



Food and Agriculture
Organization of the
United Nations

FISH4ACP

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

SUMMARY REPORT

Nile Tilapia value chain in Côte d'Ivoire

December 2022



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Authors and contributors

Aimée Kourgansky, FAO Consultant

René Fréchet, FAO Consultant

Pierre-Philippe Blanc, FAO Consultant

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Contents

Acknowledgements	v
Disclaimer	v
Acronyms	vi
1. Introduction	1
2. Functional analysis	3
3. Sustainability analysis	7
4. Vision and upgrading strategy	12
5. Upgrading strategy implementation plan	26
Annex – Scenario B – 24 000 tonnes produced in 2031	40
References	43

LIST OF FIGURES

Figure 1 – Map of the tilapia value chain (culture, fishing and imports) in Côte d'Ivoire	5
Figure 2 – Spider diagram of economic sustainability	7
Figure 3 – Spider diagram of social sustainability	8
Figure 4 – Spider diagram of environmental sustainability	9
Figure 5 – Theory of change for the overall farmed tilapia value chain upgrading strategy in Côte d'Ivoire	23

LIST OF TABLES

Table 1 – Map of risk elements in the Nile tilapia value chain	9
Table 2 - SWOT of the Nile tilapia value chain	13
Table 3 – Upgrade projections – 68 000 tonnes	15
Table 4 – Improved performance of the value chain	24
Table 5 – Upgrade activities of the Nile tilapia value chain	26
Table 6 - Investment required for the upgrade	35
Table 7 – Stakeholders involved by outcome	36
Table 8 - Risks in the implementation of the upgrade strategy and mitigation measures	38
Table 9 – Upgrade projections (24 000 tonnes)	40
Table 10 – Improved performance (24 000 tonnes)	41
Table 11 – Investment required for the upgrade (24 000 tonnes)	42

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Acronyms

ACP	African, Caribbean and Pacific
ACV4D	Value chain analysis for development
ADB	African Development Bank
ADG	Average daily gain
ANADER	National Rural Development Support Agency
ANAQUACI	National Aquaculture Association of Côte d'Ivoire
AQUABIA	Bia Aquaculture Producers Co-operative Society
BMZ	German Federal Ministry for Economic Cooperation and Development
CMATPHA	Abidjan Fish Processors Cooperative
CNRA	National Centre for Agricultural Research
COMHAFAT	Ministerial Conference on Fisheries Cooperation between African States along the Atlantic Ocean
COOVEP-CI	Fishmongers cooperative society of Côte d'Ivoire
covid-19	Coronavirus disease 2019
CRO	Oceanographic Research Centre
CFA franc	CFA franc
EC	European Commission
ECA	National aquaculture framework survey
ECOWAS	Economic Community of West African States
EMP	Endangered, threatened or protected (species)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FENASCOOP-CI	National Federation of Cooperatives and Stakeholders in the Fisheries Sector of Côte d'Ivoire
FIRCA	Interprofessional Fund for Agricultural Research and Advice
FTE	Full-time Equivalent (employment)
GIFT	Genetically improved farmed tilapia
JICA	Japanese International Cooperation Agency
LANADA	National Agricultural Development Support Laboratory
MIRAH	Ministry of Animal and Fishery Resources
MPME	Micro, Small and Medium Enterprises
NCARP	New African Fish Breeding Company
OACPS	Organization of African, Caribbean and Pacific States
OIE	World Organization for Animal Health

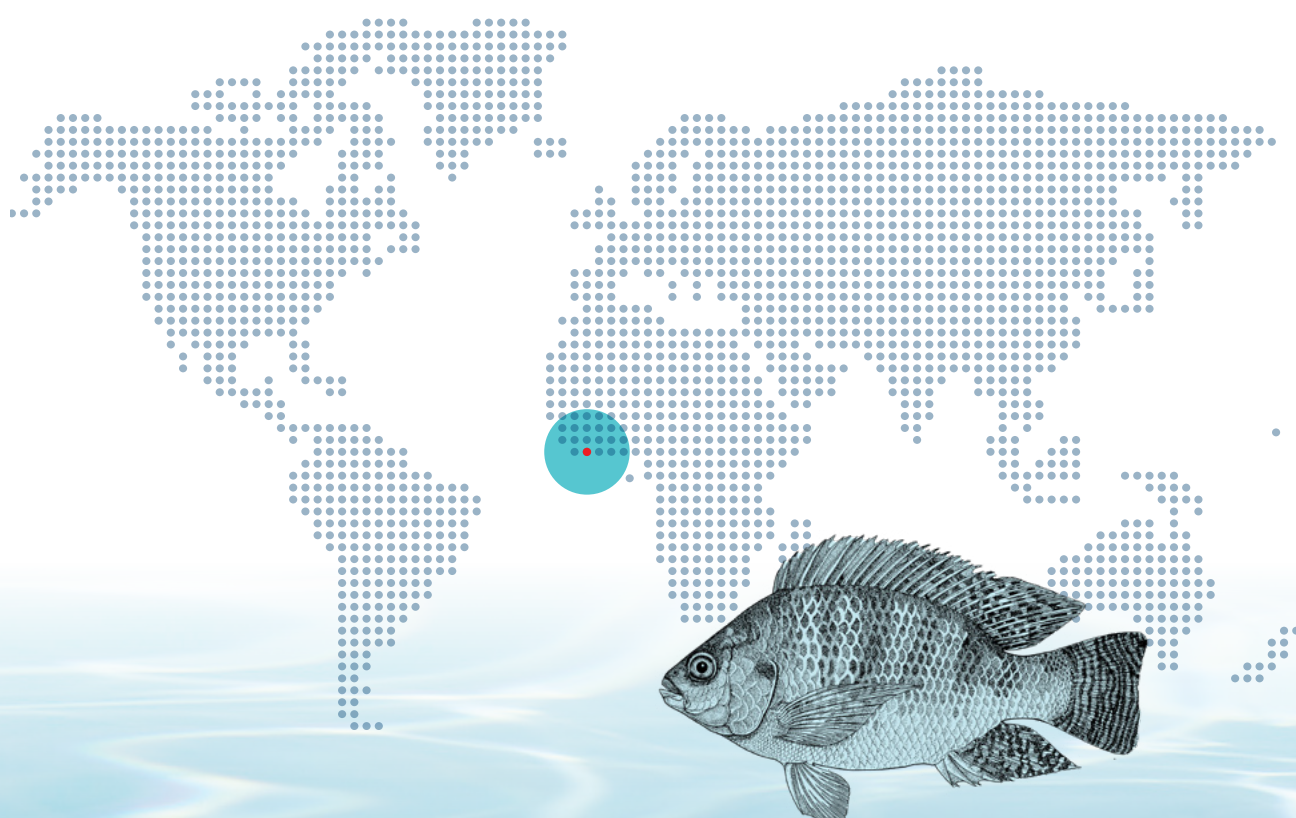
PAGDRH	Support programme for the sustainable management of fishery resources
PAL	Lagoon Aquaculture Project
PANDEP	National action plan for the development of fish farming
PAPPE	Support project for the fish farming profession in the East
PARFACI	Support programme for the relaunch of agricultural sectors in Côte d'Ivoire
PDDPA	Sustainable development programme for fisheries and aquaculture in Côte d'Ivoire
PND	National Development Plan
PNIA	National Agricultural Investment Programme
PONADEPA	National policy for the development of livestock, fisheries and aquaculture
PPCO	Support project for the fish farming profession in the Central West
PREPICO	Continental Fish Production Revival Project in the Republic of Côte d'Ivoire
PROVAC	Continental extension aquaculture project in the Republic of Benin
PSAT	Poisson Sain d'Aghien Télégramme
PSDEPA	Strategic Development Plan for Livestock, Fisheries and Aquaculture
SAP la Mé	Agro-pastoral Company of la Mé
SAPPE	African Farmed Fish Production Company
SEPIA	Company for the study and promotion of aquaculture engineering
SIPEP	Ivorian Company for Fish Production and Expertise (RANAAN food importer)
SEDP	Fish Farming and Distribution Company (major group for fish farming in floating cages)
SIAL	Ivorian Lagoon Aquaculture Company
SOAP	West African Fish Farming Society
SYNQIDEPS-CI	Independent union of importers, distributors and warehouse keepers of frozen products from Côte d'Ivoire
TdC	Theory of change
TIVO	Sustainable development project for genetic resources of Nile tilapia (<i>Oreochromis niloticus</i>) in the Volta basin
UEMOA	West African Economic and Monetary Union
UNA	University Nangui Abrogoua
UNDP	United Nations Development Programme
VA	Value added
VC	Value chain



1. Introduction

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

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



Nile Tilapia
(*Oreochromis niloticus*)

The methodology used by a team of FAO consultants and national partners to carry out this work includes: a review of reports, publications and secondary databases; primary research and consultations with stakeholders using various methods (for example, focus groups, observation visits, semi-structured interviews and surveys); a series of workshops with stakeholders which took place in 2021 to present the work, validate the emerging conclusions and agree on an upgrading strategy for the value chain. The methodology adopted a participatory approach including the private sector, the Government, other donors, civil society and regional organizations. The team was assisted throughout its work by the Ministry of Animal and Fishery Resources (MIRAH). The structure of this report and the assessment and rating basis for the economic, social and environmental sustainability and resilience of the value chain are in accordance with the FISH4ACP methodology.

2. Functional analysis

A functional analysis was done to assess the structure and dynamics of the farmed Nile tilapia value chain in Côte d'Ivoire. The main points that emerge from the functional analysis are as follows:

Market

Local tilapia aquaculture has large market opportunities in both rural and urban areas, with a consumer preference for fresh local products, despite their higher price. The supply of farmed products amounting to **6 000 to 8 300 tonnes/year**, does not meet the domestic market demand estimated at over 45 000 tonnes/year, and the bulk of tilapia consumed is imported (39 500 tonnes/year).

The prices and **the availability of farmed Ivorian tilapia vary according to the period of the year**. For example, tilapia harvesting is often programmed according to the major religious festivals during which the demand is stronger.

Significant regional disparities need to be considered. Consumers from coastal regions and cities close to major inland fishing sites can obtain fresh fish quite easily, which is not the case for consumers in certain rural areas. Extensive fish farming is therefore of paramount importance as a source of fresh fish in remote rural areas.

Core value chain (production, aggregation, distribution)

At production level, there are three main types of farms: intensive, semi-intensive and extensive. The FISH4ACP analysis estimates that there are presently around **1 800 tilapia producers in Côte d'Ivoire**, most of which use semi-intensive systems (916 or 52 percent of producers) or extensive systems (830 or 47 percent of fish farmers) for a respective average production per actor of 5.8 and 1.7 tonnes a year. Production in an intensive system is done by less than 20 farmers (1 percent of fish farmers) for an average production of 102 tonnes per year. It is worth noting that the classification of fish farmers in either system is hereby proposed for analytical purposes, but is not set in stone, since the back and forth between the different systems is possible. The extensive and semi-intensive fish farmers are often **"farmers" who are also engaged in aquaculture as a complementary activity**. The few intensive fish farmers are engaged exclusively in this activity.

Tilapias are mostly raised **in earthen ponds** and **artificial dams** which are water impoundments, artificial lakes, water bodies or collection tanks.

