target	Assumptions	
			Planned	8 ¹⁸	8		
			Achieved				

¹⁸ Five food safety inspectors from the Fisheries Department, three veterinary services officers.

Training of fisheries sanitary inspectors to develop sanitary inspection plan for coastal pelagic products and ad hoc operational plans completed	Number of fishery sanitary inspectors (gender disaggregated) trained	8 total – sanitary fishery inspectors (5) and veterinary officers (3) – are currently working for the government	MoV	Training workshops report		All the sanitary fishery inspectors existing in 2022 are trained. Custom police and veterinary service officers are also included.	
	Output indicator 1.4.2	2022 baseline		2025 target	2032 target	Assumptions	
	Operational sanitary inspection plan for coastal pelagic products and ad hoc inspection manuals are developed	0	Planned	2	2/year		Implementation and yearly review of sanitary inspection operational plans and their manuals must be supported and carried out by the fisheries administration after the project ends.
			Achieved				
MoV			Sanitary inspection plan document Sanitary inspection manuals				

Outcome 2	Outcome indicator 2.1	2022 baseline		2025 target	2032 target	Assumptions
Value chain actors are organized and officially acknowledged as professionals	Official regulatory documents that enforce professionalization of fishers and palaiês (one for each collective)	0	Planned	2	2	The regulatory document elaborated with the technical advice of the project is approved and ratified by the competent authorities and implemented with sufficient government financial and human resources.
			Achieved			
			MoV	Officially approved regulatory documents for fisherfolk and palaiês		
	Outcome indicator 2.2	2022 baseline		2025 target	2032 target	Assumptions
	Number of fishers and palaiês (gender disaggregated) officially recognized, registered and authorized since 2023	0	Planned	850 (350 women)	6 000 (2 000 women)	The fisheries administration undertakes the process of regularization and registration of all fishers and palaiês and grants the corresponding enabling authorization.
			Achieved			
			MoV	Register of accredited fishers/palaiês		
	Outcome indicator 2.3	2022 baseline		2025 target	2032 target	Assumptions
	Number of associations properly managed	There are 5 (of 29) associations representing around 100 members, 60 of them women, better managed	Planned	5 (100 members, 60 of them women)	20 (400 members, 100 of them women)	Association members understand the potential a properly managed association has to improve their work.
Achieved						
MoV			Association statutes and meeting minutes			

	Outcome indicator 2.4	2022 baseline		2025 target	2032 target	Assumptions
	Reduction of the number of fishing infractions (including endangered, threatened or protected catches) reported from 2025 to 2032	No data available	Planned	X (TBD)	25% of X	The mandatory training received generates a greater collective awareness among sector professionals of the need to sustain resources and to adopt responsible fishing practices. The government carries out fisheries inspections.
Achieved						
MoV			Fishery inspection logbooks			
	Outcome indicator 2.5	2022 baseline		2025 target	2032 target	Assumptions
	Reduction of the percentage of fish-sanitary infractions reported from 2025 to 2032	No data available	Planned	X (TBD)	25% of X	The mandatory training received generates a greater collective awareness among palaiês to provide food-safe fishery products.
Achieved						
MoV			Fishery sanitary inspection logbooks			

Output 2.1	Output indicator 2.1.1	2022 baseline		2025 target	2032 target	Assumptions
The principles and procedures to become professional artisanal fishers and palaiês are defined and agreed	Number of awareness-raising events on the convenience and procedures required to professionalize the activity	0	Planned	15	15	The consultation process is inclusive, the communication means and procedures are effective so that participation is broad and active. Most involved stakeholders consider the professional status beneficial for themselves. As a result, an agreement is signed between the representatives of the main fisher and palaiê associations and the administration.
			Achieved			
			MoV	Campaigns reports List of means and staff involved		
	Output indicator 2.1.2	2022 baseline		2025 target	2032 target	
	Number of participatory formal consultative meetings	0	Planned	3	3	
			Achieved			
MoV			Minutes of participatory meetings and list of participants			
Output indicator 2.1.3	2022 baseline		2025 target	2032 target		
Number of regulations to professionalise fishermen and palaiês developed	0	Planned	1	1		
		Achieved				
		MoV	Regulation document			
Output 2.2	Output indicator 2.2.1	2022 baseline		2025 target	2032 target	Assumptions
Professionalization process, including specific mandatory training programmes, is defined for each subsector	Number of mandatory training curriculums developed to become professional fishers and palaiês	0	Planned	2	2	The regulatory documents, including the training programmes and the procedures to become professional, are ratified by the representatives of the actors and stakeholders involved.
			Achieved			
			MoV	Draft regulatory documents (one for each subsector)		

Output 2.3	Output indicator 2.3	2022 baseline		2025 target	2032 target	Assumptions
An upgrading training programme for professional value chain actors, with special focus on association strengthening is designed	Number of upgrading training curriculums developed	0	Planned	3	6	Actors recognize training received enables them to access funding and improve work options and show interest. Association members understand the potential a properly managed association has to improve their work.
			Achieved			
			MoV	Training programmes content documents		
Output 2.4	Output indicator 2.4.1	2022 baseline		2025 target	2032 target	Assumptions
Training services and equipment to conduct the training programmes are established and functional	Number of official agreements with training entities	0	Planned	2	3	At least two entities, public or private, have the interest and the sufficient capacity for implementing the designed training programmes, together with the initial support of the FISH4ACP during the first two years and with other funding from 2025 onwards. Means and funds provided by the project and the government ensure that all interested individuals, men and women, have an equal opportunity to regularize their professional status.
			Achieved			
			MoV	Document of agreement		
	Output indicator 2.4.2	2022 baseline		2025 target	2032 target	
	Number of value chain actors (gender disaggregated) who have completed or validated the compulsory training to become professional	0	Planned	850 (350)	6 000 (2 000)	
			Achieved			
			MoV	Training workshops report		
Output indicator 2.4.3	2022 baseline		2025 target	2032 target		
Number of value chain actors (including representatives from sectorial associations) who have followed an upgraded training course (gender disaggregated)	0	Planned	5 (100 members, 60 of them women)	15 (300 members, 180 of them women)		
		Achieved				
		MoV	Training workshops report			

Outcome 3	Outcome indicator 3.1	2022 baseline		2025 target	2032 target	Assumptions		
Service providers capacities strengthened to improve value chain actors' working conditions and product quality	Number of dugout canoes replaced by safer vessels	0	Planned	75	500	The financial mechanisms devised to finance the different economic initiatives of the members of the value chain work efficiently and in accordance with the principles and requirements established by the project, and the default rate is reduced thanks to the control mechanisms in place.		
			Achieved					
			MoV	Fishing vessel register				
	Outcome indicator 3.2	2022 baseline		2025 target	2032 target		Assumptions	
	Number of service providers able to maintain fish cold-chain equipment (individual or entity), specialized in solar-panel run equipment	0	Planned	5	15		The value chain palaiês invest in purchasing freezers to preserve their products.	
			Achieved					
			MoV	Logbook of service providers				
	Outcome indicator 3.3	2022 baseline		2025 target	2032 target			
	New refrigeration equipment running on alternative energies adopted by associations or microenterprises	0	Planned	25	200			
			Achieved					
MoV			Independent assessment report in 2025 and 2032					

Outcome indicator 3.4	2022 baseline		2025 target	2032 target	Assumptions
Proper fish-transport services available and accessible for professional workers of the value chain	0	Planned	5	15	The improved quality of fishery products transported under appropriate conditions is recognized and appreciated by the consumer, who bears the cost involved
		Achieved			
		MoV	Independent assessment report in 2025 and 2032		
Outcome indicator 3.5	2022 baseline		2025 target	2032 target	Assumptions
Number of actors benefiting from new infrastructure facilitated by the strategy	0	Planned	500	2 500	Infrastructure (e.g. mooring points) is required to improve working conditions/safety. Investments by other programmes, such as the Infrastructure Rehabilitation for Food Security Support Project (PRIASA), Phase III, are committed.
		Achieved			
		MoV	Independent assessment report in 2025 and 2032		
Outcome indicator 3.6	2022 baseline		2025 target	2032 target	Assumptions
Number of value chain professional actors accessing finance facilitated by the strategy	0	Planned	250 (150 of them women)	1 200 (600 of them women)	Improved access to finance and savings will enable actors to invest in equipment (freezers run by solar power, boats, etc.), improve working conditions, develop new products, grow businesses and increase profits.
		Achieved			
		MoV	Independent assessment report in 2025 and 2032		

Output 3.1	Output indicator 3.1	2022 baseline		2025 target	2032 target	Assumptions
Study to determine the most convenient boat design and materials to capture coastal pelagics	Number of studies to determine the most convenient boat design and materials to capture coastal pelagics	0	Planned	1	1	Study can identify potential new models and materials to be used to have a more efficient fleet.
			Achieved			
			MoV	Study report		
Output 3.2	Output indicator 3.2	2022 baseline		2025 target	2032 target	Assumptions
Training to build modern and safer fishing boats completed	Number of people (specialists) trained on building modern and safer fishing boats	5	Planned	20	20	The means and actions provided by the project to improve capacities, support services, equipment and infrastructure for the fishing activity are maintained over time by the actors/institutions benefited by the project.
			Achieved			
			MoV	Training workshops report		
Output 3.3	Output indicator 3.3	2022 baseline		2025 target	2032 target	Assumptions
Training on how to maintain/repair cold-chain equipment (also those that run with solar panels) completed	Number of people (specialists) trained in maintenance/repair of cold-chain equipment	4	Planned	20	20	The means and actions provided by the project to improve capacities, support services, equipment and infrastructure for post-harvest activities are maintained over time by the actors/institutions/NGO, etc., benefited by the project.
			Achieved			
			MoV	Training workshops report		

Output 3.4	Output indicator 3.4	2022 baseline		2025 target	2032 target	Assumptions
Use of alternative energies for refrigeration equipment is promoted	Number of market surveys to identify refrigeration equipment running on alternative energies and adapted to the needs of value chain actors	0	Planned	1	1	The Government of Sao Tome and Principe keeps supporting the introduction and use of alternative energies in the country, and solar panels are available in the country.
			Achieved			
			MoV	Market survey report		
Output 3.5	Output indicator 3.5	2022 baseline		2025 target	2032 target	Assumptions
Technical and financial feasibility study on alternatives to improve transportation of fishery products to promote and support the creation of appropriate fish-transport services	Number of technical and financial feasibility studies on alternatives to improve transportation of fishery products completed	0	Planned	1	1	Existing transport service providers have interest in upgrading their services to transport fish complying with good conservation and hygiene practices.
			Achieved			
			MoV	Study report		
Output 3.6	Output indicator 3.6	2022 baseline		2025 target	2032 target	Assumptions
Appropriate infrastructure specified, procured and delivered	Number of infrastructure built	TBD	Planned	TBD	TBD	Appropriate specifications can be agreed on, and materials/goods sourced from suppliers. Investments in fisheries infrastructure are considered in PRIASA Phase III implementation.
			Achieved			
			MoV	Inspection visits, procurement records		

Output 3.7	Output indicator 3.7.1	2022 baseline		2025 target	2032 target	Assumptions
Based on established self-help groups (SHGs), awareness and access to finance sources have been improved	Number of trainers trained in setting SHGs for setting up associations (gender disaggregated)	0	Planned	12(6)	12(6)	The local NGOs trained in SHG establishment are able to promote the creation of pilot SHGs and accompany them for at least two years from their creation, facilitating their relations with financial institutions. The collaborating financial institutions support the fund and follow the protocols established and agreed with the project. Purchasing capacity of the funds is not severely affected by external unmanageable macroeconomic factors. Linkages with existing programmes (e.g. Commercialization, Agricultural Productivity and Nutrition Project – COMPRAN) establish synergies to facilitate access to finance.
			Achieved			
			MoV	Training reports		
	Output indicator 3.7.1	2022 baseline		2025 target	2032 target	
	Number of awareness-raising campaigns to inform about financial sources	0	Planned	1	7	
			Achieved			
MoV			Awareness-raising campaign material			

Outcome 4	Outcome indicator 4.1	2022 baseline		2025 target	2032 target	Assumptions
New value-added value chain products available in the market through new channels	Number of associations or small and medium enterprises (SMEs) using value-added technologies in compliance with "quality labels" requirements	0	Planned	5	15	Selected pilot associations/SMEs sell value-added products produced with adequate means in an efficient and profitable manner and serve as a reference point for other associations adopting similar business models.
			Achieved			
			MoV	Independent assessment report in 2025 and 2032		
	Outcome indicator 4.2	2022 baseline		2025 target	2032 target	Assumptions
	Number of new or improved value-added products elaborated by value chain actors	0	Planned	10	20	Value-added products may have different degrees of processing, but they are properly identified and differentiated from regular fresh or dried fish sold in markets.
			Achieved			
			MoV	Independent assessment report in 2025 and 2032		
	Outcome indicator 4.3	2022 baseline		2025 target	2032 target	Assumptions
	A national network of value-adding associations or microenterprises embracing and displaying the differentiating "quality label" is promoted and established	0	Planned	1	1	Associations that have embraced the quality level join forces to increase quality label visualization to have greater commercial reach and consequent impact in the population.
Achieved						
MoV			Independent assessment report in 2025 and 2032			