Despite the emergence of new distribution channels (supermarkets, fish shops, sale on social networks) the **main distribution network for farmed tilapia remains limited, poorly equipped (particularly in terms of the cold chain), informal and dominated by small-scale actors (vendors)**. There are few wholesalers, who are mostly fish farmers or retailers belonging to stakeholder organizations.

Half of the total domestic production is distributed by wholesalers and small-scale vendors. The rest of the production is sold directly by the fish farmers to the final consumers or to restaurants.

The value chain is mostly informal. Relations between stakeholders are generally not contractualized in writing, but they are nevertheless considered good. Most of the actors belong to cooperatives or associations. They can act as aggregators and wholesalers and achieve economies

of scale by purchasing the production of members. Marketing is more effective when the member fishmongers and fish farmers of the same organization coordinate the harvesting and distribution of fish. Prices are then discussed and fixed at the level of the associations.

Extended value chain (input and service suppliers)

Breeding

The National Centre for Agricultural Research (CNRA) is the structure responsible for the genetic strains distributed to the various actors of the chain. However, maintaining the quality of the strains does not receive adequate attention and effort and the quantities supplied do not meet the demand. At national level, there are four public stations and seven private hatcheries. The capacity of the public stations (in terms of infrastructure, equipment and staff) to ensure the supply of quality broodstock and fingerlings to private hatcheries and farms needs to be improved.

Fish feed

Based on surveys conducted, the average price of farm-produced aquaculture feed is from 400 to 500 FCFA/kg, which is about 45 to 50 percent lower than the price of imported feed, which are heavily taxed.

Nutritional and physical characteristics of locally produced feed however differ greatly from imported feed (floating extruded feeds for example are not manufactured locally), which can negatively impact production.

At the level of fish farmers, the three major problems associated with fish feeds are: 1) providing quality feeds at an affordable price; 2) optimal use of feeds; 3) maintaining the quality of feed (storage).

Other services

Apart from breeding, feed supply and management, **other services to the sector, such as financial services, remain underdeveloped. The financial institutions do not yet offer financial products adapted to the tilapia sector** or more broadly to fish farming, but only standard loans for the agricultural sector.

Enabling environment

The enabling societal environment contributes positively to the expansion of activities, with the development of training programmes in fish farming, the presence of national plans, research institutes (like the National Oceanographic Centre [CRO] or the CNRA) and development projects to capitalize on.

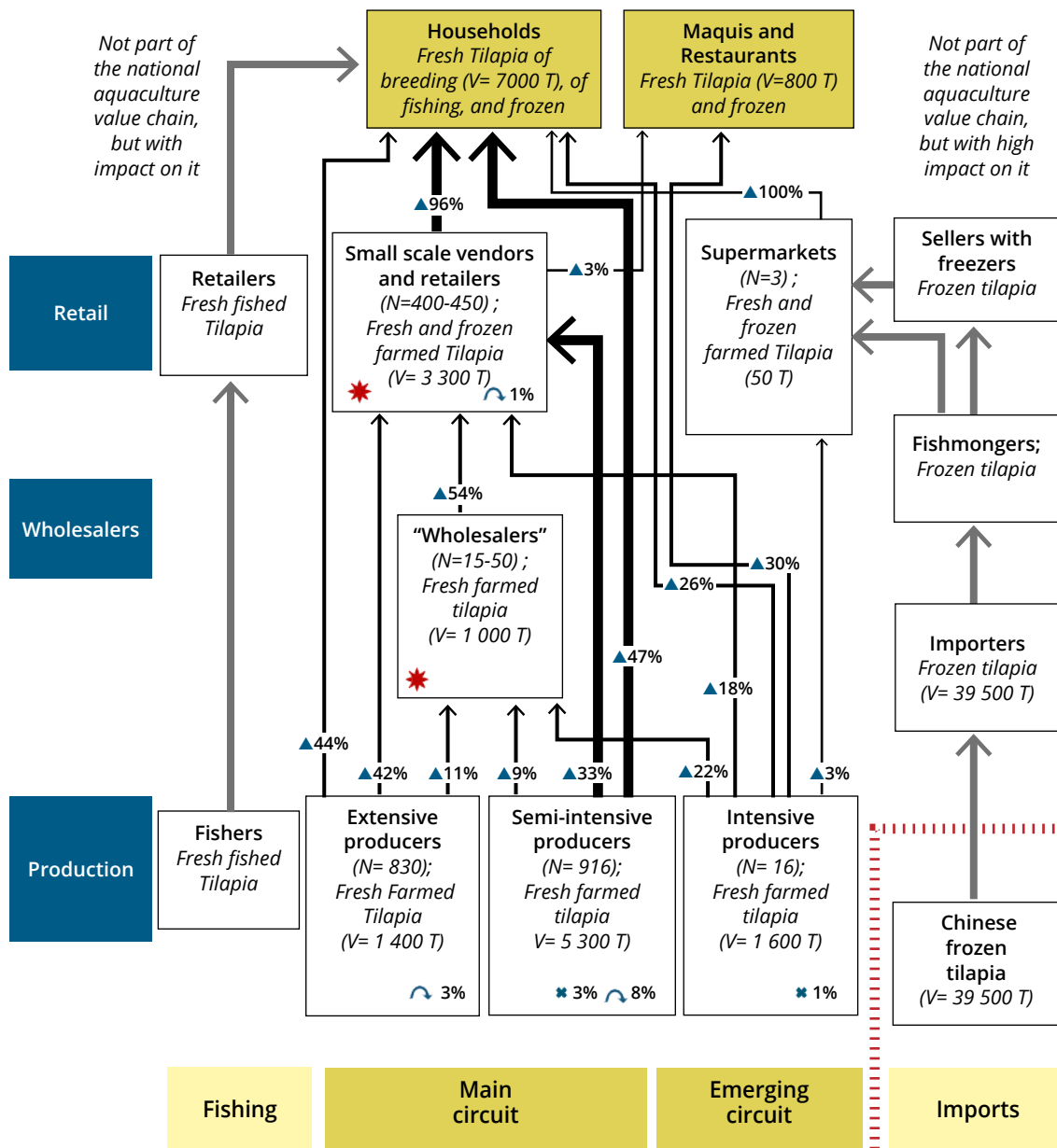
The majority of the stakeholders interviewed (82 percent) however call for more public policy support for farmed tilapia value chain activities.

Monitoring the stakeholders also remains problematic, with very little reliable data available, which constrains the development of the sector (for example, access to funding).

The natural environment has significant potential, with many water bodies and shallows.

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

Figure 1 – Map of the tilapia value chain (including bred, fished and imported Nile Tilapia) in Côte d'Ivoire



Légende

N	Number of actors	→	Sale	▲	Sold (%)
V	Volume in metric tonnes (MT)	---	National border	*	Lost (%)
*	Leverage points	↻		↻	Self-consumed (%)
		*		*	Conversion ratio

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.



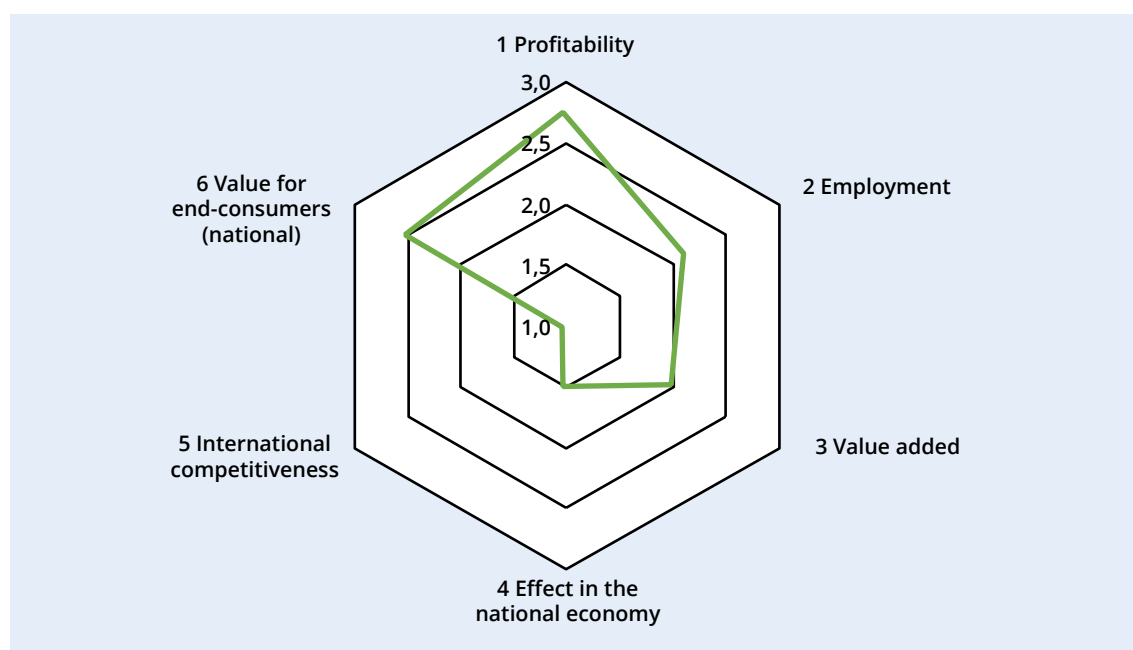
3. Sustainability analysis

Economic sustainability

The value chain is profitable and is perceived positively by consumers.

However, it remains **very informal** and **does not contribute positively to public finances**. More generally, it **does not provide sufficient volumes to reduce the trade deficit**. The informal nature of the chain also affects employment. These jobs, when available, are informal and not properly accounted for.

Figure 2 – Economic sustainability spider diagram



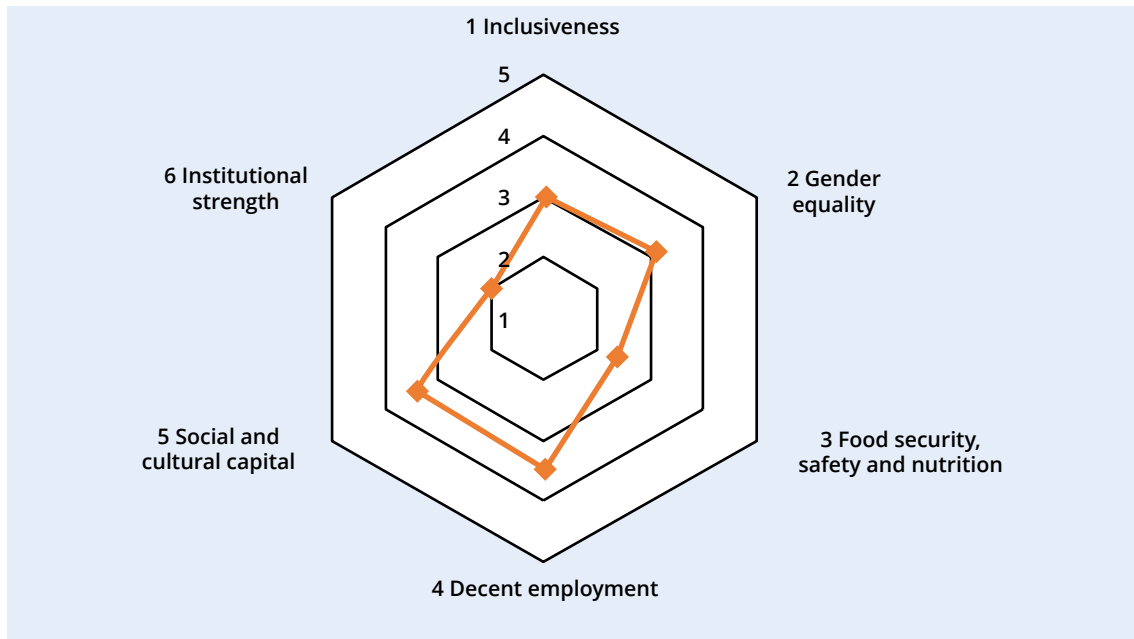
Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Analytic summary of the value chain analysis and design report*. Rome, FAO.