	Outcome indicator 4.4	2022 baseline		2025 target	2032 target	Assumptions
	Number of trade and market agreements signed and implemented by value chain actors	0	Planned	3	15	Value-added products developed with project support are economically profitable and appreciated by diverse target consumers, including the tourism sector in the longer term
Achieved						
MoV			Documents of agreement			
	Outcome indicator 4.5	2022 baseline		2025 target	2032 target	Assumptions
	A multistakeholder partnership (MSP) to coordinate implementation of the strategy is created and is active throughout the strategy implementation	0	Planned	1	1	Key value chain actors and stakeholders find the MSP a useful platform to coordinate efforts to improve value chain performance and meet regularly.
Achieved						
MoV						

Output 4.1	Output indicator 4.1			2025 target	2032 target	
Social awareness campaigns about food safety and responsible fishing	Number of awareness-raising campaigns about food safety and responsible fishing	0	Planned	1	7	The awareness campaigns supported by the project are well implemented and well accepted by most of the beneficiaries. The printed brochures distributed are plain language and designed to be understood by semiliterate people.
			Achieved			
			MoV	Awareness-raising campaign material		
Output 4.2	Output indicator 4.2	2022 baseline		2025 target	2032 target	Assumptions
Training to develop new quality products, with a special focus on child consumers, is supported and provided	Number of people trained on new product development (including staff from three to five associations/SMEs (gender disaggregated))	0	Planned	15 (12)	25 (20)	At least three to five associations, SMEs or associations are interested in developing and manufacturing new products from coastal pelagics. The presentation and taste of the new products are well accepted by a wide range of consumers, particularly child consumers, and are healthy and processed under international standards good hygienic food practices.
			Achieved			
			MoV	FISH4ACP progress reports		
Output 4.3	Output indicator 4.3.	2022 baseline		2025 target	2032 target	Assumptions
A quality label to differentiate products marketed/processed is adopted by SMEs/associations following good handling and processing practices	Number of quality label developed	0	Planned	1	1	The quality label developed by the project is perceived by consumers as a real guarantee of quality and is profitable for value chain actors who use it.
			Achieved			
			MoV	Quality label documentation		

Output 4.4	Output indicator 4.4	2022 baseline		2025 target	2032 target	Assumptions
Draft agreements between the processing associations/SMEs and relevant public or private institutions for the purchasing of these new fish products are promoted	Number of draft agreements promoted and facilitated through institutional meetings	0	Planned	5	15	The purchase of value-added products by institutions on a regular basis generates benefits for institutions as well as for processing and selling entities.
			Achieved			
			MoV	FISH4ACP progress reports Fishery administration records		
Output 4.5	Output indicator 4.5.1	2022 baseline		2025 target	2032 target	Assumptions
The multistakeholder partnership (MSP) contributes to project/strategy management	An MSP is established	1	Planned	1	1	MSP members keep meeting and adopting decisions to coordinate the strategy implementation after FISH4ACP support finishes in 2025
			Achieved			
			Mov	MSP terms of reference		
	Output indicator 4.5.2	2022 baseline		2025 target	2032 target	
	Number of MSP meetings held	2	Planned	8	2 every year	
			Achieved			
			Mov	MSP meeting minutes		
Mov			FISH4ACP progress reports			

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Activity and investment plans

For all outputs specified in the logframe in Table 18, one or more activities will need to be implemented for the outputs to be realized. In most (but not all cases), these activities will require associated costs/investments. Table 19 provides a summary list of activities in support of the different outputs. For each activity, an indication is provided if the activity and associated investment relates to:

- facilitation/studies
- training
- plant and equipment
- infrastructure

Following the summary table (Table 19), information is provided for each activity on the key stakeholders involved, the costs/investments, the timing, and a link to the relevant output in the logframe, along with a short description to aid with implementation.

The activity and investment plans in this section, in line with the logframe, are for the entire upgrading strategy rather than being FISH4ACP specific. Costs are indicative only and are based on the best assessment possible during the design and analysis phase and may be adjusted during the implementation period if necessary.

Summary of upgrading activities and investments (in USD)

A summary of upgrading activities is presented in Table 19. The activities are colour-coded green, yellow and blue.

- Activities to be funded by FISH4ACP are shaded in green.
- Activities to be funded by other donors are shaded yellow.
- Activities to be funded from blended sources (e.g. FISH4ACP and government, other donors and the private sector) are shaded in blue.

TABLE 19. SUMMARY OF UPGRADING ACTIVITIES AND INVESTMENTS (IN USD)

Outcome 1: Improved management of coastal pelagic fishery resources for their sustainable exploitation		Funding source	Total costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
1.1. Capacity development programme for collecting, processing and analysing fish stock assessment statistical data is designed and implemented	1.1.1 Conduction of a fleet and palaiês frame survey	FISH4ACP	15 000	Facilitation/ studies	2023
		Government	10 000		
	1.1.2 Elaboration of a coastal pelagics data collection plan and training of data collectors on its implementation	FISH4ACP	27 000	Training/ facilitation	2023
	1.1.3 Implementation of coastal pelagic data collection operational plans, including elaboration of guides and allocation of fitted equipment	FISH4ACP	18 000	Facilitation/ studies	2023–2025
		Government	131 000		2024 onwards
	1.1.4. Update training and technical assessment for data encoding and storage on an appropriate database	FISH4ACP	22 000	Training/ facilitation	2023
			3 000	Equipment	
	1.1.5 Update training on standard models and indicators for data analysis, stock assessment and report development	FISH4ACP	23 000	Training/ facilitation	2024
1.1.6. Annual review of analysis and reporting by a stock assessment specialist (university, external working group, non-governmental organization, etc.) for comments and proposals of improvement	FISH4ACP	23 000	Facilitation/ studies	2024–2025	
	Government	29 400		2026 onwards	

1.2. A fishery management plan, to be biannually reviewed and updated, is designed and communicated	1.2.1 Elaboration of a fisheries management plan, including a review and improving proposals of existing fisheries regulations, and the implementation strategy	FISH4ACP	22 000	Facilitation/ studies	2024
	1.2.2 Elaboration and implementation of a communication plan, including the production and distribution of plain language manuals	FISH4ACP	10 000	Facilitation/ studies	2024
13 000			Equipment/ materials		
1.3 Training of fisheries inspectors to develop operational fishery inspection plans completed	1.3.1. Design and implementation of a training programme and operational plans for improving the monitoring, control and surveillance (MCS) of the coastal pelagic fishery	FISH4ACP	22 000	Training/ facilitation	2023
	1.3.2 Definition, procurement and allocation of necessary equipment and materials for carrying out the inspection operational plans	FISH4ACP	7 000	Equipment/ materials	2023
	1.3.3 Implementation of operational plans for coastal pelagics monitoring, control and surveillance (MCS)	FISH4ACP	17 000	Facilitation/ studies	2024–2025
		Government	60 000		2026 onwards
1.4. Training of fisheries sanitary inspectors to develop Sanitary Inspection Plan for coastal pelagic products and ad hoc operational plans completed	1.4.1 Training of fishery products food safety officers	FISH4ACP	25 000	Training/ facilitation	2023
	1.4.2 Elaboration of the sanitary inspection operational strategy for coastal pelagic VC products	FISH4ACP	21 000	Equipment	2023–2024
			7 000	Facilitation	
	1.4.3. Implementation of operational plans for fishery sanitary inspectors	FISH4ACP	17 000	Facilitation/ studies	2024–2025
Government		60 000	2026 onwards		

Outcome 2: Value chain actors are organized and officially acknowledged as professionals		Funding source	Total costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
2.1 The principles and procedures for achieving the professional status of artisanal fishers and palaiês are established and agreed following a participatory consultation process	2.1.1 Technical advice to the competent administrations concerned (Fishery, Health, Labour, etc.) for the discussion and elaboration of a professionalization proposal for the palaiê and artisanal fisher occupations	FISH4ACP	20 000	Facilitation	2023
	2.1.2 Carry out awareness-raising and information campaigns and facilitate a consultation process to agree on the conditions required for obtaining official accreditation	FISH4ACP	15 000	Facilitation	2023
	2.1.3 Elaboration of an official regulatory document concerning the professionalization of palaiês and fishers to be ratified by competent authorities	FISH4ACP	45 000	Facilitation	2023
2.2 The professionalization process, which involves specific qualifying training programmes, is defined and regulated for each subsector	2.2.1 Design of official training programmes compulsory to achieve the accreditation of certified palaiês or certified artisanal fishers	FISH4ACP	14 000	Facilitation	2023
2.3. An upgrading training programme for professional value chain actors, with special focus on associations strengthening is designed	2.3.1 Design of upgrading training programmes aimed at improving entrepreneurial/performing capacities of VC actors	FISH4ACP	30 000	Facilitation	2023–2024
2.4 Training services and appropriate equipment for implementing the qualifying and upgrading training programme are established and functional	2.4.1 Agreement with existing entities for implementing the training programmes and the planification and implementation of the training programmes along coastal communities	FISH4ACP	17 000	Materials	2023–2025
			118000	Training	
		Government	18 000	Materials	2026 onwards
			46 000	Training	

Outcome 3: Service providers capacities strengthened to improve value chain actors working conditions and product quality		Funding source	Total costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
3.1 Study to determine the most convenient boat design and materials to capture coastal pelagics	3.1.1 Conduct a study to determine: (i) the most convenient boat design and material to capture coastal pelagic; (ii) the existing offer, in quantity and quality, of service providers; and (iii) approaches to substitute several dugout canoes by an improved boat to control fishing capacity	FISH4ACP	16 000	Facilitation / studies	2023
3.2 Training to build modern and safer fishing boats completed	3.2.1 Training in modern and safe boat building	FISH4ACP	20 000	Training	2023
			5 000	Materials	
3.3 Training on how to maintain/repair cold-chain equipment (also those which run with solar panels) completed	3.3.1 Training of cold-chain specialists	FISH4ACP	42 000	Training	2023-2025
			10 000	Materials	
3.4 The use of alternative energies for refrigeration equipment is promoted	3.4.1 Promote the use of alternative energies for refrigeration equipment	FISH4ACP	12 000	Equipment	2023-2024
			5 000	Facilitation	
3.5 Technical and financial feasibility study on alternatives to improve fishery products transportation to promote and support the creation of an appropriate fish-transport service is supported	3.5.1 Carry out a market and feasibility study for improving fish-transport services in compliance with international standards regulations	FISH4ACP	6 500	Facilitation / studies	2024
	3.5.2 Promote and support (technically and financially) the creation of appropriate road fish-transport services	FISH4ACP	7 500	Facilitation / studies	2024
			3 000	Equipment / materials	
	3.5.3 Support, technically and financially, local initiatives deemed relevant for establishing a “formal and effective” fish-transport service (through cooperatives or small and medium enterprises) between Sao Tome and Principe with fair conditions and trade guarantees	FISH4ACP	8 000	Facilitation	2024
2 000			Equipment / materials		

3.6 Appropriate infrastructure specified, procured and delivered	3.6.1 Infrastructure building programme implemented in critical/defined areas	PRIASA	TBD	Infrastructure	2024 onwards
3.7 Based on established self-help groups, awareness and access to finance sources has been improved	3.7.1 Design in consultation and collaboration with financial entities and other development actors (NGOs) specific financial products with conditions suitable and affordable by VC actors	FISH4ACP	7 500	Facilitation	2023-2024
	3.7.2 Access to credit and savings mechanisms are facilitated through the establishment of self-help groups (SHGs) in at least five communities	FISH4ACP	320 000	Facilitation	2024-2025
		COMPRAN / Private sector	384 000		
Outcome 4: New value-added VC products available in the market through new channels		Funding source	Total costs (USD)	Type of cost	Timing (by)
Outputs	Activities				
4.1 Social awareness campaigns aimed at producers and consumers for understanding the importance of food safety and responsible fishing in fishery products	4.1.1. Communication strategy for raising awareness on the importance of adopting responsible fishing and good hygiene VC product practices	FISH4ACP	7 500	Facilitation	2023
	4.1.2. Implementation of awareness campaigns	FISH4ACP	24 000	Materials	2023-2025
4.2 Technical advice for research and development of new quality products derived from the VC, with a special focus on child consumers is supported and provided	4.2.1 Conduct market studies for assessing the opportunity and feasibility of supplying new VC products, including quality-labelled products, to different market niches with a particular focus on child consumption	FISH4ACP	7 500	Facilitation / studies	2023
	4.2.2 Encourage research and development of new quality products derived from the coastal pelagic VC (based on the market opportunities assessed)	FISH4ACP	9 000	Facilitation / studies	2024
	4.2.3 Training, financial and technical support to three to five pilot associations or microenterprises members, selected through an open "call for proposals", for the elaboration and commercialization of new branded quality products	FISH4ACP	28 000	Training	2023-2024
			5 000	Equipment / materials	
		FISH4ACP	8 000	Facilitation	2024

	4 Design, manufacture and distribution of advertising and merchandising items (banners, posters, T-shirts, caps, aprons, tools, etc.) to promote new products manufactured		10 000	Equipment / materials	
4.3 A national network of value-adding associations or microenterprises embracing and displaying the differentiating “quality label” is promoted and established.	4.3.1 Inform and encourage the pilot projects associations/small and medium enterprises to create a functional network (for improving visibility, differentiation and consumer recognition of their products)	FISH4ACP	4 000	Facilitation	2024
4.4 Agreements between processing associations/small and medium enterprises and relevant public or private institutions for the purchasing of these new fish products are promoted and implemented in school canteens, hospitals or other public canteens, market stalls, etc.	4.4.1. Advice for the elaboration of commercial agreements established between public or private institutions with the processing associations or small and medium enterprises	FISH4ACP	4 000	Facilitation	2024
4.5 The multistakeholder partnership (MSP) contributes to project/strategy management	4.5.1. Constitution of the MSP	FISH4ACP	3 000	Facilitation	2023–2025
	4.5.2 Support and coordinate the implementation of the upgrading strategy's activities	FISH4ACP	15 000	Facilitation	2024–2025
		Private sector	35 000		2026 onwards

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Using Table 19 information, Table 20 provides an overview of the funds needed to execute the activities and the expected source of the funds. These data should be taken as a rough estimation only, as most of the data needed to calculate the actual costs and sources of funding are not available at the time this table was compiled and are also dependent on further studies and conversations with potential partners, such as PRIASA, the Commercialization, Agricultural Productivity and Nutrition Project (COMPRAN), UNDP, as well as the new fisheries administration appointed by the government recently elected (November 2022). Table 21 shows the amount of funding per outcome.