Social sustainability

The value chain contributes positively to inclusion, decent employment and national social and cultural capital.

However, its contribution to **institutional strength and food and nutritional security is limited**. The value chain is unable to meet consumer demand. Besides, although governance mechanisms and good relations between stakeholders exist, public/private **coordination** and coordination between stakeholders need to be improved. **Funding** remains a major problem for the chain, as well as **land security**.

Figure 3 –Social sustainability spider diagram



Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. Farmed Nile tilapia value chain in Côte d'Ivoire: Analytic summary of the value chain analysis and design report. Rome, FAO.

Environmental sustainability

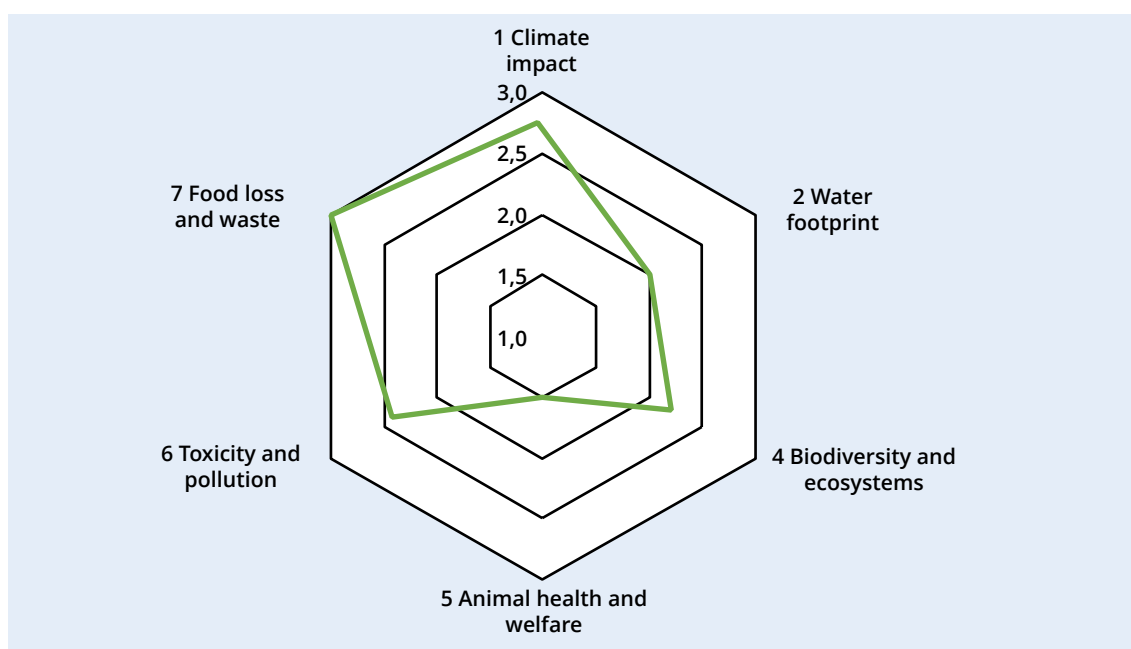
The value chain is dominated by extensive and semi-intensive systems and sales systems, which are low-tech and with a short sales cycle, use few inputs. **The overall impact of the value chain on the environment is therefore limited.** However, some elements still give rise to concern, or could have a significant impact in the future in case of an intensification of production systems.

Water consumption, necessary for the operation of ponds and dams, is a matter of concern, particularly in a context of climate change.

Knowledge of current regulations by value chain players and their application in the field remain poor, as well as environmental concerns and understanding of the possible impacts by the actors on the ground.

Finally, biosecurity, the stress of animals during rearing and aquatic animal health, measures to prevent the introduction and spread of diseases and measures to prevent harmful impacts on the environment are areas that are not yet considered by the actors.

Figure 4 - Spider diagram of environmental sustainability



Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

Resilience

The performance of the value chain in terms of resilience is relatively **poor**. This is mainly due to inadequate financial and technical resources of value chain actors and to certain limiting infrastructural conditions (for instance, roads, electricity). These factors, together with the lack of public/private coordination, contribute to the limited capabilities of value chain stakeholders to improve their practices/processes or prepare for future shocks.

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

Table 1 - Sustainability Heatmap of the Nile tilapia value chain

Economic sustainability	Social sustainability	Environmental sustainability
Net income	Wages and employment distribution	Electricity use
Trend in net income	VA distribution	Fuel consumption
Return on sales	Poverty and vulnerability	Carbon footprint
Return on investment	Discrimination	Use of renewable and clean energy
Number of jobs expressed in full-time equivalent (FTE)	Women's economic involvement	Water and ice consumption
Number of full-time jobs	Gendered division of labor	Water pollution
Number of wage labour jobs	Gendered access to productive resources	Associated species

(cont.)

Economic sustainability	Social sustainability	Environmental sustainability
Number of family/self-employed jobs	Women's decision-making and leadership	Vulnerable ecosystems
Average wage for hired workers	Availability of food	ETP ¹ species
Average wage proxy family labor	Accessibility of food	Aquatic genetic resources
Total value of net wages	Utilisation of food	Biosecurity measures
Direct VA ² at value chain level	Stability of food	Animal husbandry
Indirect VA at value chain level	Respect for labour rights	Use of animal feed
Total VA	Child labour and forced labour	Use of pharmaceutical and chemical products
Contribution to the trade balance	Job safety and security	Air pollution
Rate of integration	Job attractiveness	Pollution by inorganic waste
Impact on public finances	Collective action	Pollution by organic waste
Contribution to investment	Coordination of transactions	Food loss
Nominal protection coefficient	Social cohesion	Food waste
Domestic resource cost ratio	Cultural traditions	
Consumer surplus	Policies, regulations and standards	
Food safety	Access to finance	
Consumer evaluation	Access to natural resources	
Consumer preference	Access to information	
Prices relative to substitutes		
Resilience		
Redundancy	Diversity	Connectivity
Collaboration	Learning and adaptation	Participation and inclusion

■ Not concerning	■ Concerning	■ Highly concerning	<input type="checkbox"/> Not calculated
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Economic sustainability score:	62 %
Social sustainability score:	52 %
Environmental sustainability score:	68 %
Resilience score:	33 %
Overall sustainability score:	58 %
Number of sustainability hotspots (in red):	13

Source : Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

¹ Endangered, Threatened and Protected Species

² Value Added



4. Vision and upgrading strategy

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

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

The farmed tilapia value chain in Côte d'Ivoire has long benefited from available know-how and areas developed for fish farming, due to a natural environment conducive to the development of aquaculture (many water bodies and shoals). Over the past decade, the value chain has also received increased attention, including a political will to develop the sector in order to improve national food security. The programmes put in place so far, which have not focused on the value chain as a whole, have dealt with specific elements and have enabled the development of training in fish farming, increasing investments in feed and fry research and the progressive structuring of the value chain, with the creation of organizations bringing together the actors (umbrella associations and cooperatives).

However, these initiatives need to be further strengthened in order to truly take the value chain to the next level and ensure higher production volumes. In fact, despite a strong demand for fresh Ivorian fish on the national market (45 000 tonnes of tilapia consumed in 2019) and the strong prospects of the sector, there has been little focus on the value chain. Other sectors were relatively more attractive (such as cocoa, rubber or cashew) and food self-sufficiency was not as high on the political agenda. As a result, **investments have not lived up to their ambitions and coordination has been lacking**, leading ultimately to production volumes well below their initial targets (only 7 000 tonnes produced in 2020 compared to the posted target of 100 000 tonnes).

Despite the political will, three main reasons account for the low impact of programmes initiated by the Government. Firstly, the **low budget allocated to the aquaculture sector of MIRAH** has led to a low level of monitoring and state supervision of fish farms, to insufficient extension services, particularly with regard to the size of the territory, difficulties in the collection of production data (no up-to-date register of fish farms) and the absence of the genetic follow-up necessary for the proper management of strains. Furthermore, policies, although introduced repeatedly, have been based on **top down approaches**, hindering their implementation and ownership. Finally, the inadequate documentation on production cycles, returns of investment and the risk/return profile has cooled financial institutions and led to **limited investments in the value chain**, especially compared with **other more structured and more promising sectors** (cocoa, cashew).

The lack of training for fish farmers, especially in terms of financial management (lack of necessary guarantees, credit history and skills needed to prepare proper financial statements) has further limited their access to credit and their ability to invest in more modern production/distribution systems and quality feed and fingerlings. The low tilapia production volumes and low demand for quality feed in turn discouraged investment by feed suppliers in extruded feed production lines, and therefore the availability of competitive and quality local feed. **The high taxation of quality imported extruded feed (18 percent VAT on fish food, 0 percent for chicken and pork)**, combined with the lack of access to credit for fish farmers, has not enabled them to fill

Table 2 – SWOT of the Nile tilapia value chain

<p>Strengths</p> <ul style="list-style-type: none"> • Availability of fish farming know-how and infrastructure. • Presence of organizations and collaboration within the value chain. • Increasing development of training in fish farming and presence of active research institutes. • Political will to develop the sector and existence of a national aquaculture strategy. • Willingness for collaboration/association between the stakeholders (fish farmers/fishmongers) to work on the development of fish farming at the local level. • Investments in Brazilian strains, with the belief that the growth rate is more rapid in fed fish farming. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Fish farmers and fishmongers lack the necessary guarantees, credit history and skills to prepare formal financial statements, which limits their access to credit and their ability to invest in more modern production/distribution systems and in quality feed and fingerlings. • No documentation on the production cycles, return on investment (ROI) and risk/yield profile, leading to an asymmetry of information and limited investments of financial institutions in the value chain. • Low budget granted to the aquaculture section of the MIRAHA, leading to a low level of monitoring and state supervision of fish farms, insufficient extension services, particularly with regard to the size of the territory and difficulties in collecting production data (no updated farm register). • Governmental <i>top-down</i> approach to implement policies and strategies. • Low production volumes and demand for quality feed, leading to the non-investment of feed suppliers in extruded food production lines and low availability of competitive and quality local feed. • Heavy taxation of extruded imported foods leading to high production costs. • No national strategy for the development of aquatic genetic resources and insufficient resources. • Inadequate knowledge of good production practices on most farms, in particular, new fish farmers' limited understanding of stocking techniques (no sexing or counting before stocking). • Limited cold chain, constraining access to remote markets (cities). • Environmental regulations not well known to stakeholders.
<p>Opportunities</p> <ul style="list-style-type: none"> • Strong consumer demand (market) and positive product image. • Fisheries/aquaculture trade deficit. • High water potential (water bodies and shoals). • Wide variety and availability of agro-based products and by-products to be used as local feeds. • Technological innovation in the fish farming sector (e.g. feed). • Many fish farming projects and growing interest in the value chain. • Interprofessional and local feed plant being developed. • Many unemployed young people who may be interested in the value chain. • Absence of major diseases (listed by the World Organization for Animal Health [OIE]) affecting tilapias in the country. • Cocoa crisis, making other sectors more attractive. 	<p>Threats</p> <ul style="list-style-type: none"> • Competition from imported frozen fish, at a cheaper price than locally produced tilapia and sometimes sold as fresh tilapia. • Climate change (risk of drought, flooding). • Competition for resources (especially land) and unstable land law. • Pollution risks in case of intensification of activities. • Pathologies and outbreaks of diseases affecting the breeding process.