TABLE 20. VALUE CHAIN UPGRADING INVESTMENT TABLE (USD)

In USD	Financing sources				Total
	FISH4ACP (2023–2025)	Other donors (COMPRAN)	Government (2023–2032)	Private sector (2023–2032)	
Type of investment					Totals by type
Facilitation/studies	681 500	145 400	290 000	274 000	1 390 900
Equipment, material	132 000		18 000		150 000
Infrastructure		TBD (PRIASA)			TBD
Training	327 000		46 000		373 000
Totals by source	1 140 500	145 400	354 000	274 000	1 913 900

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

TABLE 21. COSTS BY OUTCOMES

Outcome	Total funding (USD)
Outcome 1	582 400
Outcome 2	323 000
Outcome 3	848 500
Outcome 4	160 000
Total	1 913 900

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Table 22 shows the key stakeholders involved in the four elements/outcomes of the strategy.

TABLE 22. KEY STAKEHOLDERS AND CATALYSTS INVOLVED IN THE UPGRADING STRATEGY AND ITS FOUR ELEMENTS

Upgrading strategy elements	Key stakeholders and catalysts involved
Improved coastal pelagics resources management	<ul style="list-style-type: none"> • Department of Fisheries • Value chain actors • Value chain associations • FISH4ACP • Port Captainty • Food safety and quality inspectors
Fisherfolk and palaiês professionalization	<ul style="list-style-type: none"> • Department of Fisheries • Value chain actors • Value chain associations • FISH4ACP • Vocational training centres • Non-governmental organizations
Coastal pelagics new inputs and service providers development	<ul style="list-style-type: none"> • Department of Fisheries • Value chain actors • Value chain associations • FISH4ACP • Ministry of Planning, Finance and Blue Economy • Boatyard owners • Cold-chain operators • Public transport and cargo boats operators • Other donors • Microfinance institutions
New sales channels being utilized and new safe coastal pelagic products are available on the market	<ul style="list-style-type: none"> • Department of Fisheries • Value chain actors • FISH4ACP • Value chain associations • PNASE (National School Feeding and Health Programme) • Hotels and restaurants • Other donors

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Detailed description of outcomes, outputs and activities

Outcome 1: Improved management of coastal pelagic fishery resources for their sustainable exploitation

Developing and adopting sustainable management of coastal fishery resources based on an ecosystem approach and on the most reliable monitoring information available, including the traditional and empirical knowledge of fishers, is the first expected outcome.

Improvement actions to be developed are oriented to:

- Support and strengthen the technical capacity of the fisheries administration in the formulation of appropriate fisheries management measures that take into account the interests and knowledge of the main actors involved.
- Strengthen the control and inspection capacity of the corps of fisheries inspectors so that they can effectively carry out their duties to ensure compliance with fisheries and food safety regulations.

Output 1.1 Capacity development programme for collecting, processing and analysing fish stock assessment statistical data is designed and implemented

Sustainable management of fisheries resources can only be effective if it is based on reliable and sufficient information obtained through appropriate data collection and statistical analysis. Sao Tome and Principe information on fish stock status dates to a fishery resource assessment campaign carried out in the 1980s. Since oceanographic resources' assessment surveys are excessively costly, an alternative tool to update fishery resources assessments is by the continuously and adequate collection, storage, processing and analysis of fish captures and fishing effort data. In recent years, FAO has provided support to the fisheries administration to set up a data collection plan through local enumerators based in 13 landing sites, providing software to encode the data for their analysis. FISH4ACP will continue this process by providing the necessary support to keep on strengthening the fisheries administration capacity for carrying out this relevant function in an adequate and efficient manner.

Activity number and name: 1.1.1 Conduction of a fleet and palaiês frame survey

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 15 000

Category of investment: Technical assistance (facilitation/studies)

Timing: 2023

Description: A new fleet and palaiês frame survey is necessary to update the catch and effort sampling programme and to have a better understanding of the number of fishers and palaiês to better design the professionalization process under outcome 2. This frame survey will be conducted as the first step to guide the implementation of the remaining activities of this output.

Activity number and name: 1.1.2 Elaboration of a coastal pelagics data collection plan and training of data collectors on its implementation

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 27 000

Category of investment: Technical assistance (facilitation/studies)

Timing: 2023

Description: Currently, data collection is coordinated by Fishery Administration (FA) officers with the support of enumerators, individuals from coastal communities who provide fisheries catch data to the FA. This first activity consists of carrying out a detailed assessment of the current situation to have a clear picture of the procedures applied, the human and material resources used, and the functions and responsibilities of each actor involved in the process. Subsequently, an improvement proposal will be elaborated, adapted to Sao Tome and Principe context, considering: (i) the adoption of international standards procedures to enable harmonized information exchange and use of suitable tools for data collection, processing and reporting; and (ii) a mechanism to support the Port Captaincy to update the boat register regularly. Elaboration of appropriate operational data collection plans will be reflected on a Data Collection Plan, agreed and approved by the competent authority. In addition, the data collection enumerators will be properly trained with procedures adapted. The Data Collection Plan should consider increasing the number of fishing communities and enumerators currently used.

Activity number and name: 1.1.3 Implementation of coastal pelagic data collection operational plans, including elaboration of guides and allocation of fitted equipment

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 41 000

Category of investment: Administration function

Timing: 2023–2025

Description: To ensure the necessary harmonization of all data collection procedures, field manuals will be developed and distributed to each of the collectors to facilitate efficient and correct data collection and to reinforce the knowledge learned during the training. Essential equipment deemed indispensable will be also supplied. The fisheries statistics department will implement the annual operational plans, following the Data Collection Plan. The project will provide technical assistance for evaluating the implementation of the operational plan after 12 and 24 months of functioning, aiming to guarantee the efficacy and appropriateness of the data and the collecting procedures. Once the project is finalized, the government will fund this activity with its own budget (about USD 15 000 yearly until 2032).

Activity number and name: 1.1.4 Update training and technical assessment for data encoding and storage on an appropriate database

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 25 000

Category of investment: Training, technical assistance

Timing: 2023

Description: The next step in strengthening the capacity to assess fisheries resources is to ensure the correct storage and processing of the data collected by enumerators. To this end, the equipment and procedures currently used will be assessed and solutions for improvement will be supported if necessary. Assistance will also be provided in training the persons in charge of this function in the correct use of the equipment and procedures for storing and processing the data. As in activity 1.1.2, the project will provide technical assistance for evaluating the implementation after 12 and 24 months of functioning, aiming to guarantee the efficacy and appropriateness of the data storage procedures.

Activity number and name: 1.1.5 Update training in standard models and indicators for data analysis, stock assessment and report development

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 23 000

Category of investment: Training

Timing: 2024

Description: The officers in charge of data analysis and stock assessment reporting will be trained in these two fields, creating the capacity to develop stock assessment reports. Reporting models should be in compliance with international standards for harmonizing fishery statistics at the regional level.

Activity number and name: 1.1.6 Annual review of analysis and reporting by a stock assessment specialist (university, external working group, non-governmental organization, etc.) for comments and proposals of improvement

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 23 000

Category of investment: Technical advice

Timing: 2024–2025

Description: Annual review of the data analysis and reporting systems for fish stock assessment will be provided by external experts. Ideally, a technical support agreement will be signed with an international regional institution (to be defined) for the periodical evaluation of the data gathered and analysis and for exchange of relevant information. From 2026 onwards, the government will fund this activity (USD 29 400).

Output 1.2 A fishery management plan, to be biannually reviewed and updated, is designed and communicated

The design and adoption of a sustainable management plan for fisheries, including coastal pelagic resources, is a medium-term objective that requires, on the one hand, having sufficient and appropriate scientific data for understanding the current situation of the resources, and on the other hand, to inform and raise awareness among resource users about the convenience of adopting management measures to ensure the availability of the resources in the medium and long term. Moreover, the involvement of the stakeholders on the management plan design process is necessary for assuring the acceptance and adoption of management measures.

During the FISH4ACP implementation period, the proposed actions will include the design of the management plan, the elaboration and implementation of communication campaigns, and the elaboration of a schedule for the implementation and updating of the management plan in the midterm. Subsequently, the plan should begin its implementation during the third year, led by the fishery administration and counting on stakeholder collaboration.

Activity number and name: 1.2.1 Elaboration of a fisheries management plan, including a review and improving proposals of existing fisheries regulations, and the implementation strategy

Stakeholders or facilitators involved: FA, consultants, stakeholders

Costs and investments: USD 22 000

Category of investment: Technical assistance, consultation/participatory workshops

Timing: 2024

Description: Technical advice will be provided to the competent authority for the elaboration of the fisheries management plan (FMP). Management measures will be taken based on collected data and evidence available, mostly provided by activities under output 1.1 and relevant historic records. It will include a review and analysis of existing fisheries regulations and proposals for changes needed for the implementation of the FMP. For the design and implementation of the plan, consultation and participation of the stakeholders is a must in order to take advantage of their empirical knowledge and to assure their acceptance and adoption of the management measures to be implemented.

Activity number and name: 1.2.2 Elaboration and implementation of a communication plan, including the production and distribution of plain language manuals

Stakeholders or facilitators involved: FA, consultants, printing/editing service providers

Costs and investments: USD 23 000

Category of investment: Technical advice

Timing: 2024

Description: To assure the acceptance and understanding of the management plan among stakeholders, a communication strategy must be thoroughly designed and subsequently implemented in all fishing communities concerned. The communication strategy will include the production and distribution of plain language manuals for understanding the benefits of adopting appropriate management measures, including different aspects, from regulatory, enforcement and fisheries management essentials to ecological biodiversity raising-

awareness concepts. Implementation should be carried out by the Fishery Extension Service of the Directorate of Fisheries, supported by FISH4ACP, if operative.

Output 1.3. Training of fisheries inspectors to develop operational fishery inspection plans completed

The new law 09/2022 on fisheries and aquaculture of Sao Tome and Principe defines, in its chapter 8, the functions and attributions of the inspectors and control agents to ensure the inspection, monitoring, control and surveillance of fishing activities. However, in practice, these functions are carried out without the necessary effectiveness to prevent the regular occurrence of bad practices, openly recognized as destructive and unsustainable, such as the use of purse seine fishing with *rede brisa* very close to the shore. To tackle this problem, a series of actions will be carried out to strengthen the inspection and control capacity of the fisheries administration and to develop operational plans that will contribute to effectively carry out the functions set out in Law 09/2022.

Activity number and name: 1.3.1 Design and implementation of a training programme and operational plans for improving the monitoring, control and surveillance (MCS) of the coastal pelagic fishery

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 22 000

Category of investment: Technical assistance/studies

Timing: 2023

Description: This activity consists in making an appraisal of fisheries inspectors existing capacities to assess their current situation, both in terms of their knowledge and human capacities and in terms of the means at their disposal to carry out their duties. The results of this appraisal will be the basis for the elaboration of a fisheries inspectors training programme, aimed at strengthening their capacities. It will also serve to elaborate a proposal for an MCS operational plan that will standardize the inspections work, defining the equipment and means needed to conduct MCS work. This proposal will be finalized by the inspectors after their training and submitted to the competent authority for approval.

Activity number and name: 1.3.2 Definition, procurement and allocation of necessary equipment and materials for carrying out the inspection of operational plans

Stakeholders or facilitators involved: Directorate of Fisheries, consultants, printing/editing service providers

Costs and investments: USD 7 000

Category of investment: Printed materials/technical assistance

Timing: 2023

Description: Equipment and means identified in activity 1.3.1 will be prioritized, and those considered essential to conduct MCS work will be purchased if necessary. MCS equipment and material to be purchased should explore partnerships with other institutions to guarantee required equipment and means for fishing MCS are in place.

Activity number and name: 1.3.3 Implementation of operational plans for coastal pelagics monitoring, control and surveillance (MCS)

Stakeholders or facilitators involved: Directorate of Fisheries, consultants

Costs and investments: USD 17 000

Category of investment: Technical assistance (facilitation/studies)

Timing: 2024–2025

Description: The implementation of operational fisheries MCS plans will be carried out by the staff responsible for this function and will be covered by the government budget. It will have a review procedure, conducted on a regular basis, based on the inputs made by fisheries inspectors and the annual performance of the MCS operational plan itself. From 2026 onwards, the government will fund the activity (USD 60 000 until 2032).

Output 1.4 Training of fisheries sanitary inspectors to develop the Sanitary Inspection Plan for coastal pelagic products and ad hoc operational plans completed

Capacity development related to the sanitary inspection of fishery products follows the same logic as indicated in outputs 1.1 and 1.2: analysis and diagnosis of the current situation to assess constraints and needs, human capacity development through an adapted training plan, reinforcement of material means for the performance of functions, and elaboration and implementation of an operational plan for inspection, monitoring and control of the quality of fishery products.

Activity number and name: 1.4.1 Training of fishery products food safety officers

Stakeholders or facilitators involved: FA, consultants, trainers

Costs and investments: USD 25 000

Category of investment: Technical advice

Timing: 2023

Description: An assessment of the human capacity and materials and means of the Fisheries Health Inspection and Control Department will be conducted to identify areas for improvement. Consequently, a training programme on fishery products safety and quality inspection will be developed and implemented. The training programme will be in conformity with internationally accepted standards and will be adapted to the reality of Sao Tome and Principe. Manuals will be developed, including standard fish food sanitary inspection procedures and indicators. Training should cover all government officers in charge of coastal pelagic fishery products food safety inspections.

Activity number and name: 1.4.2 Elaboration of the sanitary inspection operational strategy for coastal pelagic VC products

Stakeholders or facilitators involved: FA, consultants, fish mongers (palaiês) associations, competent authority on food health inspection

Costs and investments: USD 28 000

Category of investment: Technical assistance.

Timing: 2023–2024

Description: Once the technical capacities of the fishery product sanitary inspection service have been strengthened, the strategy for monitoring and control of the hygienic and sanitary conditions of coastal pelagic VC products, from capture landing to the final sale, will be developed. This strategy should include revision and adaptation of existing regulation, updating of sanitary inspection procedures and protocols, and the development of efficient operational inspection plans. Support for the acquisition of means and equipment considered critical to carry out the fishery inspection functions will be provided. Furthermore, technical field guides to facilitate and harmonize the fishery sanitary inspections and informative brochures on good food hygiene practices for fishery products will be developed and provided.

The development of this strategy will involve the participation of trained fishery health inspectors and will take into account that the mission of inspectors should not be restricted to inspection and enforcement actions but also to raise awareness and inform the users for adopting appropriate food hygiene practices. This activity should be coordinated with the sanitary health inspection service of the Ministry of Health to harmonize procedures and exchange information.

Activity number and name: 1.4.3 Implementation of operational plans for fishery sanitary inspectors

Stakeholders or facilitators involved: FA

Costs and investments: USD 17 000

Category of investment: Administration functions

Timing: 2024–2025

Description: The implementation of the operational plan will be the responsibility of the fisheries administration, considering that the sanitary fishery inspection is a duty that must be perpetuated over time to protect the health of consumers. The precedent activities of this output (training, operational plans, means and materials, etc.) provided by the project should be sufficient support for the institution to take charge of the implementation of its own budget and to operationalize the food safety laboratory existing in the country, which has never been operational. At the end of the first 12 months of the implementation period, the project will provide the necessary technical support for evaluating the operational plan and the fishery sanitary inspector's performance, and necessary actions for updating and improving will be proposed. From 2024 onwards, annual evaluations will be carried out under the budget and responsibility of the fishery administration.

Outcome 2: Value chain actors are organized and officially acknowledged as professionals

As stated in Section 4.2.1, professionalization of value chain actors is considered a major changing force and a strategic line for developing the upgrading strategy. Professionalization implies assuming that to carry out a certain economic activity it is necessary to have a prior qualification or authorization that guarantees the person who conducts that activity is duly qualified for it. This, which is evident in many technical specialties and higher careers, is not so evident in traditional activities which can be carried out without prior formal training, as in the case of the artisanal fishing sector in Sao Tome and Principe. However, as has been argued above, professionalization implies legal and public recognition providing a social status that should enable people to carry out an activity with the appropriate means and procedures (for instance, through access to private finance or public support), being the product delivered from this activity is fairly recognized by the society.

Moving from a situation of informality to another one where activities are regulated and carried out only by those who are qualified to do so is a highly complex and time-consuming process. However, it is one of the conditions to break out of the circle of precariousness, where the most vulnerable are placed.

Output 2.1. The principles and procedures for achieving the professional status of artisanal fishers and palaiês are established and agreed following a participatory consultation process

Activities proposed for achieving this outcome aim to set up a sound base to initiate and carry out the professionalization process in the best possible conditions. Therefore, special care and effort will be made to successfully carry out the information and consultation process, which is essential to reach a basic agreement between the different parties involved in which the conditions and rules of the professionalization process are defined and established by common agreement. The consultation process should be led by the fisheries administration, with the representatives of both concerned subsectors and other involved entities (nongovernmental organizations, vocational schools, etc.).

Activity number and name: 2.1.1 Technical advice to the competent administrations concerned (Fishery, Health, Labour, etc.) for the discussion and elaboration of a professionalization proposal for the palaiê and artisanal fisher occupations

Stakeholders or facilitators involved: FA, consultants, involved administrations (Fishery, Health, Labour, etc.)

Costs and investments: USD 20 000

Category of investment: Technical assistance

Timing: 2023

Description: The FISH4ACP project will provide technical assistance and facilitate a first round of discussions between the different administrations involved in order to secure the necessary ownership and political will to initiate and support the process. This activity will take into consideration and explore the integration of the efforts made to date by the fisheries administration to register and issue identification cards to the palaiês.

Activity number and name: 2.1.2 Carry out awareness-raising and information campaigns and facilitate a consultation process to agree on the conditions required for obtaining official accreditation

Stakeholders or facilitators involved: FA, consultants, stakeholders

Costs and investments: USD 15 000

Category of investment: Technical assistance, printed materials

Timing: 2023

Description: The project will provide technical assistance and required funds to design and implement a communication plan, including awareness-raising campaigns in the main coastal communities, to inform of the advantages of professionalizing value chain actors and to increase consumer/society recognition. Communication materials and means, such as the publication and distribution of information brochures, the production of radio advertisements and/or the production and placement of information panels, will also be supported. A consultation process between the administration and the actors involved will be conducted through participatory meetings and workshops in order to agree on the conditions required for obtaining official accreditation to exercise the activity.

Activity number and name: 2.1.3 Elaboration of an official regulatory document concerning the professionalization of palaiês and fishers to be ratified by the competent authorities

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 45 000

Category of investment: Technical assistance

Timing: 2023–2024

Description: This is a two-step process. First, a final document that reflects the conclusions of the consultation process and that will form the basis on which the official professionalization regulation will be elaborated. This document will need to be endorsed and approved by the representatives of the associations involved in the negotiation. Second, the project will provide technical assistance for the development of a regulatory document that, according to the consultation process results, should include all regulatory aspects related to the professionalization of the two subsectors, specifying the required conditions for obtaining official accreditation (considering the different capacity fisherfolk and palaiês may have in terms of capturing/trading), the mechanisms and procedures for the validation of existing competences and for the provision of training, and the levels/categories of proficiency to be established, etc. This document will be ratified, approved and endorsed by the competent authorities.

Output 2.2 The professionalization process, which involves specific qualifying training programmes, is defined and regulated for each subsector

One of the necessary conditions for obtaining the status of professional palaiê or artisanal fisher must be the demonstration that the person possesses the essential knowledge to carry out the activity in accordance with the minimum standards required, which will vary according to the degree of complexity of the activity carried out, from simple fishing or marketing of whole fresh fish to an entirely processed product. This accreditation of knowledge may be carried out by means of aptitude or validation tests (for those who already have the suitable knowledge or expertise) or through specific training courses adapted to different levels of comprehension and skills, indicated for those who need to reinforce or update their knowledge.

The accreditation process should be inclusive and accessible so that all interested persons have the option to undertake it. Training courses should be defined upon detailed needs diagnoses and must be accessible (by time, location, level of education, economy, family situation, etc.) and appealing for potential receivers.

Activity number and name: 2.2.1 Design of official training programmes compulsory to achieve accreditation of certified palaiês or certified artisanal fishers

Stakeholders or facilitators involved: FA, consultants, training schools, NGOs, stakeholder delegates

Costs and investments: USD 14 000

Category of investment: Technical assistance

Timing: 2023

Description: The detailed programme of compulsory training for each category should be discussed and agreed with the competent administration, training institutions, stakeholder representatives, specialized NGOs, etc. In principle, it should focus on elementary good food hygiene practices for both palaiês and fishers and in the basics of navigation and sea safety issues for fishers.

- A procedure should also be defined and agreed to provide the accreditation or licence by validating demonstrated knowledge or experience of palaiês or fishers.
- To assure the interest of the actors in obtaining the official palaiê or fisher accreditation, several conditions should be envisaged, such as:
 - It is a requirement for selling in public markets, or for supplying certain institutional clients (schools, hospitals, institutions, etc.).
 - It will grant preferential conditions (e.g. discounts or priority of access to specific products, such as ice) for the purchase of supplies related to the VC (ice, storage capacity, transport, fishing equipment, boats, etc.).
 - It could imply advantages for obtaining a retirement pension or compensation for invalidity or illness, etc.

Current palaiê identification cards issued by the Directorate of Fisheries should include compulsory training courses/certificates to prove they have passed them.

Output 2.3. An upgrading training programme for professional VC actors, with special focus on associations strengthening is designed

As described in Section 3.1.2, most actors of the VC, and particularly women, are self-employed workers. Accordingly, to properly manage their business, regardless of how small and elementary it may be, they need to attain the basic knowledge of bookkeeping that enables them to forecast and plan their profits and expenses or even to set their selling prices. In addition, a vast majority of VC actors cannot access formal finance (e.g. bank credits), in many cases because of their inability to present and endorse a reliable business plan and meet the established conditions. To reverse this situation, this output aims to offer the possibility of reinforcing or acquiring the necessary basic knowledge in business management in order to carry out their business with greater solvency and to become creditworthy for conventional financial institutions.

To raise stakeholder interest in carrying out this training, it is envisaged to start with a pilot demonstration. In this demonstration, training will be provided to a certain number of interested people (as individuals or on behalf of small and medium enterprises or associations); those who successfully pass the training will have the opportunity to apply for some of the financial support provided under output 3.7. In this way, on the one hand, the interest in training is encouraged and, on the other hand, it is ensured that those who can benefit from output 3.7 have the necessary knowledge to successfully take advantage of the financial support received. Once the effectiveness of this process is demonstrated in the pilot phase, training and crediting can thereafter be implemented on a permanent basis by its own means according to the interest and demand of the various parties involved.

Finally, this upgrading training can be addressed to other subjects where there is a widespread demand from stakeholders. For example, in the case of fishers, it could help them to improve their skills on navigation, fishing techniques or other safety issues, including those related with SCUBA or compressor diving. It should also be desirable to include responsible fishing practices and environmental awareness, as training and awareness are the main tools to fight against the common use of bad practices, such as *rede brisa* fishing.

Furthermore, the governance of the associations is still their weakest point and is the main cause of inefficiency of the existing associations and of the disaffection of their members. The professionalization of the sector must be accompanied by a good organization, structured in efficient and functional associations, which defend the legitimate interests of their members and that are truly representative when it comes to their dialogue with the administration or with other social actors. It is therefore essential to intervene in this aspect to strengthen the organizational and management capacities of existing associations.

Activity number and name: 2.3.1 Design of upgrading training programmes aimed at improving entrepreneurial/performing capacities of VC actors

Stakeholders or facilitators involved: FA, consultants, training schools, NGOs, stakeholder delegates,

Costs and investments: USD 30 000

Category of investment: Technical assistance

Timing: 2023–2024

Description: The definition of the subjects and contents of the upgrading training programmes will be carried out by previously identifying the interests and needs of potential beneficiaries. To this end, a survey will be carried out in at least three communities and, based on the results, the programmes will be formulated, adapting the contents to the training level identified in the survey and to the suggestions and contributions of the possible interested trainers. Capacity development to improve the governance of associations will be based on participatory workshops for discussion and exchange of experiences between at least three pilot associations, facilitated by an expert in associations. The situations of each of the associations will be presented and analysed, and the appropriate mechanisms and procedures to resolve the deficiencies will be defined in a participatory manner and establish them organically in the statutes of the associations. If this methodology proves to be successful, it will subsequently be applied to other associations.