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Analytical summary of the value chain analysis and design report*. Rome, FAO.

the shortage of locally produced feed and *ultimately*, increase their production. Finally, the lack of knowledge of good production practices on a large part of fish farms, particularly the limited control of stocking techniques of new fish farmers (no sexing or counting before stocking) and use of simple breeding models minimizing risks (no systematic feeding and low biomass) has further constrained the improvement of production volumes.

New threats also hinder the potential development of the value chain, in particular climate change (risk of drought, flooding), which impacts the water conditions of the country; as well as competition for resources (particular land) and unstable land law, which leads to conflicts in the allocation and management of ponds. Moreover, should modes of production be intensified, increased risks of pathologies and outbreaks of diseases could affect the farms; harmful discharges into the environment could increase, especially as the actors have scant knowledge of environmental regulations and pathological risks.

In order to permit the sustainable development of the farmed tilapia value chain in Côte d'Ivoire, it will be necessary to ensure that the various points that emerge from this SWOT analysis are considered and addressed by the upgrading strategy.

Vision, targets and strategy

An ambitious vision proposal for the farmed Nile tilapia value chain was developed as part of the FISH4ACP project, based on consultations with stakeholders during validation and action planning workshops. This vision is the following:

“By 2031, Côte d'Ivoire will have increased its production of tilapia from the Nile nine-fold to meet the entire national demand, through a more structured, local and sustainable value chain which will generate jobs, respect good environmental practices and increase resilience.”

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

- production of 68 000 tonnes (+830 percent);
- 100 percent of domestic demand met by local production;
- Increase in direct value added (+800 percent);
- 3 300 new producers;
- Increase in the number of actors (main value chains) (+140 percent);
- Unchanged environmental impact (same number of environmental hotspots).

These objectives are based on the ambitious wishes of the various stakeholders expressed during the planning workshop and on preliminary calculations based on the data collected during the economic analysis of the value chain and on various hypotheses, listed in Table 3 below and proposed as a basis for discussion with all stakeholders (the Government, actors of the value chain and development partners).

It should be noted here that the value chain analysis team initially favoured a scenario to reach 23 500 tonnes of tilapia by 2031, considered more realistic in view of the efforts and investments to be made to achieve such a level of production. However, the majority of actors and stakeholders

favoured a more ambitious vision of self-sufficiency, from which the upgrading strategy of this report is developed.

Table 3 - Upgrade projections – 68 000 tonnes

	Number of fish farmers in 2031	Current productivity (tonnes/year)	Productivity in 2031 (tonnes/year)	Total volume in 2031 (tonnes)
60 % of current 1 800 producers adopt improved business models	1 060			13 000
Extensive	500	1.7	3.4	1 700
Semi-intensive	550	5.3	19.2	10 600
Intensive	10	65.4	72.0	700
3 300 new producers use improved business models	3 300			52 300
Extensive new producers (40 %)	1 320	-	3.4	4 500
New semi-intensive ponds producers (50 %)	1 650	-	19.2	31 700
New intensive cage producers (5 %)	165	-	72.0	11 900
New intensive biofloc systems producers (5 %)	165	-	25,5	4 200
40 % of farms do not adopt improved models	740			2 900
Extensive	340	1.7	1.7	600
Semi-intensive	370	5.3	5.3	1 900
Intensive	6	65.4	65.4	400
Total 2031	5 100			68 300
	Increase			830 %

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Analytic summary of the value chain analysis and design report*. Rome, FAO.

A 10-year period (2031) is proposed, given the achievements of fish farming and the existing political will to develop the sector. The challenge is to boost the value chain in two stages. A critical first step around 23 000 tonnes, if achieved, would make investments in local extruded feed production lines profitable and make the sector more attractive. Once this threshold is met, the sector is expected to grow faster, with the price of quality local extruded feed decreasing and reducing production costs, and higher production volumes allowing for economies of scale and again, a decline in production costs.

FISH4ACP, a programme which runs from 2020 to 2024, will seek to support the sector as much as possible to move towards the first level by 2024 and contribute to the exponential growth of the sector, once the level has been reached.

Table 3 also highlights the levers on which this growth will be based. First, a 60 percent increase by current producers, based on improved efficiency of extensive, semi-intensive and intensive business models will produce an additional 8 600 tonnes by 2031. Next, the involvement of 3 300 new fish farmers in the industry will enable national production to increase by a further 52 300 tonnes. In the proposed scenario, the new fish farmers will be mainly semi-intensive (1 650 fish farmers) and extensive (1 320 fish farmers), but also intensive, with 165 new fish farmers using floating cages, and 165 new fish farmers using the biofloc system. The idea here is not to promote increased production by all actors, but rather to optimize and expand existing models, by strengthening capacities in terms of good husbandry practices (how to determine optimal stocking, fish growth, market-targeted size, cycle length and economic output, fertilization optimization, or supply throughout the growth cycle) and the adoption of systems adapted to local situations (especially in rural areas, where the access to electricity is not always guaranteed).

Four main outcomes will help to achieve the vision developed by stakeholders:

1. Professionalization of value chain actors, formalization of activities, from production to distribution and financial inclusion, through the strengthening of collective producer structures.
2. Availability in quantity and quality of fish feed, fingerlings and other inputs.
3. Monitoring the sector and strengthening environmental preventive measures through the development of a digital monitoring and certification system.
4. The differentiation of Ivorian production.

The articulation of these four outcomes is presented below.

In 2031, the strengthening and formalization of producer organizations (Outcome 1), driven by the desire of stakeholders to form associations and the presence of existing collaborations, will counterbalance the weaknesses linked to the current low level of professionalization of fish farmers and provide access to increased knowledge, through the sharing of expertise, particularly on the use of more efficient business models, adapted to different local and sometimes more capital-intensive environments. The more formal structure of cooperatives will reassure the banks and enable actors to benefit from the necessary guarantees to access more financing, which will in turn make it possible for fish farmers to have access to more, but also cheaper, inputs through enhanced agreements and collaboration with suppliers set up by cooperatives. All this will contribute to increased volumes of tilapia produced nationally, which can be easily sold on the expanding domestic market as long as **differentiation from imported fish, based on the freshness and taste of the national tilapia (expression of selective consumer preferences), is well marked (Outcome 4)**, and the sales prices and production costs remain competitive. The increase in volumes produced and sold will gradually strengthen the demand for inputs and enhance the attractiveness of the sector for suppliers of local feed and fingerling, who will gradually offer **quality fingerlings and feed in quantity, through the specialization of their profession and increased private and public investments (Outcome 2)**. Moreover, as production volumes increase, to further reinforce differentiation from imported tilapia, cooperatives will allow access to cold chain facilities based on larger and more aggregated production volumes. Finally, in order not to constrain the productive potential on the long term of the value chain by water pollution, increased risks of pathologies

and epidemics associated with more intensive breeding and squandering of genetic resources, increased yields will have been supported by **regular monitoring of the value chain and the development and dissemination of appropriate environmental regulations (Outcome 3).**

The vision, objectives strategic outcomes, in addition to contributing to the achievement of several SDGs³ are coherent and relevant to national policies aimed at increasing national production and improving access to quality inputs and funding. They are for example in agreement with those proposed in the new National Policy for the Development of Breeding, Fisheries and Aquaculture (PONADEPA) in Côte d'Ivoire, namely: improving the professionalization and structuring of the sector, in order to make actors more responsible and autonomous; the adequacy of the specific funding request to the profiles and needs of the sector's players and the types of financial products and services offered; the requirement to strengthen the business environment specific to the animal resources and fisheries sector with a view to raising the level of private sector investment; improving the level of integration of young people and women in the fisheries and animal resources sector.

1. Professionalization of value chain actors, formalization of activities, from production to marketing and financial inclusion, through strengthening collective producer structures

The upgrading strategy will first involve **the sustainable intensification of production and the expansion of farms of current fish farmers** through the professionalization of jobs, the promotion of more effective and formal production systems, adapted to local conditions, access to adequate funding, access to quality inputs in all aquaculture regions.

Despite the strong demand for locally produced fresh tilapia, Ivorian production does not provide the quantities demanded by the market. The lack of funding capacity within the value chain prevents the actors from acquiring the efficient inputs needed to produce larger volumes. A key leverage point for increasing product volumes is therefore **the funding of producers**. It will be necessary to facilitate producers' access to credit in order to adequately finance working capital requirements for the acquisition of fingerlings and feed, as well as equipment and infrastructure when fish farms are being set up. To make this possible: **1) the value chain should be promoted and explained to financial institutions, who should endeavour to develop suitable financial products; 2) financial products should be presented to fish farmers and they should be made aware of and be trained on how to develop clear and monitored farm accounts and business models.**

In a sector dominated by extensive and semi-intensive systems, technical levers for better management and increased yields will also be activated to allow for an increase in production. The preparation of operating accounts, business plans and production/distribution registers among other elements, will allow the actors to have a better control of their company. Several aquaculture models relevant to the Ivorian market will be tested and promoted through voluntary pilot farms, open to visits and which will make it possible to disseminate good practices. For production areas where the limiting factor is

³ In particular SDG 14 Aquatic Life, and its objective of "conserving and sustainably exploiting oceans, seas and marine resources for sustainable development"; SDG 2 Fight Against Hunger, and its objective to "eliminate hunger, ensure food security, improve nutrition and promote sustainable agriculture"; SDG 12 Responsible Consumption and Production, and its objective of "establishing sustainable consumption and production patterns"; and SDG13 Combatting Climate Change, and its goal to "take urgent action to address climate change and its impacts".

available space (suburban areas, for production of broodstock or nursery stages) or for intensive production stages, tanks models, in liner ponds or with reinforced banks, in closed recirculation system or through the use of bioflocs systems will be considered. For water bodies and areas with a dynamic flow of water, technical optimizations and cage production models will be highlighted. Existing business models will be optimized, in order to exploit their full potential. All these transitions should take into account of the local models and constraints of fish farmers.

The adoption of new techniques, the professionalization of actors and formalization of activities will also take place through the **organizational strengthening of associations and cooperatives within the territory**. A thorough diagnosis of these groups will be carried out and a development plan prepared jointly with the actors concerned. Organizational strengthening **will be achieved through the creation of regional or national cooperative unions and by providing key actors (cooperatives, federations) with appropriate training and support in terms of business development and access to funding. The trained individuals will be able to disseminate good technical and management practices and better monitor the value chain.**

With the support of cooperatives, farm production will gradually increase. It is estimated that the intensification of existing farms will double current production in 10 years (7 800 tonnes today, **15 900 tonnes**² in 2031), all systems combined.

Further to the intensification and expansion of existing farms, increased production will also be based on **the gradual establishment of new fish farmers** in all fish farming areas following an improved business model for each of the three production systems. This **gradual recruitment of new fish farmers**, particularly of young people and women, can be done through appropriate training in fish farming, but also and above all through a **positive synergy, communication and emulation effect**, based on more profitable business models.

It is estimated that the recruitment of 3 300 new fish farmers will help to produce an additional **52 300 tonnes** in 10 years.

2. Availability and quality of feed, fingerling and other inputs

In addition to professionalization, which will enable fish farmers to make good use of the technical systems and associated inputs, and funding for actors, which will give them the means to buy them, there is **the key role of feed and fingerling suppliers**, as the inputs offered by the suppliers must be of good quality, affordable and available nationally.

a. Fish feed

The development of a local quality feed at an industrial level can be extremely long, given the volumes needed to make the investments profitable (at least 40 000 tonnes of feed, or 25 000 tonnes of tilapias required according to the calculations made), it will be imperative to resort temporarily to feed imports while local capacity is being developed (intermediate phase), especially for feeds for which the nutritional values and physical properties of the pellets (floating and extruded) are important, namely "finisher" feeds, hatchery and broodstock feeds and feeds for intensive system. **Tax relief on imported extruded feeds** will have to be introduced to give fish farmers better access to quality feeds in the short term.

In the medium-long term, the gradual increase in the demand for fish farmers' feed will make investment in large scale local facilities attractive. Once the 25 000 tonnes of fish are achieved (expansion phase), the private investment from major manufacturers of livestock feed (especially chicken) in production lines benefiting from industrial extruders will ultimately gradually replace dependence on quality imported feed. Investment incentives could also potentially be considered at that time, to speed up the process of autonomy.

During the intermediate phase, similarly with the high-quality feed, the development of a "simple" feed will also help to improve the yields of extensive and semi-intensive or even intensive systems for start-up and biomass growth phases, by providing a competitive source of feed compared to the imported feed for their production models. This feed will also help to increase the resilience of the chain and create local jobs. Several key elements will increase the technical quality and economic efficiency of local, on-farm or commercial fish feed:

Zero-rating inputs for aquaculture feed production will encourage private actors to establish small units for extruded feed for local and safe feed production, with multiple nutritional ranges as required by breeding models. These units will be able to develop and grow with the sector and offer a solid alternative to the growing business models.

- The development of regional production units specialized in fish food production and funded and managed through public-private partnerships.
- The development of guidelines and technical support for the implementation of the Fish and Feed Act (2010). It will also be necessary to strengthen the control and monitoring of these units in order to support the professionalization and increase of the quality of feed.
- Encouragement and support for the use of local raw materials, especially for protein sources or possible sourced from discharges from the chicken industry or from insect flour development, which can provide high nutritional raw materials at competitive costs.
- Professionalization of small-scale aquaculture feed producers. Fish farmers must be assured of a reliable supply of key quality ingredients at a stable cost, assistance in upgrading equipment and processes, training in good manufacturing practices and encouragement to organize for better economies of scale in the purchase of raw materials and other transactions.
- Enhancing the ability of fish farmers to use feed effectively through training provided by cooperatives (Result 1) and through the development and promotion by the Government of guidebooks on Best Aquaculture Practices.

b. Broodstock and fingerlings

At the level of fingerlings and Broodstock, a supply of quantity and quality (higher performing and monosex animals) should be developed. To do this, the genetic management of strains should be mastered, regulations should include genetic risks and their prevention, structures offering broodstock and/or fingerlings should increase their capacity, and the number of these structures will have to increase.

A diagnosis of genetic strains belonging to the CNRA should first be done, in order to start on a sound basis. The technical capacity of the CNRA should also be strengthened. Finally, new strains should be provided and a genetic monitoring plan will need to be developed.

These three elements already considered in the sector's development projects (projects planned for 2022), will have to be structured to include all aspects of improvement, needs and dissemination of genetic progress. They will lead to an increase in the quantity and quality of CNRA broodstock. To enhance these effects, there will be a need to work with the "multiplying centres". The upgrading strategy will build on the existing five private hatcheries established in the five regions by the Support Programme for the Relaunch of Agricultural Sectors in Côte d'Ivoire (PARFACI), with an annual production target of 1 200 000 fingerlings each, and five state hatcheries, with production facilities, but whose management is not yet producing the expected results (estimated theoretical production capacity of 1 000 000 fry/year for each hatchery). A public-private partnership will be engaged to improve the operating system of these facilities.

Once the quantity and quality of spawners is improved, the supply of fry will gradually increase, leading to new expansion opportunities: development of new private hatcheries, and possibly nurseries, which provide fish farmers with more resistant and bigger fries. This process should be based on the professionalization and specialization of jobs.

For both fingerlings and feed, the **regional** component should not be forgotten. The development of large regional nurseries and fish feed hubs, together with the establishment of an improved distribution system, by feed suppliers and hatcheries and through the network of associations and cooperatives present or to be established, will help to make these inputs available nationally and ensure a steady supply in all aquaculture regions of the country. The gradual increase in volume may lead to lower costs and economies of scale. Feed suppliers and nursery structures will also have a major role to play in supporting and training fish farmers in the proper use of inputs.

3. Monitoring the sector and strengthening preventive environmental measures through the development of a digital tracking and certification system

In order to respond to environmental and epidemiological threats which may be caused by more intensive farming, the control of the physicochemical parameters of the water and monitoring of the genetic strains are necessary. To improve the monitoring of the value chain especially in terms of production volumes, the number of fish farms, areas allocated to aquaculture and changes in the value chain will also help to adjust support for aquaculture and promote the right investments.

To this end, **a digital tracking platform** will be developed, in which all information relevant to the product will be compiled, in particular the genetic strains and environmental controls carried out on the farm, as well as information made available on pathologies, genetic risks, health controls, etc. Further information, directly from fish farmers and associations of fish farmers, motivated by access to better services, but also from government field agents, will condition the issuance of a certificate of origin and certificate of quality "Produced in Côte d'Ivoire". **This system of recording and monitoring production, in addition to ensuring environmental awareness and limiting negative impacts on the value chain, will help to pilot and adjust the support needs of the value chain.** For example, monitoring will help to identify regions where there is a greater need for quality fingerlings. Finally, the system for monitoring and issuing certificates will be **a key element in differentiating Ivorian tilapia from imported tilapia** (see Outcome 4), which

will further motivate producers to participate in the system. Concretely, the development of this platform could be based on a public-private partnership and be associated with the efforts to set up a system of accreditation and authorizations of farms provided by the Government, as well as the establishment of surveys with georeferencing of structures. Some input suppliers already have similar digital platforms, from which synergies could be built, but not necessarily technical tools for monitoring the physicochemical parameters (for example, oximeters, pH-meters and also some units of finer chemical measurements) in the field. These can be acquired by large cooperatives and the most intensive private farms, in the case of the most profitable structures; or by universities for smaller farms, universities that already have the necessary tools. The incentives for the universities to participate will lie in the practical experience acquired by student researchers and the improvement of research programmes, through access to data updated on a daily basis.

In parallel with this platform, the strengthening of MIRAH officials will help in a progressive extension of controls and institutional monitoring of compliance with existing laws on the environment, water management, animal health and sanitary controls, and regulations on hydraulic works. This reinforcement will be twofold: 1) increase in the number of officials; 2) reinforcement of their initial and continuing training.

Funding for the reinforcement will be supported in the short term by development projects and government budgets. In the medium-long term, the increase of tax-revenue, linked to the formalization of farms and increasing volumes of tilapia production and feed sales, will ensure the availability of larger government budgets for aquaculture, which will guarantee the sustainability of the system.

4. The differentiation of Ivorian production

All the previous measures will permit a sustainable increase in production, which will generate a greater volume marketed by wholesalers and fishmongers, better and better organized, who will share the increased production volume and will see their turnover rise.

In order to maximize the impact of the upgrade, however, local production will also have to differentiate more from imported products on the domestic market. The national tilapia will have to **assert and strengthen its comparative advantages in terms of freshness and consumer appreciation, in order to justify its higher price.**

a. Logistics

The distribution channel will be strengthened in collaboration with wholesalers and retailers who are members of groups/associations existing or to be established. The feasibility of a collective marketing system by cooperatives will be tested. The objective is to prioritize collective action to improve various aspects of logistics, including the cold chain, by making it possible to access equipment and materials, through investments made possible by pooling stakeholders and their needs, reconciliation with banks and formalization of business plans. The improved organisation of associations/cooperatives involved in the marketing of tilapia will make it possible to distribute the product faster and further. Through pooled investments in cold rooms and better transport and sales conditions, producers and distributors will be able to access markets presently reserved for better organized suppliers (importers and intensive farms) who can ensure compliance with the cold chain through appropriate equipment (coolers, cold rooms, transport refrigerated

transport, etc.) and provide the volumes requested, with regularity and with the same quality criteria. For transport and refrigerated storage, the value chain will also be able to rely on collaborations, synergies and outsourcing with the more developed cold chains (fishery and import products), as production volumes increase. Actions on animal handling and monitoring of health parameters of Result 3 will also provide consumers with fresher, healthier and better controlled fish, reinforcing the trust they already have in the national aquaculture product.

b. Packaging, marketing and communication

The pooling of resources and the organizational strengthening of cooperatives will also help in the development of more standardized packaging. Furthermore, as mentioned above, the certificate “produced in Côte d’Ivoire” will enhance the differentiation and value of the product and will be particularly attractive to new sales channels, such as supermarkets.

The development of a label for imported products “frozen imported product” (on the packaging or by eyelet on the product), if deemed relevant as part of a feasibility study conducted beforehand, could enhance the attractiveness of the local certificate and increase the differentiation of the two products in order to better inform buyers.