Output 2.4 Training services and appropriate equipment for implementing the qualifying and upgrading training programme are established and functional

The differential idea is that the training provided, thanks to FISH4ACP, remains stable over time, representing a business opportunity for local entities (public or private) that provide training, such as vocational schools, university and local non-governmental organizations. Thus, it will be necessary to identify the most appropriate and competent institutions, organizations or companies that could be interested in participating by the most appropriate means (partnership, contract, project, etc.) as instructors or monitors of the different proposed programmes and their corresponding training actions. In this sense, preliminary interviews have been held with the heads of the vocational training centres of Brazil-Sao Tome, the centre of Budu-budu, in Sao Tome, and the Business Incubators and Accelerators Network of Sao Tome and Principe "REINA", and all of them have shown their interest and willingness to collaborate with the project.

When there is not enough local training capacity to deliver any of the envisaged programmes, it will be necessary to create or reinforce the required capacity. To this end, the project may collaborate in providing sufficient resources (material and human) to ensure the training programmes meet the needs and specific characteristics of the recipients. Furthermore, taking into account the low-income level of most of the recipients of the training, the project must initially contribute to financing the costs of the training, seeking the most appropriate procedure for each case. Once training supply and demand have been consolidated, funding sources may be diversified in search of sustainability.

Activity number and name: 2.4.1 Agreement with existing entities for implementing the training programmes and planification and implementation of the training programmes along coastal communities

Stakeholders or facilitators involved: FA, consultants, training institutions

Costs and investments: USD 135 000

Category of investment: Technical assistance, facilitation

Timing: 2023–2025

Description: Consultation with potential training institutions (schools, NGOs) that might be interested in carrying out training programmes for official accreditation of palaiês and artisanal fishers will be conducted. The goal is to establish an agreement whereby the training institution would be previously reinforced in their material and human training capacities by the FISH4ACP project and would commit themselves to deliver the training for the time needed to ensure that the training can reach all those who need it. Following technical assessment of the training capacities in accordance with the programmes to be implemented, the necessary reinforcement actions will be taken. Training of trainers can be carried out by specialists hired by the project or through collaboration with other projects that include training programmes in their activities, as in the case of the Commercialization, Agricultural Productivity and Nutrition Project (COMPRAN).

To assure that the professionalization process is carried out in an inclusive manner, training must be easily accessible for all interested stakeholders, including those who live in distant communities from the training centres. To this end, the pertinence of arranging a mobile classroom will be analysed (i.e. a vehicle equipped with proper materials/equipment for the different disciplines to be taught). This mobile classroom could be used for training both palaiês and fishers. Furthermore, the strengthening and participation of the fishery extension service (currently under the Directorate of Fisheries and not operative) should be considered.

For the implementation of both the official and the upgrading training programmes, implementing plans will be respectively developed and subsequently executed in at least three pilot communities. After the pilot phase, the respective training programmes will be reviewed and adapted with the lessons learned from the pilots and will be gradually expanded to the rest of the coastal communities. The plan will estimate the cost of implementation, considering among other things, the training materials, logistic expenditures and salaries. Collaborative arrangements will be explored to cover the costs.

Outcome 3: Service providers capacities strengthened to improve VC actors working conditions and product quality

The analysis of the value chain has shown the existing deficiencies in infrastructure, equipment and auxiliary services for the correct functioning of the chain. Aware of the impossibility of addressing each and every one of the deficiencies detected, the project will focus on those that have been considered a priority by the actors, namely the construction of safer and more efficient boats to gradually replace dugout canoes and the securing of the cold chain for the preservation of fresh products. In addition, the question of establishing a financial mechanism to enable fishers and palaiês to access financing in line with their ability to repay and guarantees will also be addressed.

Output 3.1 and Output 3.2: Study to determine the most convenient boat design and materials to capture coastal pelagics/training to build modern and safer fishing boats completed

The functional analysis of the VC indicates that the demand for safer, more durable and more efficient boats is increasing and that boat builders may not be sufficient to meet the demand, as they regularly lack the necessary conditions and materials to carry out their work properly. Moreover, there is an environmental concern about the widespread use of wooden boats, which need to be replaced every few years and represent an unsustainable pressure on the forest environment, particularly when it comes to large wooden vessels that also require, because of their high weight, very high fuel consumption, making them extremely energy inefficient.

Activity number and name: 3.1.1 Conduct a study to determine: (i) the most convenient boat design and material to capture coastal pelagics; (ii) the existing offer, in quantity and quality, of service providers; and (iii) approaches to substitute several dugout canoes by an improved boat to control fishing capacity

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 16 000

Category of investment: Technical assistance

Timing: 2023

Description: A study will be conducted with a threefold objective to determine: (i) the technical and financial feasibility on the boat design/construction and the materials to be used to upgrade the artisanal fishing fleet; (ii) the existing offer in quantity and quality of service providers; and (iii) mechanisms to substitute several dugout canoes by a single modernized boat, suggesting arrangements for fisherfolk to work together under this new scheme.

Activity number and name: 3.2.1 Training in modern and safe boat building

Stakeholders or facilitators involved: Consultants, private craft shipyards

Costs and investments: USD 25 000

Category of investment: Technical assistance

Timing: 2023

Description: Based on the results of the previous study, training in modern and safe boat building will be conducted. Collaboration agreements will be signed with at least two existing boatyards through which practical training programmes will be designed and implemented for a certain number of apprentices (to be determined). The goal is to increase their production capacity for better boats and to transfer building skills to new boat builders. For service providers and for fishers willing to purchase modern and safer boats, financing opportunities would be available through output 3.7.

Output 3.3 Training on how to maintain/repair cold-chain equipment (also those which run with solar panels) completed

Many of the facilities and equipment donated by various international development cooperation projects are inoperative because of lack of maintenance or repair. For this reason, FISH4ACP aims to promote and encourage specialized training and the updating of knowledge of people working in key sectors for the post-harvest fishing sector, particularly in the cold chain, to increase local capacity for the maintenance of installations and equipment and increase their resilience in the event of breakdowns derived from their regular use.

Activity number and name: 3.3.1 Training of cold-chain specialists

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 52 000

Category of investment: Technical assistance

Timing: 2023–2025

Description: The functional analysis has identified as a weakness the lack of enough local knowledge and specialists providing cold-chain services. The project will facilitate agreements (i.e. with existing vocational schools, development projects or private enterprises) to develop a training programme that will benefit local specialists or youth that want to enhance/create technical capacity in the cold chain.

Output 3.4. The use of alternative energies for refrigeration equipment is promoted

The lack of preservation means (ice/refrigerators) to properly preserve fish products, following good hygiene and conservation practices, was identified as a main constraint in the functional analysis. This activity will conduct a study to identify the most suitable refrigeration equipment running on alternative energies to pilot test them through selected associations or microenterprises.

Activity number and name: 3.4.1 Promote the use of alternative energies for refrigeration equipment

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 17 000

Category of investment: Technical assistance

Timing: 2023–2024

Description: The project will conduct a market survey to identify and procure refrigeration equipment running on alternative energies and adapted to the needs of VC actors. Through a transparent and open process, a certain number of entities (associations or microenterprises) will be selected to carry out demonstration projects. Access to loans will be favoured for the selected entities (through activities under output 3.7) to purchase the refrigeration equipment. These entities will be responsible, with the support of the project, for analysing the effectiveness and efficiency of the respective borrowed equipment. The result of this pilot will be evaluated for replication with other entities.

Output 3.5 Technical and financial feasibility study on alternatives to improve fishery products transportation to promote and support the creation of an appropriate fish-transport service is supported

As described in Section 2.3.2.2, fish products are transported in inappropriate conditions, both by road from the coastal communities to the capitals and by boat between Principe and Sao Tome. The project will carry out a study to assess the possibilities of improving the transport of fish products in accordance with international standards and the requirements of the Decree Law 19/2011 of the Republic of Sao Tome and Principe, which regulates sanitary and hygiene standards for foodstuffs.

Activity number and name: 3.5.1 Carry out a market and feasibility study for improving fish-transport services in compliance with international standards regulations

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 6 500

Category of investment: Technical assistance

Timing: 2024

Description: The study should analyse and propose alternative fish stowage and transport systems to those currently used, such as placing fish face down with their tails up in plastic buckets, which are suitable for being carried short distances on the head but not to stow properly and efficiently in a vehicle. Likewise, the relevance and feasibility of enabling the usual vehicles with adapted isothermal containers or promoting the use of isothermal vehicles exclusively for the transport of fish should be analysed, proposing the most pertinent and profitable alternatives that should also be agreed both with transporters and with users. The convenience of using refrigerated vehicles with solar panels (*kuzafreezer* type) should also be considered.

Activity number and name: 3.5.2 Promote and support (technically and financially) the creation of appropriate road fish-transport services

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 10 500

Category of investment: Technical assistance

Timing: 2024

Description: In accordance with the most viable alternatives proposed in the previous study, the project will favour the implementation of proposed measures, analysed case by case, so that they can be financed by the financial mechanism of output 3.7. Similarly, if deemed pertinent, the project will promote the creation of cooperatives or small and medium enterprises specialized in fish transport, providing technical support in the preparation of their business and viability plans.

Activity number and name: 3.5.3 Support, technically and financially, local initiatives deemed relevant for establishing a “formal and effective” fish-transport service (through cooperatives or small and medium enterprises) between Sao Tome and Principe with fair conditions and trade guarantees

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 10 000

Category of investment: Technical assistance

Timing: 2024

Description: In the case of the transport of fish between Principe and Sao Tome, existing proposals will be analysed and/or the most appropriate options will be proposed to ensure that the transport is carried out under satisfactory conditions and with adequate guarantees of delivery at the destination. The project will advise and, if necessary, facilitate the financing of the necessary working capital and equipment investments through output 3.7.

Output 3.6. Appropriate infrastructure specified, procured and delivered

The functional analysis has detected several deficiencies in the VC infrastructure (landing sites upgrade, mooring points, market cold-chain services, electricity grid, roads, etc.). The Infrastructure Rehabilitation for Food Security Support Project (PRIASA) has been a key partner in Sao Tome, supporting the development of infrastructure, such as markets in landing sites and villages, for the past year. When finalizing this strategy, the PRIASA third phase was being formulated and had initial discussions on which kind of fisheries sector infrastructure they could support. Since one of its goals is to support the development of infrastructure in the country, they are better placed to achieve this output.

Activity number and name: 3.6.1 Infrastructure building programme implemented in critical/defined areas

Stakeholders or facilitators involved: FA, consultants

Costs and investments: TBD

Category of investment: Equipment

Timing: 2024 onwards

Description: It is expected that funding for this activity will come from the ongoing PRIASA project. This activity will first involve careful assessment of the current status of the sector infrastructure with a key focus on critical infrastructure that needs to be rebuilt or built to boost VC performance, including managerial alternatives in case these infrastructure (e.g. mooring points) can be managed by communities or existing associations. It will also include

a document review of lessons and key determinants of success from other infrastructure privately or publicly managed. These lessons may relate to quality/availability of the materials used, maintenance challenges, managerial solutions, etc. Drawing on the assessment and these lessons, an infrastructure development plan will be designed and implemented. The detailed approach will be discussed and agreed with stakeholders/actors prior to finalization to ensure stakeholder buy-in/agreement. The activity will also involve the monitoring of the results on the use given to the infrastructure built. Detailed implementation arrangements will be specified by the African Development Bank through its PRIASA phase III project.

Output 3.7 Based on established self-help groups, awareness and access to finance sources have been improved

Access to credit is one of the main demands of VC actors. The project aims, on the one hand, to strengthen the capacities of the actors so that they can be considered creditworthy. On the other hand, it is necessary to promote the confidence of credit institutions in the VC, and this output seeks to establish the mechanism to achieve it.

Activity number and name: 3.7.1 Design in consultation and collaboration with financial entities and other development actors (NGOs) specific financial products with conditions suitable and affordable by VC actors

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 7 500

Category of investment: Facilitation, technical assistance

Timing: 2023–2024

Description: Establish lines of credit conditioned to the proposed activity and to the fulfilment of business plans previously developed (with support from activity 2.3.1), evaluated and approved. The entities that grant the credit and control compliance with the conditions may be banks, cooperation agencies, NGOs, etc., that manage their own funds or those of different donors. The system should take into account the learned lessons from the mechanisms established in the past to guarantee loan repayment for acquisition of praos and to prevent fishers from quickly misusing the revenues from their sales.

This fund should offer different financial credit lines or mechanisms for supporting VC actors who want to invest in activities, such as:

- acquisition of new boats and engines (built or repaired under output 3.2)
- cold chain (built/repared under output 3.4)
- adoption of new transportation means (under output 3.5)
- development of new products (under output 4.2)
- increase savings and/or working cash flow

This activity should be informed by the consultancy that the African Rural and Agricultural Credit Association (AFRACA) is undertaking for FISH4ACP in which they have developed

access to finance a strategy. Synergies with the COMPRAN microcredit programme will be considered.