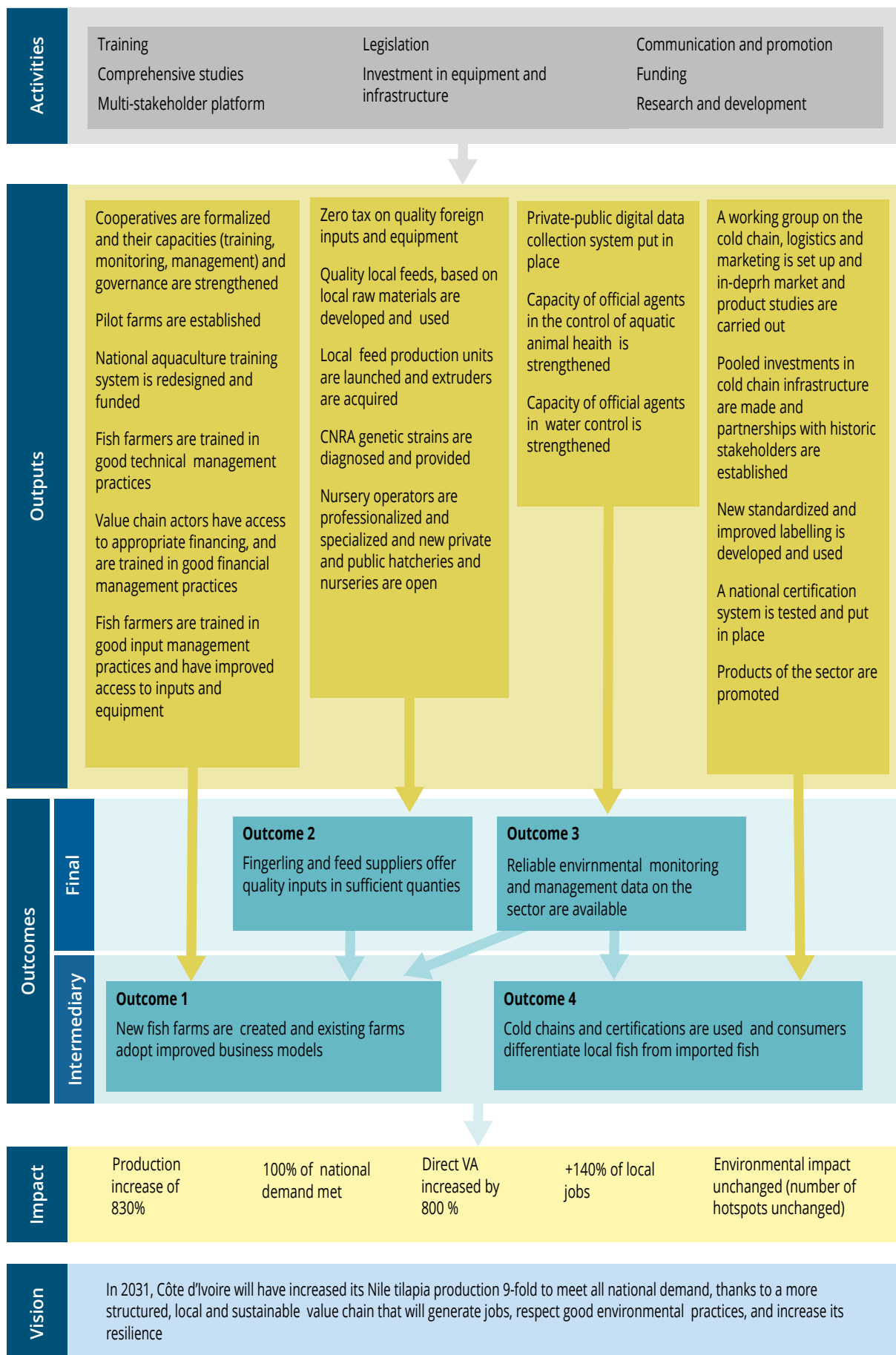
Finally, communication activities to encourage the consumption of Ivorian tilapia will help to promote local products.

Theory of change

The theory of change (ToC) underlying this strategy is presented in **FIGURE 5** below. The ToC covers the entire upgrading strategy (which can be implemented beyond the scope of the FISH4ACP project). A series of activities, actions (for example, studies, training) and investments by different stakeholders, including the Government, private sector (the main actors of the value chain and suppliers of services and inputs), the FISH4ACP project and other donors, will lead to the development of several products. These products will in turn deliver results in support of the vision.

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

Figure 5 - Theory of change for the global strategy for upgrading the farmed tilapia value chain in Côte d'Ivoire



Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

Table 4 - Improved performance of the value chain

Economic indicators	Current situation (2021)	With upgrade by 2031 – 68 000 tonnes
Total revenues (in USD)	37 600 000	495 150 000
Total profits (in USD)	12 000 000	176 900 000
Number of actors (entrepreneurs) in the main value chain	2 300	5 418
Number of salaried jobs in the main value chain (FTE)	2 600	8 200
Total direct value added (in USD)	19 800 000	176 900 000
Domestic demand met by local production	18 %	100 %
Share of value chain fish farmers paying taxes on profits (%)	0 % ⁴	30 %
Social indicators	Current situation (2021)	With upgrade by 2031 – 68 000 tonnes
Annual national consumption of Ivorian tilapia per capita (in kg)	0.3 kg/head/year	1.79 kg/head/year
Share of value chain fish farmers with a bank account (%)	63 % ⁴⁵	80 %
Share of value fish farmers using external financing (%)	7 % ⁶⁵	29 %
Share of value chain fish farmers reporting their activities (to Government or cooperatives) (%)	61 % ⁷⁶	85 %
Share of value chain fish farmers with a formal licence for the conduct of their activities (%)	11 % ⁷⁸	50 %
Environmental indicators	Current situation (2021)	With upgrade by 2031 – 68 000 tonnes
Number of environmental hotspots	3	3
Proportion (%) of fish farmers recording their environmental ⁸ data on the monitoring platform	0 %	50 %

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

⁴ Sample of 15 fish farmers, FISH4ACP economic interview – Question: Do you pay taxes on profits?

⁵ Sample of 50 fish farmers, FISH4ACP survey – Question: Do you have a bank account?

⁶ Sample of 15 fish farmers, FISH4ACP economic interview – Question: In a typical marketing year, for which services (other than loans/credit) have you paid (names), from which sources, and for each source, in what volume and at what price (average) have you paid?

⁷ Sample of 18 fish farmers, FISH4ACP social interview – Question: Is your tilapia farming activity registered? If so, with which authority?

⁸ Sample of 18 fish farmers, FISH4ACP social interview – Question: Do you have a formal licence for your activities? If yes, how many days did it take you to register?



5. Upgrading strategy implementation plan

Improving performance and achieving the four outcomes of the upgrading strategy will require funding and implementation of many activities. **FISH4ACP, the Government, the private sector and other donors** will all have a role to play in financing and implementing these activities.

The table below (**TABLE 5**) provides a summary of the activities supporting the various outcomes and estimates the costs associated with these activities. Some of the costs included in the table will need to be revised based on studies examining in more detail the feasibility, necessity and magnitude of the required investments.

Activities intended to support the specific outcomes of each of the four outcomes of the strategy were outlined in the more detailed analysis and design document. In this document, for each activity, a text description was provided to facilitate implementation, as well as an indication of the time table, source of funding and type of investment.

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

Table 5 - Nile tilapia value chain upgrading Activities

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Outcome 1 – New fish farms are created and existing farms adopt improved business models				
Output 1.1 – Cooperatives are formalized and their capacities (training, monitoring, management) and governance are strengthened				
Activity 1.1.1 – Comprehensive diagnosis of cooperatives at national level and identification of focal points within each cooperative	FISH4ACP	Study/legislation	10 000	2022
Activity 1.1.2 – Formalization of the regional umbrella organizations, to move towards the national union of umbrella organizations	FISH4ACP	Mediation, monitoring and advice	5 000	2022
Activity 1.1.3 – Organize coordination sessions with cooperatives	FISH4ACP	Mediation, monitoring and advice	72 000	2025
Activity 1.1.4 – Training in cooperative governance and management of “governance” focal points of cooperatives	FISH4ACP	Training	40 000	2022

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Activity 1.1.5 – Publicize and promote the formation of cooperatives	Private sector	Communication	25 000	2031
Output 1.2 – Pilot farms are identified to test and disseminate new business models				
Activity 1.2.1 - Identification of pilot farms	FISH4ACP	Mediation, monitoring and advice	5 000	2022
Activity 1.2.2 – Training for pilot farms to implement improved business models	FISH4ACP	Training and extension material	40 000	2023
Activity 1.2.3 – Financing for upgrading pilot farms (infrastructure and working capital requirements)	FISH4ACP	Infrastructure/service	100 000	2023
Activity 1.2.4 – Monitoring and technical assistance to pilot farms	FISH4ACP	Mediation, monitoring and advice	120 600	2025
Output 1.3 – National aquaculture training system is redesigned and funded				
Activity 1.3.1 – Comprehensive study on the aquaculture training system	FISH4ACP	Study	10 000	2023
Activity 1.3.2 – Establishment of national enhanced aquaculture training system	Government	Training	6 800 000	2031
Output 1.4 – Fish farmers are trained in good technical management practices, particularly through strengthened cooperatives				
Activity 1.4.1 - Development of training manuals on business models and good production practices and production of related video modules.	FISH4ACP	Training and extension material	35 000	2025
Activity 1.4.2 – Training of cooperative focal points and government officials in the implementation of good technical management and environmental monitoring practices	FISH4ACP	Training	160 000	2024
Activity 1.4.3 – Technical management training and environmental monitoring by the focal points for fish farmers	Private sector	Training	120 000	2031
Activity 1.4.4 – Monitoring the achievements of cooperatives and farms	FISH4ACP Private sector	Mediation, monitoring and advice	300 000	2031

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Output 1.5 – Value chain actors have improved access to appropriate financing, and are trained in good financial management practices				
Activity 1.5.1 – In-depth study to identify financial and insurance product and service needs of value chain actors	FISH4ACP	Study/legislation	10 000	2022
Activity 1.5.2 – Establishment of confidentiality and working agreements between FISH4ACP and financial institutions and identification of technical assistance needs for financial institutions	FISH4ACP	Mediation, monitoring and advice	14 400	2023
Activity 1.5.3 – Technical training for partner financial institutions to build their capacity to develop financial products and services for the tilapia value chain	FISH4ACP	Training	40 000	2023
Activity 1.5.4 – Commitment of institutions to finance (products and services) the value chain actors with or without risk sharing	Private sector	Infrastructure/service	16 113 000	2031
Activity 1.5.5 – Organisation of training courses on agricultural finance for value chain actors by financial institutions and insurance companies.	Private sector	Training and extension materials	400 000	2031
Activity 1.5.6 – Training of finance focal points of cooperatives on the needs of banks (operating accounts, business models, etc.)	FISH4ACP	Training and extension materials	40 000	2023
Activity 1.5.7 – Organisation of financial training for fish farmers by finance focal points.	Private sector	Training and extension materials	120 000	2031

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Output 1.6 – Fish farmers are trained in good input management practices and have improved access to food, fingerlings and other inputs and materials, particularly through strengthened cooperatives				
Activity 1.6.1 – Contractual relationship between cooperatives and feed suppliers and establishment of a feed supply and financing system and monitoring of the system	Private sector	Infrastructure/service	2 150 000	2031
Activity 1.6.2 – Contractual relationship between cooperatives and fingerling suppliers and establishment of a system for supply and financing of fingerlings and monitoring of the system	Private sector	Infrastructure/service	2 150 000	2031
Activity 1.6.3 – Training for feed and fingerling focal points in the implementation of good fingerling and feed management practices	FISH4ACP	Training and extension materials	40 000	2022
Activity 1.6.4 – Organisation of fingerling and feed training for fish farmers by the focal points involved	Private sector	Training and extension materials	120 000	2031
Outcome 2 – Fingerling and fish feed suppliers offer quality and quantity inputs				
Output 2.1 – Zero-rating of quality imported feed, local raw materials and fish farming equipment				
Activity 2.1.1 - Establishment of a multi-stakeholder and zero-rating working group	FISH4ACP	Mediation, monitoring and advice	8 000	2025
Activity 2.1.2 – Study on the effects of a zero-rating of inputs and equipment used by the value chain and on the possibilities of taxing imported tilapia	Government	Study/legislation	7 000	2022
Activity 2.1.3 - Adoption and promulgation of the Tax Exemption Act	Government	Study/legislation	0	2022