Activity number and name: 3.7.2 Access to credit and savings mechanisms are facilitated through the establishment of self-help groups (SHGs) in at least five communities

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 320 000

Category of investment: Technical assistance, facilitation

Timing: 2024–2025

Description: Through local NGOs that work regularly with fishing communities, a programme will be implemented to create SHGs that are eligible for credit to finance their productive activities and the acquisition of necessary materials and equipment. Participating NGOs will be previously trained by an international expert contracted by FISH4 ACP.

It is expected that the programme will provide the funds in agreement with an appropriate entity according to the recommendations of AFRACA's access to the finance strategy. It is estimated that FISH4ACP will contribute 40 percent and the private sector 60 percent of the required funds.

Outcome 4: New value-added VC products available in the market through new channels

This outcome seeks to guarantee the good quality and wholesomeness of the products of the value chain, but also aims to ensure social and political recognition of the importance that this value chain represents for the country from the point of view of food and nutritional security, as well as resilience, by minimizing dependence on food imports. To this end, it is proposed to work on the valorization and differentiation of coastal pelagic fishery products, produced with sustainable and environmentally responsible practices and marketed with internationally recognized food safety and hygiene standards.

Improvement actions are oriented to:

- Increase public awareness regarding the importance of adopting and respecting the good practices of responsible fishing and fishery products hygiene.
- Promote value-added VC products by developing new forms of processing and marketing and by designing and adopting a distinctive label for their differentiation from improperly processed products.
- Stimulate the involvement of different actors of the VC to the valorization and differentiation process so that they themselves see the interest and advantages of valorizing their products and consider themselves as guarantors of “responsible fishing and healthy eating”.

Output 4.1. Social awareness campaigns aimed at producers and consumers for understanding the importance of food safety and responsible fishing in fishery products

The project will support the design of awareness campaigns on the importance of adopting responsible fishing and good hygiene VC products practices for the food security and nutrition of the population and environmental sustainability. The aim is to contribute to the gradual eradication of bad hygiene practices, such as drying fish on the ground within the reach of domestic animals or selling fish on the ground of market entrances or in the street in buckets with dirty water and without minimum hygienic conditions.

Activity number and name: 4.1.1 Communication strategy for raising awareness on the importance of adopting responsible fishing and good hygiene VC product practices

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 7 500

Category of investment: Technical assistance

Timing: 2023

Description: A communication strategy will be defined and implemented by means of awareness-raising campaigns with signage in landing areas, markets, public facilities, as well as messages on television and radio. The campaigns will be aimed at the general public and will serve to raise awareness of the desirability of buying healthy and hygienically treated products. In this sense, consideration will also be given to the relevance of collaboration with other programmes, such as COMPRAM, whose activities include nutrition education for rural women in collaboration with the National Council for Food and Nutrition Security (CONSAN) and specialized NGOs.

Activity number and name: 4.1.2 Implementation of awareness campaigns

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 24 000

Category of investment: Technical assistance

Timing: 2023–2025

Description: FISH4ACP, together with other collaborators' entities (government, environmental NGOs, etc.), will support the elaboration and procurement of necessary means for implementation of awareness campaigns, using information panels, merchandising, leaflets, radio, television, etc. The campaigns will be implemented in at least three targeted coastal communities where bad fishing practices (fishing of immature fish or too close to the shore with purse seines) or bad hygiene practices (drying fish on the ground, selling fish in the sun, insufficient use of ice, etc.) are most evident and widespread. The campaigns could be replicated after adaptation with lessons learned from the experiences in these first communities.

Output 4.2 Development of new quality products derived from the VC, with a special focus on child consumers is supported

The aim of developing new quality products is not to shift the consumption of VC products towards more favoured social strata, but rather to generally enhance the nutritional qualities of coastal pelagic fish so that regular consumers can also take advantage of them. In this respect, special attention will be paid to the possibility of developing products for children's food, such as fish burgers or low-salted dried fish, to promote the consumption of these products in school canteens and thus contribute to improving the nutrition of the child population.

Activity number and name: 4.2.1 Conduct market studies for assessing the opportunity and feasibility of supplying new VC products, including quality-labelled products, to different market niches with a particular focus on child consumption

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 7 500

Category of investment: Technical assistance

Timing: 2023

Description: To identify both the types of products to be produced and the market niches to be targeted, it is necessary to carry out a prior market study, to be funded by the project, analysing all the variables that will make it possible to determine the most convenient products to elaborate. On the other hand, the convenience and feasibility of differentiating these products with a quality label will also be analysed, which would serve to identify those products produced with certain quality requirements, both in terms of the fishing and processing methods.

Activity number and name: 4.2.2 Encourage research and development of new quality products derived from the coastal pelagic VC (based on the market opportunities assessed)

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 9 000

Category of investment: Technical assistance

Timing: 2024

Description: FISH4ACP will provide technical assistance to: (i) identify and develop new products from selected pelagic coastal species based on conclusions from activity 4.2.1; and (ii) elaborate manuals for their processing by associations or microenterprises, considering the limitations of equipment and materials available in the country. Ideally, the project will contribute to the development of new products by providing technical support to a collaborating body or entity specialized in the development of new food products (university, NGO, vocational school) and subsequently supporting the transfer of knowledge to the selected pilot associations or microenterprises. There are some value-added food product initiatives developed with agricultural organizations (through the NGO Qua Tela) that can serve as an example.

Activity number and name: 4.2.3 Training, financial and technical support to three to five pilot associations or microenterprises members, selected through an open “call for proposals”, for the elaboration and commercialization of new branded quality products

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 33 000

Category of investment: Technical assistance, equipment

Timing: 2024

Description: For the elaboration of the products previously identified, the project will establish the basis for the call of proposals to those associations or microenterprises interested in carrying out the elaboration of these products. The selected ones will receive training and guidance for the production and marketing of their products from collaborating entities. Financial support for this activity would be under output 3.7.

The relevance of defining and implementing experience exchanges or study tours (at national or international level) should be considered.

Activity number and name: 4.2.4 Design, manufacture and distribution of advertising and merchandising items (banners, posters, T-shirts, caps, aprons, tools, etc.) to promote new products manufactured

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 18 000

Category of investment: Technical assistance

Timing: 2024

Description: The project will also support the design of a differentiating label and production of different merchandising products that will help to make visible and differentiate the products produced and marketed under the quality criteria established and promoted by FISH4ACP. It will take the necessary measures to make it widely known to consumers through communication and dissemination tactics, such as labelled containers, uniforms, caps, utensils, boats, market stalls, processing sites and vehicles.

Output 4.3 A national network of value-adding associations or microenterprises embracing and displaying the differentiating “quality label” is promoted and established

The creation of a network of associations or microenterprises that are committed to the production and differentiation of quality products will help to reinforce the image of their products and to carry out joint actions that contribute to strengthening and improving their production.

Activity number and name: 4.3.1 Inform and encourage the pilot projects associations/small and medium enterprises to create a functional network (for improving visibility, differentiation and consumer recognition of their products)

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 4 000

Category of investment: Technical assistance

Timing: 2025

Description: To increase the impact and visibility of the project in the valorization of VC products, the project will promote the creation of a network of the three to five pilot associations or microenterprises that have benefited from the project or that adopt the good processing and quality practices established by the project. The products produced by the members of this network will be differentiated by means of the labels designed in activity 4.2.4. The project will provide technical advice for establishing criteria and statutes for the creation of the network and will formalize according to regulation.

Output 4.4 Agreements between processing associations/small and medium enterprises and relevant public or private institutions for the purchasing of these new fish products are promoted and implemented in school canteens, hospitals or other public canteens, market stalls, etc.

Supply contracts with public entities represent an ideal mechanism to ensure the sale of products in sufficient quantities and on a stable basis to enable better planning and higher profitability. FISH4ACP will facilitate and support the elaboration and signing of trade agreements between associations or small and medium enterprises that have benefited from the above activities with different public or private entities to ensure the supply and demand for value-added products elaborated by the mentioned associations.

Activity number and name: 4.4.1 Advice for the elaboration of commercial agreements established between public or private institutions with the processing associations or small and medium enterprises

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 4 000

Category of investment: Technical assistance

Timing: 2024

Description: In particular, efforts will be made to establish agreements with the National School Food and Health Program (PNASE), which is responsible for school meals for 50 000 children. Previously, some associations carried out supply agreements with this programme, but they were not beneficial for them because of the excessive delay in payment by PNASE. In the near future, thanks to the imminent implementation of Law 4/2012, PNASE will have its own budget and greater autonomy in its management, which will allow supply agreements to be carried out under more favourable conditions for small producers. This represents an opportunity and an incentive for the development of new products made with guarantees of health and hygiene for infant feeding. The project will also mediate so that both parties comply with the commitments made in their contracts. In addition to PNASE, efforts will be made to establish agreements with other public institutions responsible for hospitals or nursing homes, as well as the army or prisons, without ruling out the opportunities that may open up with the private sector. In this sense, the elaboration of good quality products aimed at the tourism sector, in clear expansion, also represents opportunities for VC producer associations to exploit.

Output 4.5 The multistakeholder partnership (MSP) contributes to project/strategy management

Activity number and name: 4.5.1 Constitution of the MSP

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 3 000

Category of investment: Technical assistance

Timing: 2023

Description: The multistakeholder platform “Kitembu Mionga 8 KB” (meaning “collective action to support 8 coastal pelagics”) is constituted, including a core group composed by the Steering Committee, namely, the president, vice president, secretary general (FISH4ACP national professional officer – acting) and two presidents of palaiê associations.

Activity number and name: 4.5.2. Support and coordinate the implementation of the upgrading strategy’s activities

Stakeholders or facilitators involved: FA, consultants

Costs and investments: USD 50 000

Category of investment: Technical assistance

Timing: 2023 onwards

Description: The MSP will be responsible for coordinating the implementation of the activities defined in the upgrading strategy. It will also be responsible for the follow-up of the activities, facilitating their implementation with the available financial means foreseen by the project.

Among its functions are the following:

- revision of the terms of reference required for the implementation of the different activities and facilitating and monitoring them;
- elaborating and monitoring the procurement of materials and equipment, according to FAO's contracting and/or procurement procedures;
- establishing the frequency of monitoring meetings and facilitating their implementation; and
- drawing up the technical and economic monitoring reports in accordance with the established frequency (quarterly, half-yearly, annual, etc.).

Risk analysis

The risk analysis (Table 23) reflects on the risks that can hamper the achievement of the envisioned impact and presents the associated mitigation measures contemplated in the strategy. The risks are listed from higher to lower and overall risk level is calculated by multiplying risk likelihood with risk impact.

TABLE 23. RISKS ASSOCIATED WITH THE UPGRADING STRATEGY

Risk name	Risk nature	Risk likelihood (1-5)	Risk impact (1-5)	Overall risk level (1-25)	Mitigation options
Most fishers oppose to accept sustainable resource management measures, which they consider as going against their own interests	The design and implementation of a fisheries management plan is essential for assuring the sustainable exploitation of the coastal pelagic resources and avoid overfishing. The fishers understanding and adoption of these measures are a prerequisite for the plan to be effective and successful	4	5	20	FISH4ACP foresees communication and consultation activities to involve fishers in the elaboration and acceptance of the plan. The implementation of some co-management projects of marine protected areas in some points of the coast with the support of the NGO Oikos could be used as demonstrative examples of the importance and the positive effect of establishing management rules that limit the indiscriminate exploitation of the resources.
The decline of fishery resources, resulting from the lack of effective management measures, is increasingly jeopardizing the profitability of fishers and palaiês activities and the supply of fish products to the population	Complaints that fish stocks have been declining over the last few years need to be checked against statistical data to confirm whether this decline is due to an increase in the number of fishers (and decreasing catch per unit effort) or whether there is actually a decline in the overall catch	4	4	16	The project foresees two types of actions to address this risk. On the one hand, to strengthen and improve stock assessment capacity and to design and implement a resource management plan and regulations. On the other hand, to improve the capacities and knowledge of the actors involved to make better use of fishery products and reduce losses due to the handling, transformation, conservation and use of fishery products
Poverty and lack of alternative livelihood means compel	Implementation of management measures, such as closed fishing	4	4	16	The upgrading training activities in outcome 2 aim to improve skills related to small business

fishers to continue using illegal fishing practices	seasons, prohibition of destructive gear and limited quota, etc., cannot be assured if fisherfolk do not have sufficient economic alternatives to face the measures and are forced to transgress them to guarantee their livelihood				management, promoting entrepreneurship, as well as savings and economic planning
Banks are reluctant to grant credit to value chain actors and demand unaffordable conditions	The upgrading strategy is based on reinforcing the capacities of value chain actors so that they acquire the necessary skills and credibility to be subject to credit. However, banks generally consider that the fishing activity is high risk, and the conditions for granting credit are unaffordable by stakeholders	4	4	16	FISH4ACP explores different alternatives in collaboration with other donors to support value chain actors to meet the required conditions to obtain a formal credit
A majority of stakeholders oppose the formalization and professionalization of artisanal and/or palaiês fishing activities	The process of professionalization of the activities of palaiês and artisanal fishers is essential to change the current situation of informality and lack of rights and responsibilities that prevails in the value chain	3	5	15	Information and awareness-raising campaigns are planned prior to the adoption of measures to professionalize and formalize these activities. It is essential that these campaigns are designed with the support of professional communication experts who are familiar with the particular idiosyncrasies of coastal communities and are carried out with special commitment, with the support of experts who know how to transmit and argue the advantages of these measures for those affected
There are no carriers interested in offering an adequate fish-transport service in accordance with international hygiene standards	The transport of fish is carried out with poor hygiene conditions and mixed with products of all kinds, including polluting products such as gasoline, detergents, etc.	3	4	12	FISH4ACP will carry out market studies and propose alternatives for stowage and transport of fish that are profitable for transporters and that guarantee adequate hygienic conditions
Power supply remains unstable	The electricity supply in Sao Tome and Principe is increasingly unstable	4	3	12	FISH4ACP foresees activities aimed at increasing and ensuring the proper use and operation of