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Output 2.2 – Quality local feed, based on the use of local raw materials, including protein resources, is developed and used				
Activity 2.2.1 – Support for research into the development of innovative and competitive feed	Government	Equipment/materials/ inputs	45 000	2025
Activity 2.2.2 - Research, pilot testing and promotion of local ingredients for feed production – local agricultural products	FISH4ACP	Study/legislation	19 000	2025
Activity 2.2.3 – Research, pilot testing and promotion local ingredients for feed production – insect meal and other animal protein sources (slaughterhouse waste and chicken-egg industry)	FISH4ACP	Study/legislation	38 000	2023
Activity 2.2.4 – Training for feed producers	FISH4ACP	Training and extension materials	80 000	2024
Output 2.3 – Local fish feed production units launched and extruders equipment acquired				
Activity 2.3.1 – In-depth study and design of local feed production units	Donors	Study/Legislation	10 000	2023
Activity 2.3.2 - Presentation of the production unit model and validation with stakeholders.	Government	Mediation, monitoring and advice	0	2023
Activity 2.3.3 - Creation of local production units	Private sector ⁹	Infrastructure/Service	480 000	2028
Activity 2.3.4 Acquisition of industrial extruders by a private stakeholder	Private sector	Equipment/materials/ inputs	90 000	2031
Output 2.4 – CNRA genetic strains are diagnosed and supplied				
Activity 2.4.1 – Diagnosis of genetic strains belonging to the CNRA	FISH4ACP	Study/legislation	18 000	2022
Activity 2.4.2 – Strengthening the CNRA's technical capacity	FISH4ACP	Training and extension materials	40 000	2023
Activity 2.4.3 – Upgrading of CNRA equipment	FISH4ACP	Equipment/materials/ inputs	38 000	2023

(cont.)

⁹ Or public-private partnership based on the findings of the study 2.3.1

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Activity 2.4.4 - Development and implementation of a genetic improvement programme and provision and dissemination of strains	Government	Mediation, monitoring and advice	23 000	2031
Output 2.5 – Nursery operators are professionalized and specialized and new public and private hatcheries and nurseries are open				
Activity 2.5.1 – In-depth study of the nursery situation in Côte d'Ivoire	FISH4ACP	Study/legislation	10 000	2022
Activity 2.5.2 – Training of fingerling producers	FISH4ACP	Training and extension materials	40 000	2023
Activity 2.5.3 – Establishment of a private-public partnership for the rehabilitation of private multipliers	Private sector	Infrastructure/service	Cost to be determined	2023
Activity 2.5.4 – Development of private hatcheries	Private sector	Infrastructure/service	1 470 000	2031
Activity 2.5.5 – Development of private nurseries	Private sector	Infrastructure/service	710 000	2031
Outcome 3 – Reliable monitoring and environmental management data on the sector are available				
Output 3.1 – A digital system for collecting and monitoring private-public data is put in place				
Activity 3.1.1 – Establishment of a multi-stakeholder working group for monitoring the sector	FISH4ACP	Mediation, monitoring and advice	8 000	2025
Activity 3.1.2 - Evaluation of legislative tools for the monitoring, registration of farms and the traceability of fish and adoption of the draft decree on the creation and exploitation of aquaculture production structures	FISH4ACP	Study/legislation	9 000	2022
Activity 3.1.3 - Development and contractualization of a private-public partnership for production and environmental data management through a digital platform	FISH4ACP	Mediation, monitoring and advice	1 500	2023

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Activity 3.1.4 – Strengthening the monitoring of the sector, through the training and provision of field staff	Government	Mediation, monitoring and advice	100 000	2031
Activity 3.1.5 – Pilot testing and establishment of the digital monitoring platform	FISH4ACP	Infrastructure/service	20 000	2023
Activity 3.1.6 – Extension of the platform and inventory of aquaculture activities (formal and autonomous census through the platform)	Private sector	Infrastructure/service	30 000	2029
Output 3.2 – The capabilities of official agents in the control of aquatic animal health are strengthened				
Activity 3.2.1 – Training and strengthening the aquatic animal health knowledge of veterinary services	Donors	Training and extension materials	41 800	2025
Activity 3.2.2 – Training and capacity building of laboratory staff for the diagnosis of diseases, following CODEX principles	Donors	Training and extension materials	44 800	2031
Activity 3.2.3 – Upgrading of laboratory equipment for the diagnosis of aquatic animals	Government	Equipment/materials/inputs	177 000	2030
Activity 3.2.4 - Development and implementation of a national epidemiological surveillance of aquatic animal diseases	Government	Mediation, monitoring and advice I	105 000	2031
Activity 3.2.5 – Development of a biosafety manual and diagnosis of pathologies and parasites	Donors	Training and extension materials	20 000	2025
Activity 3.2.6 - Development and implementation of an emergency epidemiological plan	Government	Mediation, monitoring and advice	43 000	2027
Activity 3.2.7 – Training for import control	Donors	Training and extension materials	25 000	2023

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Activity 3.2.8 – Control of imports	Government	Study/legislation	10 000	2023
Activity 3.2.9 – Upgrading and development of quarantine areas	Government	Training and extension materials	13 000	2027
Output 3.3 – Capacity of official agents in water control is strengthened				
Activity 3.3.1 - Development and implementation of a contaminant surveillance campaign	Government	Mediation, monitoring and advice	50 000	2026
Activity 3.3.2 – Training of water control agents	Donors	Training and extension materials	36 000	2025
Activity 3.3.3 – Improvement of resources for laboratory and field staff for water analysis	Donors	Equipment/materials/ inputs	100 000	2025
Activity 3.3.4 - Development of extension materials on water management and associated risks and extension services for stakeholders	Donors	Training and extension materials	20 000	2025
Outcome 4 – The cold chain is respected, certification used and consumers differentiate local fish from imported fish				
Output 4.1 – A working group on the cold chain, logistics and marketing is set up and in-depth market and product studies are carried out				
Activity 4.1.1 – Establishment of a multi-stakeholder working group on the cold chain, logistics, marketing and potential associated collaborations	FISH4ACP	Mediation, monitoring and advice	8 000	2025
Activity 4.1.2 – Market study for tilapia aquaculture products in Côte d'Ivoire	Donors	Study/legislation	16 000	2025
Activity 4.1.3 – Testing of new tilapia-based products	Donors	Study/legislation	15 000	2025
Output 4.2 - Pooled investments in cold chain facilities and partnerships with historic players are established				
Activity 4.2.1 – Feasibility study for the purchase of cold chain facilities through cooperatives (pooling)	Private sector	Study/legislation	10 000	2023

(cont.)

Outcomes, outputs and activities	Lead	Type of cost	Total cost (USD)	Timetable
Activity 4.2.2 - Contractualization for the use of cold chain facilities and testing	Private sector	Contractualization	Cost to be determined	2031
Activity 4.2.3 - Extension of cold chain systems	Private sector	Infrastructure/service	Cost to be determined	2031
Output 4.3 - New standardized and improved packaging is developed and used				
Activity 4.3.1 - Feasibility study on improved packaging and commercial linkages between cooperatives and private or public sector entities	Donors	Study/legislation	16 000	2025
Activity 4.3.2 - Pilot testing of improved packaging	Donors	Equipment/materials/inputs		2024
Activity 4.3.3 - Development of training manuals and materials on improved packaging	Donors	Training and extension materials	20 000	2026
Activity 4.3.4 - Training on improved packaging for cooperatives and NGOs	Donors	Training and extension materials	40 000	2024
Output 4.4 - A national certification programme is tested and implemented				
Activity 4.4.1- Feasibility study on a digital certificate, from the digital tracking platform	FISH4ACP	Study/legislation	10 000	2024
Activity 4.4.2 - Trademark registration and testing of digital certificates and associated labels	FISH4ACP	Study/legislation	10 000	2024
Activity 4.4.3 - Extension of the use of certificates to all players in the sector	Private sector	Infrastructure/service	70 000	2031
Output 4.5 - Promotion of improved products and the sector				
Activity 4.5.1 Establishment of a national tilapia day and communication around the product	FISH4ACP	Communication	90 000	2025

Activities to be funded by:

FISH4ACP

The private sector

Donors

The government

Mixed sources (FISH4ACP and private sector)

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Chaîne de valeur du tilapia du Nil d'élevage en Côte d'Ivoire: Résumé analytique du rapport d'analyse et de conception de la chaîne de valeur*. Rome, FAO.

Based on the information provided above, the investment table (TABLE 6) provides an overview of the investments required to achieve the vision and how these investments should be funded. It also illustrates how blended finance strategies can be applied to finance investment in the enhanced business models identified in the value chain strategy.

To reach 68,000 tonnes by 2031, it is estimated that **USD 59.9 million**¹⁰ will need to be invested in a variety of services and infrastructure; training and extension materials; mediation, monitoring and counselling; comprehensive studies; equipment, materials and inputs; communication activities. This provisional budget also contains an estimate of the sums to be released for the upgrade or creation of farms, by bank credit or use of own funds, the first items of expenditure of the upgrade. **Some costs are not quantified** and will need to be determined through comprehensive studies. Costs linked to Product 1 of the strategy account for 89 percent¹¹ of total costs; Product 2 costs account for 6 percent of total costs; Product 3 costs account for 3 percent of total costs; Product 4, costs account for 1 percent of total costs.

Table 6 - Investments needed for upgrade

In USD	Sources of financing				Total		
	Type of investment	Donors	FISH4ACP	Government	Private sector	Total per type (USD)	Total per type (%)
	Communication		90 000		25 000	115 000	0 %
	Equipment/materials/inputs	100 000	138 000	222 000	90 000	550 000	1 %
	Infrastructure/service		20 000		8 173 000	8 193 000	14 %
	Study/legislation	57 000	144 000	17 000	10 000	228 000	0 %
	Mediation, monitoring and counselling		362 500	1 721 000	180 000	2 263 500	4 %
	Training and extension materials	247 600	555 000	6 813 000	760 000	8 375 600	14 %
	Installation and improvements with own funds				25 175 000	25 175 000	42 %
	Improvements via bank credit				15 000 000	15 000 000	25 %
	Total by source	404 600	1 309 500	8 773 000	49 233 000	59 900 100	100 %

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report. Rome, FAO.

¹⁰ This is a "low range", with certain costs not quantified. Another calculation brings the amount of the budgeted amount to USD 100 million.

¹¹ The costs of setting up bank credits and capital to be mobilized for the upgrading and creation of new farms (equipment, infrastructure, inputs) have been included in outcome 1.

Table 7 below summarizes the key stakeholders involved in the four outcomes of the upgrading strategy. Identification of partners for the implementation of the upgrading strategy is still ongoing and this table is subject to change. It will be crucial to find additional donors and secure everyone's commitments to ensure the achievement of ambitions.