	and the frequent power outages compromise the proper functioning of the cold chain, causing breakdowns, lack of ice or poor conservation and deterioration of the products stored in cold rooms				refrigeration systems that use renewable energy, as well as the manufacture and repair of insulation systems for boats, refrigerators, containers, etc.
A significant proportion of the actors are not interested in participating in the training activities that accompany the professionalization process	The training of actors is essential for an effective and successful professionalization process	3	4	12	It is envisaged that the training will take place in different communities and will be adapted to the timetables and different levels of education of those concerned. The implementation of demonstration projects and the implementation of incentive mechanisms to encourage participation are also envisaged.
The government does not consider it necessary to upgrade the knowledge and skills of fisheries management officials and collaborators and, instead, demands new inspection means and equipment, such as motorboats, radar, sonar, etc., to strengthen monitoring, control and surveillance capacity	The strategy aims to strengthen the capacities of officials and collaborators of the Directorate of Fisheries with a twofold objective: to improve the collection and analysis of statistical data necessary to know the state of the resources and thus have a reliable scientific basis for the development of a sustainable management plan for the resources and, on the other hand, to improve the quality assurance of fishery products	2	4	8	The project foresees providing some of the basic inspection equipment that is deemed essential, but will have to convince the fisheries administration that the technical capacity development foreseen in the strategy should take priority over the acquisition of equipment and materials requiring high investment and maintenance
Value chain actors are not interested in improved business models for new-product development	For many palaiês, processing is a part-time activity and therefore they could be reluctant to invest in a full-time business	2	3	6	The development of new products will be carried out gradually, starting with three to five “pilot” microenterprises or associations selected to serve as models for future interested persons

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Annexes

Annex 1 – Primary data collection

NUMBER OF RESPONDENTS INTERVIEWED DURING PRIMARY DATA COLLECTION PERIOD IN 2021

Survey/interview type	Number of respondents
Surveys	
Small-scale fishers	63
Small-scale processors	35
Consumers	209
Actor interviews	
Functional	48
Economic	50
Social	49
Environmental	55
Focus group discussions	
Small-scale fishers	4
Small-scale processors and traders	2
Consumers	2
Key informant interviews	
Input and service providers	17
Ministry official – trade	1
Ministry official – Directorate of Fisheries	1

Ministry official – Directorate of the Environment	1
Ministry official – Port Captaincy	2
Ministry official – Coast Guard	1
Ministry official – nutrition programme	1
Ministry official – sanitary inspection	1
Sector associations	3
Non-governmental organizations	3

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Annex 2 – Assumptions overview

ASSUMPTIONS OVERVIEW

Variable	Estimates	Notes
Artisanal fisheries production	14 775 tonnes of fish landed yearly, of which 8 480 tonnes belong to coastal pelagics	<p>Porriños (2022, unpublished data) provided catch and effort (C&E) information of 7 541 C&E samples conducted in southern Sao Tome and Principe per gear and vessel type (with motor/no motor) during 2020 and 2021, which provided an average of catch per species and fishing trip.</p> <p>Data on the number of vessels and gear were taken from the Directorate of Fisheries, 2019 frame survey, with the exception of number of vessels using seines and purse seines obtained in key informant interviews with fishers.</p> <p>After discussions with fishers, it was determined:</p> <ul style="list-style-type: none"> • Hook and line is used 240 days/year • Surface gillnet: used between 5 to 6 months, 15 days/month – 82.5 days/year • Scoop net: 10–15 days during gravana, the dry season (3 months) – 37.5 days/year • Seine and purse seine: 184 days/year <p>Based on discussion with fishers, it was also determined:</p> <ul style="list-style-type: none"> • 80% of the vessels using hook and line (morning) use gillnets (afternoon) the same day. • In gravana season, vessels using scoop nets only use this gear • Purse seine/seine fishers normally use only this gear during the whole year
Semi-industrial fisheries production	476.8 tonnes of fish landed yearly, of which 216.8 tonnes are coastal pelagics	<p>Key informant interviews with semi-industrial vessel owners provide estimations on the number of fishing trips per month for “bigger” and “smaller” vessels, average catches and percentage of coastal pelagics</p> <ul style="list-style-type: none"> • Bigger vessels (4): each vessel conducts 3 fishing trips every 2 weeks, and catches an average of 2 tonnes, of which 35% are coastal pelagics • Smaller vessels (8): each vessel conducts one fishing trip per week, normally five days duration (Monday to Friday), catches an average of 800 kg per fishing trip, of which 50% are coastal pelagics
Number of palaiês	2 640 palaiês	The Directorate of Fisheries 2014 frame survey counted 2 355 palaiês in the country. According to the World Bank (2023b), the population increase between 2014 and 2020 was 11.97% (from 195 727 to 219 161 inhabitants). Applying the same percentage increase, there were around 2 640 estimated palaiês in 2020.

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Annex 3 – Detailed economic calculations

This section provides operating accounts for the different actors in the value chain. For the fisherfolk, the operating accounts include other fish in the calculations in order to gain a more in-depth understanding of the operations. For the purse seine, the revenue is divided by 2 as they operate on two boats. Also, the numbers in italic are not taken into account but are there to show the other fish volumes.

OPERATING ACCOUNTS: PURSE SEINE

	Unit	Number of Kg	Cost/Kg (DBS)	Total DBS
Revenues (received by actor)				
Fulu Fulu Sales	Kg	14,281	48.00	685,471
Fulu Fulu Self-consumption	Kg	1,571	48.00	75,402
Cavala Sales	Kg	1,482	40.00	59,270
Cavala Self-consumption	Kg	163	40.00	6,520
Voador Sales	Kg	33	30.00	979
Voador Self-consumption	Kg	4	30.00	108
Maxipombo Sales	Kg	10,596	20.00	211,917
Maxipombo Self-consumption	Kg	500	20.00	10,000
Bonito Sales	Kg	404	54.00	21,793
Bonito Self-consumption	Kg	44	54.00	2,397
Sintra Sales	Kg	-	52.00	0
Sintra Self-consumption	Kg	-	52.00	0
Carapau Sales	Kg	309	52.00	16,085
Carapau Self-consumption	Kg	34	52.00	1,769
Other fish sales	Kg	<i>4,365</i>	<i>50.00</i>	
Other fish Self-consumption	Kg	<i>450</i>	<i>50.00</i>	
Volume of catch all fish		<i>34,264</i>	Total revenues	\$ 545,856
Volume of catch – only small pelagics		<i>29,420</i>		
				Only costal pelagics 78%
Costs (paid by actor)				
Gasoline	lt			\$ 122,400
Gross Profit after Gasoline	lt			\$ 423,456
70% for the boat owner				\$ 296,419
Petrol	lt			\$ 95,550
Engine Oil	lt			\$ 10,483.20
Services	unit			\$ 81,900
Hired labor (gross salaries, wages)	person-day			
Family labor (gross salaries, wages)	person-day			
Public fees (licenses, quotas, ...)				\$ 1,248
Depreciation				\$ 78,357.04
Total costs for boat owner				\$ 267,538
Net profit Boat owner				\$ 28,881
30% for Boat staff				\$ 127,037
Net profit per Marinheiro (10 ppl)				\$ 12,704
Net profit (net income)				\$ 155,917

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: HOOK AND LINE, GILLNET AND SCOOP NETS

Revenues (received by actor)	Unit	number of	Cost/kg	Total cost (DB\$)
Fulu Fulu Sales	Kg	241	48.00	11,585
	Kg	27		
Fulu Fulu Self-consumption			48.00	1,274
Cavala Sales	Kg	20	40.00	785
Cavala Self-consumption	Kg	2	40.00	86
Voador Sales	Kg	930	30.00	27,912
Voador Self-consumption	Kg	102	30.00	3,070
Maxipombo Sales	Kg	-	25.00	0
Maxipombo Self-consumption	Kg	-	25.00	0
Bonito Sales	Kg	676	54.00	36,516
Bonito Self-consumption	Kg	74	54.00	4,017
Sintra Sales	Kg	-	52.00	0
Sintra Self-consumption	Kg		52.00	0
Carapau Sales	Kg	198	52.00	10,309
Carapau Self-consumption	Kg	22	52.00	1,134
Other fish Sales	Kg	2,306	53.00	
Other fish Self-consumption	Kg	254	53.00	
Direct subsidies		-	\$ -	\$ -
Total revenues (annual turnover)		4,852		\$ 96,689
				Only pelagics 49.5%
Costs (paid by actor)				
Raw materials (from within the VC)	kg			
Physical inputs (other than raw materials)	unit			
√Gasoline	lt			\$ 33,188
√Petrol	lt			\$ -
√Engine oil	lt			\$ 7,128
				\$ -
Services	unit			\$ 17,245
Hired labor (gross salaries, wages)	person-day			\$ 6,000
Family labor (gross salaries, wages)	person-day			
Public fees (licenses, quotas, ...)				\$ 411.68
Interest				
Depreciation				\$ 16,253
Total costs				\$ 80,232
Operating profit (gross income)				\$ 16,457
Direct tax on gross profit				
Net profit (net income)				\$ 16,457

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: PALAIËS SELLING FRESH FISH

Revenues (received by actor)	Unit	Number of units	Unit cost	Total cost (Dbs)
Fresh				
Voador Sales	kg	70	\$ 40.0	\$ 2,817
Self-consumption	kg	4	\$ 40.0	\$ 141
Fulu Fulu Sales	kg	827	\$ 60.0	\$ 49,649
Self-consumption	kg	44	\$ 60.0	\$ 2,613
Bonito Sales	kg	176	\$ 75.0	\$ 13,204
Self-consumption	kg	9	\$ 75.0	\$ 660
Maxipombo Sales	kg	563	\$ 30.0	\$ 16,902
Self-consumption	kg	30	\$ 30.0	\$ 890
Carapau Sales	kg	53	\$ 65.0	\$ 3,433
Self-consumption	kg	3	\$ 65.0	\$ 172
Cavala Sales	kg	70	\$ 50.0	\$ 3,521
Self-consumption	kg	4	\$ 50.0	\$ 176
		1,852		\$ 94,177
Dry				
Voador Sales	kg	185	\$ 50.0	\$ 9,228
Self-consumption	kg	9	\$ 50.0	\$ 461
Fulu Fulu Sales	kg	23	\$ 70.0	\$ 1,635
Self-consumption	kg	1	\$ 70.0	\$ 82
Bonito Sales	kg	19	\$ 85.0	\$ 1,589
Self-consumption	kg	1	\$ 85.0	\$ 79
Maxipombo Sales	kg	7	\$ 40.0	\$ 280
Self-consumption	kg	0	\$ 40.0	\$ 14
Total Dry		245		\$ 13,369
Total revenues (annual turnover)				\$ 107,546
Costs (paid by actor)				
Raw materials (Fresh fish from within the VC)	kg			\$ -
Fresh				
Voador Buy		79	\$ 30.0	\$ 2,366
Fulu Fulu Buy		927	\$ 48.0	\$ 44,478
Bonito Buy		197	\$ 54.0	\$ 10,646
Maxipombo Buy		631	\$ 20.0	\$ 12,618
Carapau Buy		59	\$ 52.0	\$ 3,076
Cavala Buy		79	\$ 40.0	\$ 3,154
		1,972		\$ 76,338
Dry				
Voador Buy		251	\$ 30.0	\$ 7,530
Fulu Fulu Buy		32	\$ 48.0	\$ 1,536
Bonito Buy		25	\$ 54.0	\$ 1,350
Maxipombo Buy		9	\$ 20.0	\$ 180
		317		\$ 10,596
Salt		317	\$ 1.70	\$ 539
Costs -Transport,ice,food,package				\$ 9,750
Services	unit			
Total costs				\$ 97,223
Operating profit (gross income)				\$ 10,323
Direct tax on gross profit				
Net profit (net income)				\$ 10,323

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: PALAIÉS WHOLESALERS/PROCESSORS

Revenues (received by actor)	Unit	Number of units	Unit cost	Total cost (Obs)
Fresh				
Voador Sales	kg	136	\$ 40.0	\$ 5,437
Self-consumption	kg	7	\$ 40.0	\$ 272
Fulu Fulu Sales	kg	1,597	\$ 60.0	\$ 95,834
Self-consumption	kg	84	\$ 60.0	\$ 5,044
Bonito Sales	kg	340	\$ 75.0	\$ 25,488
Self-consumption	kg	18	\$ 75.0	\$ 1,341
Maxipombo Sales	kg	1,087	\$ 30.0	\$ 32,624
Self-consumption	kg	57	\$ 30.0	\$ 1,717
Carapau Sales	kg	102	\$ 65.0	\$ 6,627
Self-consumption	kg	5	\$ 65.0	\$ 349
Cavala Sales	kg	136	\$ 50.0	\$ 6,797
Self-consumption	kg	7	\$ 50.0	\$ 340
		3,577		\$ 181,870
Dry				
Voador Sales	kg	1,786	\$ 50.0	\$ 89,285
Self-consumption	kg	94	\$ 50.0	\$ 4,699
Bonito Sales	kg	446	\$ 85.0	\$ 37,946
Self-consumption	kg	23	\$ 85.0	\$ 1,997
Maxipombo Sales	kg	744	\$ 40.0	\$ 29,762
Self-consumption	kg	39	\$ 40.0	\$ 1,566
Total Dry		3,133		\$ 165,256
Total revenues (annual turnover)				\$ 347,125
Costs (paid by actor)				
Raw materials (Fresh fish from within the VC)	kg			\$ -
Fresh				
Voador Buy		152	\$ 30.0	\$ 4,567
Fulu Fulu Buy		1,789	\$ 48.0	\$ 85,853
Bonito Buy		381	\$ 54.0	\$ 20,550
Maxipombo Buy		1,218	\$ 20.0	\$ 24,356
Carapau Buy		114	\$ 52.0	\$ 5,937
Cavala Buy		152	\$ 40.0	\$ 6,089
		3,806		\$ 147,351
Dry				
Voador Buy		2,951	\$ 30.0	\$ 88,520
Bonito Buy		738	\$ 54.0	\$ 39,834
Maxipombo Buy		1,229	\$ 20.0	\$ 24,589
		4,918		\$ 152,942
Costs - Transport, Ice, food, package, labour				\$ 40,727
Total costs				\$ 341,020
Operating profit (gross income)				\$ 6,106
Direct tax on gross profit				
Net profit (net income)				\$ 6,106

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: PALAIÉS RETAILERS

	Unit	Number of units	Unit cost (US\$)	Total cost (US\$)
Revenues (received by actor)				
Dry				
Voador Sales	kg	882	\$ 55.0	\$ 48,510
Self-consumption	kg	46	\$ 55.0	\$ 2,530
Fulu Fulu Sales	kg	779	\$ 80.0	\$ 62,320
Self-consumption	kg	41	\$ 80.0	\$ 3,280
Bonito Sales	kg	329	\$ 90.0	\$ 29,583
Self-consumption	kg	17	\$ 90.0	\$ 1,557
Maxipombo Sales	kg	456	\$ 45.0	\$ 20,520
Self-consumption	kg	24	\$ 45.0	\$ 1,080
Total Dry		2,574		\$ 169,380
Total revenues (annual turnover)				\$ 169,380
Costs (paid by actor)				
Raw materials (Fresh fish from within the VC)	kg			\$ -
Dry				
Voador Buy	kg	928	\$ 45.0	\$ 41,760
Fulu Fulu Buy	kg	820	\$ 70.0	\$ 57,400
Bonito Buy	kg	346	\$ 80.0	\$ 27,680
Maxipombo Buy	kg	480	\$ 35.0	\$ 16,800
		2,574		\$ 143,640
Rent				\$ 2,160
Labour/Transport				\$ 14,400
Total costs				\$ 160,200
Operating profit (gross income)				\$ 9,180
Net profit (net income)				\$ 9,180

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: PURSE SEINE (ACCOUNTING AND OTHER FISH CATCH)

	Unit	Number of Kg	Cost/Kg (DBS)	Total DBS
Revenues (received by actor)				
Fulu Fulu Sales	Kg	14,281	48.00	685,471
Fulu Fulu Self-consumption	Kg	1,571	48.00	75,402
Cavala Sales	Kg	1,482	40.00	59,270
Cavala Self-consumption	Kg	163	40.00	6,520
Voador Sales	Kg	33	30.00	979
Voador Self-consumption	Kg	4	30.00	108
Maxipombo Sales	Kg	10,596	20.00	211,917
Maxipombo Self-consumption	Kg	500	20.00	10,000
Bonito Sales	Kg	404	54.00	21,793
Bonito Self-consumption	Kg	44	54.00	2,397
Sintra Sales	Kg	-	52.00	0
Sintra Self-consumption	Kg	-	52.00	0
Carapau Sales	Kg	309	52.00	16,085
Carapau Self-consumption	Kg	34	52.00	1,769
Other fish sales	Kg	4,365	50.00	218,226
Other fish Self-consumption	Kg	480	50.00	24,005
Total revenues (annual turnover)		34,264		\$ 666,971
Costs (paid by actor)				
‡Gasoline	lt			\$ 144,000
Gross Profit after Gasoline	lt			\$ 522,971
70% for the boat owner				\$ 366,080
‡Petrol	lt			\$ 122,500
‡Engine Oil	lt			\$ 13,440
Services	unit			\$ 105,000
Hired labor (gross salaries, wages)	person-day			
Family labor (gross salaries, wages)	person-day			
Public fees (licenses, quotas, ...)				\$ 1,600
Depreciation				\$ 100,458
Total costs for boat owner				\$ 342,998
Net profit Boat owner				\$ 23,082
30% for Boat staff				\$ 156,891
Net profit per Marinheiro (10 ppl)				\$ 15,689
Net profit (net income)				\$ 179,973

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A.& Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

OPERATING ACCOUNTS: HOOK AND LINE, GILLNET AND SCOOP NETS (ACCOUNTING AND OTHER FISH CATCH)

Revenues (received by actor)	Unit	Number of Kg	Cost/Kg (DBS)	Total cost (DBS)
Fulu Fulu Sales	Kg	241	48.00	11,585
Fulu Fulu Self-consumption	Kg	27	48.00	1,274
Cavala Sales	Kg	20	40.00	785
Cavala Self-consumption	Kg	2	40.00	86
Voador Sales	Kg	930	30.00	27,912
Voador Self-consumption	Kg	102	30.00	3,070
Maxipombo Sales	Kg	-	25.00	0
Maxipombo Self-consumption	Kg	-	25.00	0
Bonito Sales	Kg	676	54.00	36,516
Bonito Self-consumption	Kg	74	54.00	4,017
Sintra Sales	Kg	-	52.00	0
Sintra Self-consumption	Kg		52.00	0
Carapau Sales	Kg	198	52.00	10,309
Carapau Self-consumption	Kg	22	52.00	1,134
Other fish Sales	Kg	2,306	53.00	122,201
Other fish Self-consumption	Kg	254	53.00	13,442
Direct subsidies		-	\$ -	\$ -
Total revenues (annual turnover)		4,852		\$ 232,332
Costs (paid by actor)				
Raw materials (from within the VC)	kg			
Physical inputs (other than raw materials)	unit			
Gasoline	lt			\$ 45,720
Petrol	lt			
Engine oil	lt			\$ 8,832
Services	unit			\$ 34,838
Hired labor (gross salaries, wages)	person-day			\$ 72,000
Family labor (gross salaries, wages)	person-day			
Public fees (licenses, quotas, ...)				\$ 832
Interest				
Depreciation				\$ 32,847
Total costs				\$ 195,068
Operating profit (gross income)				\$ 37,264
Direct tax on gross profit				
Net profit (net income)				\$ 37,264

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

VALUE-ADDED INDICATORS TAKING INTO ACCOUNT OTHER FISH CATCH

Value added indicators with "Other fish"		Individual actor type level					Aggregate actor type level					Functional level				Core VC level	USD
3. Value added		Purse Sein F	Hook and L	Palaios Fresh	Palaios Proc	Palaios market retail	Purse Sein F	Hook and L	Palaios Fres	Palaios Pro	Palaios mar	Production	Aggregation	Processing	Distribution		
Ec12	Direct value added at VC level (DBS/year)	179973	109264	10323	13606	23580	19797042	233497790	25394766	1858154	4716000	19797042	233497790	27252920	4716000	285263752	
Ec13	Indirect VA at VC level (DBS/year)	87737	28142	4875	24436	4296	9651105	60139683	11992500	877500	859200	9651105	60139683	12870000	859200	83519988	
Ec14	Total VA (DBS/year)	267710	137406	15198	38042	27876	29448147	293637473	37387266	2735654	5575200	29448147	293637473	40122920	5575200	368783740	15M USD

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

VALUE-ADDED INDICATORS TAKING INTO ACCOUNT ONLY COASTAL PELAGICS

Value added		Individual actor type level					Aggregate actor type level					Functional level				Core VC level	USD
3. Value added		Purse Sein F	Hook and L	Palaios Fresh	Palaios Proc	Palaios market r	Purse Sein F	Hook and Line	Palaios Fresh	Palaios Process	Palaios market r	Production	Aggregation	Processing	Distribution		
	Direct value added at VC level (DBS/year)	\$ 155,917	\$ 22,457	\$ 10,323	\$ 10,906	\$ 23,580	\$ 17,150,912	\$ 47,991,173	\$ 25,394,766	\$ 1,858,154	\$ 4,716,000	\$ 17,150,912	\$ 47,991,173	\$ 27,252,920	\$ 4,716,000	\$ 97,111,004	
	Indirect VA at VC level (DBS/year)	\$ 87,737	\$ 36,673	\$ 4,875	\$ 24,436	\$ 4,296	\$ 9,651,105	\$ 78,370,003	\$ 11,992,500	\$ 877,500	\$ 859,200	\$ 9,651,105	\$ 78,370,003	\$ 12,870,000	\$ 859,200	\$ 101,750,308	
	Total VA (DBS/year)	\$ 243,655	\$ 59,130	\$ 15,198	\$ 35,342	\$ 27,876	\$ 26,802,017	\$ 126,361,175	\$ 37,387,266	\$ 2,735,654	\$ 5,575,200	\$ 26,802,017	\$ 126,361,175	\$ 40,122,920	\$ 5,575,200	\$ 198,861,312	8.8

Source: de Labra, G., Vilela López, B., Prieto Porriños, G., Blanc, P.P., Vasta, A. & Anibal, O. 2024. *The coastal pelagics value chain in Sao Tome and Principe: analysis and design report*. Rome, FAO.

Annex 4 – Previous cooperation projects relevant for the coastal pelagics value chain

- **Infrastructure Rehabilitation for Food Security Support Project (PRIASA I).** This project funded by the African Development Fund was implemented from 2011 to 2016. The main outputs of PRIASA I related to the fisheries sector include: (i) the rehabilitation and construction of markets to improve the commercialization of sea products in Neves, Santana and Bobo Forro in Sao Tome; (ii) the construction and equipment of a health control laboratory; (iii) awareness and training on the topic of responsible fishing, hygiene and quality, and market management; (iv) training of technicians in statistics; and (v) the supply of computer equipment, VMS surveillance material and equipment for safety at sea (ADF, 2017).
- **Project to Strengthen Civil Society for the Socio-Economic Development of the Fisheries Sector (PROFOPESCAS).** This European Union-funded project (mid-2013 to April 2016) aimed at increasing the participation of fishers and palaiês in sector development strategies and decision-making processes. The main focus of the project was: (i) the creation and support for the operation of transforming women's associations in eight communities in Sao Tome and four in Principe; (ii) implementation of a federation of fishers and palaiês that group 40 associations and a Sectoral Consultation and Coordination Committee; and (iii) support for the fishmongers' women's associations under the PNASE initiative (granting of working funds for the purchase of products) (Sy and Soares Diogo, 2019).
- **FAO Technical Cooperation Programmes (TCPs).** Two TCPs focusing on the fisheries sector have been implemented recently. The first one (TCP/STP/3603) provided support for improving the commercialization of fish products in Sao Tome and Principe and was implemented between 2016 and 2018. The other one (TCP/STP/3002) focused more on the processing and commercialization segments of the fishery value chain and aimed at improving post-harvest technologies and commercialization of fish in Sao Tome and Principe (Sy and Soares Diogo, 2019)
- **Kike da Mungú.** This European Union-funded project started in 2017 and finished in 2020; it is jointly implemented by Oikos and MARAPA. The project aimed to establish a participatory and sustainable fisheries management system in the south of Sao Tome island – including marine protected areas – with a shared governance approach to fisheries resources and territorial and ecosystem management (Kike da Mungú, 2019; Santos, da Conceição and Bolingo, 2017).
- **Omali Vida Nón.** This project was funded by the Darwin Initiative, and was jointly implemented by the University of Exeter and Fundação Príncipe. The main objective was to improve fisheries management and livelihoods in Principe island through a participatory approach (Omali Vida Nón, 2019).

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This report presents the results of the value chain analysis of the coastal pelagics value chain in Sao Tome and Principe conducted from 2021-2022 by the value chain development programme FISH4ACP. This report contains a functional analysis of the value chain, assesses its sustain ability and resilience, develops an upgrading strategy and an implementation plan to which FISH4ACP will contribute.

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

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