Table 7 – stakeholders involved by outcome

Outcome of the upgrading strategy	Main stakeholders involved
Outcome 1: New fish farms are created and existing farms adopt improved business models	<p>FISH4ACP</p> <ul style="list-style-type: none"> • Identification and formalisation of cooperatives, training and monitoring of cooperatives and their focal points • Creation and support of pilot farms • Mediation and promotion of the sector to financial bodies <p>Banks and microfinance institutions</p> <ul style="list-style-type: none"> • Establishment of credit lines • Extension and training in financial products for stakeholders of the sector <p>Fish farmers</p> <ul style="list-style-type: none"> • Equity financing <p>Cooperatives</p> <ul style="list-style-type: none"> • Dissemination of training and knowledge to fish farmers • Monitoring and technical support of fish farmers <p>Feed suppliers</p> <ul style="list-style-type: none"> • Setting up of a financing system <p>Fingerling suppliers</p> <ul style="list-style-type: none"> • Setting up of a financing system <p>Government</p> <ul style="list-style-type: none"> • Financing the education system
Outcome 2: Fingerling and feed suppliers offer quality and quantity inputs	<p>FISH4ACP</p> <ul style="list-style-type: none"> • Research and pilot testing of improved feeds • Feed and fingerling training • Study of CNRA strains, equipment and training <p>Government</p> <ul style="list-style-type: none"> • Zero-rating Act • Human capital investments and CNRA budget <p>Fingerlings</p> <ul style="list-style-type: none"> • Establishment of new hatcheries and nurseries <p>Feeds</p> <ul style="list-style-type: none"> • Establishment of new factories and acquisition of machinery <p>Other donors</p> <ul style="list-style-type: none"> • In-depth study on the establishment of regional plants

(cont.)

Outcome of the upgrading strategy	Main stakeholders involved
<p>Outcome 3: Reliable environmental, monitoring and management data is available</p>	<p>Other donors</p> <ul style="list-style-type: none"> • Training and capacity building of veterinary, water control, laboratory and customs services • Development of associated extension materials <p>FISH4ACP</p> <ul style="list-style-type: none"> • Establishment of a digital platform for tracking the sector <p>Private sector (cooperatives, feed and fry suppliers), for further expansion of the platform (once FISH4ACP ends)</p> <p>Government</p> <ul style="list-style-type: none"> • Budget for setting up field staff • Laboratory equipment • Epidemiological campaigns, contaminant surveillance and quarantine areas
<p>Outcome 4: The cold chain is respected, certification used and consumers differentiate local fish from imported fish</p>	<p>Other donors</p> <ul style="list-style-type: none"> • Market, product and packaging research • Training of actors in improved packaging and products • Development of related training and extension materials <p>FISH4ACP</p> <ul style="list-style-type: none"> • Feasibility study and establishment of certificates of origin • Implementation of communication activities <p>Private sector (wholesalers, supermarkets)</p> <ul style="list-style-type: none"> • Feasibility study and purchase of cold chain infrastructure

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

The FISH4ACP project seeks the continuity of activities in Côte d'Ivoire, between the final analysis and design phase of this report and the implementation of actions on the ground from 2022. Discussions were held with the various partners to ensure their willingness to implement the strategy. Then, at a launch ceremony for the tilapia value chain upgrading strategy in Côte d'Ivoire in April 2022, the partners were invited to sign a statement of support for the strategy.

The implementation phase of the project will run until February 2025, when the FISH4ACP programme will end. The individual commitment of the different stakeholders will need to be confirmed during the different years of the upgrading strategy.

A number of risks that may affect the implementation of the upgrading strategy have been identified and assessed based on their likelihood and potential impact. Mitigation strategies have been identified, but risks cannot be completely avoided, as outlined in Table 8 below.

Table 8 - Risks in the implementation of the upgrading strategy and mitigation measures

Description of risk	Likelihood (1-5)	Impact (1-5)	Total risk (1-25)	Mitigation measures
The private sector is unwilling /unable to invest in the proposed upgrades	4	5	20	Identification of an appropriate financing mechanism and promotion of the sector to financial institutions
Contractualization for the establishment of credit lines between banks, cooperatives and fish farmers is not implemented	4	5	20	In-depth study of the financial needs of the sector and financing mechanisms to be implemented, promotion of the sector to the financial sector and training of financial actors.
Contractualization for the establishment of enhanced cooperation between cooperatives, fish farmers, fingerling suppliers, feed suppliers is not implemented	3	5	15	Implementation of coordination sessions across cooperatives, including identifying and monitoring partnerships with input suppliers
Ivorian fish remains less competitive than imported fish	3	4	12	Implementation of legislation for the reduction of taxes affecting the sector, grouping actors into cooperatives for economies of scale and in-depth market study, assessing the possibilities of a market niche for Ivorian fish
Lack of land availability and risk of conflict regarding the appropriation of land, in a context of expansion of areas used	3	4	12	Establishment of governance focal points within cooperatives, who will act as mediators of conflicts; securing land through the study on monitoring and registration of fish farmers, and improved monitoring through the platform, to closely monitor the allocation of land.
Negative reaction of tilapia importers	3	4	12	Establishment of dialogue and working groups, to include importers in discussions, and enable their integration into the upgrading strategy (cold rooms).
Diseases – introduction of pathogens in farms	3	4	12	Government officials trained and outreach to fish farmers and stakeholders on the ground.

(cont.)

Description of risk	Likelihood (1-5)	Impact (1-5)	Total risk (1-25)	Mitigation measures
Climate change – drought leading to water supply problems	3	4	12	Development of extension materials on water management and associated risks and dissemination of extension materials to stakeholders.
Lack of political will and commitment	2	5	10	Government focal point associated with the project. Statement of support for the strategy signed at the highest political level.
Lack of stakeholder enthusiasm for post-FISH4ACP strategy	3	3	9	Participatory nature of the FISH4ACP methodology, creation of a special team with regular meetings.
External pollution – risk of contamination of waterways by agriculture and other industrial activities	2	4	8	Establishment of a monitoring platform, including environmental aspects, and plans for epidemic surveillance and quarantine zones. Training and sensitization of field agents and actors Dissemination of technical models to address risks (dykes to limit unclean water flows).
Socio-political instability	2	2	4	Strengthening governance of cooperatives and building more resilient business models.

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

Annex – Scenario B – 24 000 tonnes produced in 2031

Given the significant efforts to attract 3 300 new producers, a more conservative scenario, with only 500 additional fish farmers, is presented below.

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

- Production of 24 000 tonnes (+230 percent);
- 40 percent of national demand met by local production;
- Increase in direct value added (+180 percent);
- 500 new producers;
- Increased local employment (core value chains) (+40 percent);
- Unchanged environmental impact (same number of environmental hotspots).

Table 9 – Upgrade Projections (24 000 tonnes)

	Number fish farmers 2031	Current productivity (tonnes/an)	Productivity 2031 (tonnes/an)	Total volume 2031 (tonnes)
60 % of current 1 800 producers adopt improved business models	1 060			13 000
Extensive	500	1.7	3.4	1 700
Semi-intensive	550	5.3	19.2	10 600
Intensive	10	65.4	72.0	700
500 new producers using improved business models	500			8 000
New extensive producers (40%)	200	-	3.4	700
New semi-intensive pond producers (50%)	250	-	19.2	4 800
New intensive cage producers (5%)	25	-	72.0	1 800
New intensive above ground biofloc producers (5 %)	25	-	25.5	700
40 % of farms do not adopt improved models	740			2 900
Extensive	340	1.7	1.7	600
Semi-intensive	370	5.3	5.3	1 900
Intensive	6	65.4	65.4	400
Total 2031	2 300			24 000
	Increase			230 %

Source: Kourgangsky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

The impact of the sustainability of this scenario is described in Table 10 below.

Table 10 – Improved PERFORMANCE (24 000 tonnes)

Economic indicators	Current situation (2021)	With upgrade by 2031 – 24 000 tonnes
Total revenues (in USD)	37 600 000	143 900 000
Total profits (in USD)	12 000 000	55 500 000
Number of actors (entrepreneurs) in the main value chain	2 300	2 700
Number of salaried jobs in the main value chain (FTE)	2 600	3 600
Total direct value added (in USD)	19 800 000	55 500 000
Domestic demand met by local production	18 %	40 %
Share of value chain fish producers paying taxes on profits (%)	0 % ¹²	30 %
Social indicators	Current situation (2021)	With upgrade by 2031 – 24 000 tonnes
Annual national consumption of Ivorian tilapia per capita (in kg)	0.3 kg/head/year	0.7 kg/head/year
Share of value chain fish farmers with a bank account (%)	63 % ¹³	80 %
Share of value chain fish farmers resorting to funding (%)	7 % ¹⁴	29 %
Share of value chain fish farmers reporting their activities (to the government or cooperatives) (%)	61 % ¹⁵	85 %
Share of value chain fish farmers with a formal licence for their activities (%)	11 % ¹⁶	50 %
Environmental indicators	Current situation (2021)	With upgrade by 2031– 24 000 tonnes
Number of critical environmental issues	3	3
Proportion (%) of fish farmers recording their environmental data ^{17,17} on the monitoring platform	0 %	50 %

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Summary report*. Rome, FAO.

For this more conservative scenario, a more limited total investment of **USD 17.5 million** is considered necessary. The Strategy's Product 1 costs account for 89 percent¹⁸ of total costs; Product 2, 6 percent of total costs; Product 3, 3 percent of total costs; and Product 4, 1 percent of costs.

¹² Sample of 15 fish farmers, FISH4ACP economic interview – Question: Do you pay taxes on profits?

¹³ Sample of 50 fish farmers, FISH4ACP survey – Question: Do you have a bank account?

¹⁴ Sample of 15 fish farmers, FISH4ACP economic interview – Question: During a typical year of commercial activity, for what services (other than loans/credits) did you pay (names), from what sources, and for each source, in what volume and at what price (average) did you pay?

¹⁵ Sample of 18 fish farmers, FISH4ACP social interview – Question: Is your tilapia farming activity registered? If so, with which authority?

¹⁶ Sample of 18 fish farmers, FISH4ACP social interview – Question: Do you have a formal licence for your activities? If so, how many days did it take you to register?

¹⁷ In particular: water control, feed conversion rates, use of drugs and chemicals, genetic strains used

¹⁸ The costs of setting up bank loans and capital to be mobilized for the upgrading and creation of new farms (equipment, infrastructure, inputs) have been included in Outcome 1.

Table 11 - Investments needed for the upgrade (24 000 tonnes)

In USD	Sources of funding				Total	
	Donors	FISH4ACP	Government	Private sector	Totals by type (USD)	Total by type (%)
Communication		90 000		25 000	115 000	0 %
Equipment/materials/inputs	100 000	138 000	222 000	90 000	550 000	1 %
Infrastructure/service		20 000		8 173 000	8 193 000	14 %
Study/legislation	57 000	144 000	17 000	10 000	228 000	0 %
Mediation, monitoring and advice		362 500	1 721 000	180 000	2 263 500	4 %
Training and extension materials	247 600	555 000	6 813 000	760 000	8 375 600	14 %
Installation and improvements using own funds				25 175 000	25 175 000	42 %
Improvements via bank credit				15 000 000	15 000 000	25 %
Total by source	404 600	1 309 500	8 773 000	49 413 000	59 900 100	100 %

Source: Kourgansky, A., Fréchet, R., Blanc, P. 2022. *Farmed Nile tilapia value chain in Côte d'Ivoire: Analytical summary of value chain analysis and design report*. Rome, FAO.

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

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

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

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