CASA
Commercial Agriculture for Smallholders and Agribusiness

Rwanda Aquaculture Inclusive Growth Strategy

CASA Component A

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Acronyms

ADB	African Development Bank
BDS	Business Development Services
BEE	Business Enabling Environment
BSF	Black Soldier Fly
CASA	Commercial Agriculture for Smallholders and Agribusiness
DRC	Democratic Republic of Congo
FCDO	Foreign & Commonwealth Development Office (formerly DfID)
FAO	Food and Agriculture Organisation
ILAF	Intervention Logic Analysis Framework
IFAD	International Fund for Agriculture Development
MEL	Monitoring, Evaluation and Learning
MRM	Monitoring and Results Measurement
MSD	Market Systems Development
MT	Metric Tones
MINAGRI	Ministry of Agriculture and Animal Resources
NEPAD	New Partnership for African Development
SHF	Smallholder Farmer
SMEs	Small and Medium Enterprises
STTA	Short Term Technical Assistance
TA	Technical Assistance
TAF	Technical Assistance Facility (Component B of CASA)
ToR	Terms of Reference
ToT	Training of Trainers
GoR	Government of Rwanda
GESI	Gender and social inclusion
NISR	National Institute of Statistics of Rwanda
PSTA	Strategic Plan for Agriculture Transformation
RWF	Rwandan Francs
USD	United States Dollar
RAB	Rwanda Agricultural Board
MT	Metric Tons
NGOs	Non-Governmental Organisations
GHPs	Good Husbandry Practices
RAS	Recirculatory Aquaculture System

Executive Summary

The primary focus of the Commercial Agriculture for Smallholders and Agribusinesses (CASA) programme is to make the commercial and development case for investing in agribusinesses that source produce from smallholder farmers. CASA Component A, implemented by NIRAS and Swisscontact, supports this through implementing catalytic high-impact interventions by developing projects with agri-businesses and commercially minded producer organisations. CASA builds up the capacity and investment readiness of these organisations through the provision of technical assistance (TA) and conditional grants in order to bring more smallholders into commercial markets. It then promotes the scaling and replication in the market system of successful inclusive business models. CASA interventions aim to demonstrate 'proof of concept' to investors, ensuring agribusinesses are attractive investment propositions, which subsequently strengthens the market and improves smallholder incomes.

CASA selects 'anchor value chains', where several interventions can be implemented to demonstrate solutions to various constraints or barriers in the market, or capitalise on opportunities, and designed to address access to better and lucrative markets which results in higher incomes for participating SHFs, as well as improved food security.

In response to the global food security crisis caused by the Russian invasion of Ukraine, CASA Component A is now working towards expanding its work with agribusinesses on the ground in two new countries, Rwanda, and Ethiopia. CASA is also conducting a market assessment in Kenya, the findings of which will be disseminated to actors looking to intervene and catalyse change in this space.

Using a market systems development approach, the CASA Rwanda team has undertaken a systems selection process to identify two key systems (Aquaculture and Poultry) for intervention, followed by an in-depth system analysis of both systems. This Inclusive Growth Strategy (IGS) report describes the market dynamics of the aquaculture sector in Rwanda. It maps the aquaculture system, including its core market (or value chain) functions and actors, key supporting services, and actors; and enabling environment issues and actors. It then provides a problem and root-cause analysis of key constraints and underperforming services in the system and puts forward a strategy and vision of change. It uses the Intervention Logic Analysis Framework (ILAF) as an analytical tool to identify systemic potential intervention areas and suggests partners and stakeholders for interaction.

This document will form the basis for intervention design and concept note development for projects that will ultimately make up CASA Rwanda's portfolio for the aquaculture sector.

Key findings

- According to the National Institute of Statistics of Rwanda (NISR) and the Ministry of Agriculture and Animal Resources (MINAGRI), fish production in Rwanda increased in the last 15 years by at least 10% year to year, from 7,300 Metric Tons (MT) in 2001 to almost 48,760 MT in 2021.
- Despite the increase in production, the fish produced in Rwanda is still unable to meet the growing demand for fish which stands currently at 80,000 MT annually. The sector records around 113 farmer organisations, 10 small and medium-sized enterprises (SMEs) and 27 large producers, where women account for up to 70% of smallholder farmers (SHFs).
- Nevertheless, fish consumption per capita is still low in Rwanda, estimated at 2.3kg per capita – this is one of the lowest in East Africa (as compared to 8.5kg in Tanzania, 12.5kg in Uganda, 4.5kg in Kenya and 3.6kg in Burundi) and is below the sub-Saharan African and global estimates of 6.7kg and 16.6kg, respectively. To reach the sub-Saharan African average level of consumption, Rwanda will need to produce at least 112,000 MT by 2024.
- The Government of Rwanda's Strategic Plan for Transformation of Agriculture 4 (PSTA 4) puts emphasis on climate change adaptation and mitigation as well as

environmental protection through climate-resilient activities for aquaculture, supported by the National Aquaculture Strategy 2023 – 2035 (currently under validation). The strategy is expected to act as a roadmap for the growth of the aquaculture value chain to achieve a desired increase in fish production of 90% by 2035 to reach 104,000MT from the current 48,000 MT.

- The key issue faced by SHFs organised in cooperatives and SMEs is the availability of affordable feeds to produce fish. The high price of raw materials (maize and soya) used in feed production, and its competition for human consumption, is the key factor that drives up feed costs. As such, feed account for some 70% of production costs, limiting the number of new cooperatives or SMEs joining the aquaculture business.
- This constraint relating to expensive feed is further exacerbated by a lack of technical skills in fish production as well as limited access to finance and business management skills for cooperatives and SMEs.
- This provides an opportunity for CASA to investigate further into a potential third value chain related to feeds to support the aquaculture sector, by introducing innovative ideas of alternative ingredients for feed.

Analysis

The key blockages in the aquaculture system that need to be addressed are (1) low fish productivity, (2) limited access to support services and (3) lack of value addition. It is important to note that some of these broad problem areas have the same underlying causes; and that common root causes suggest a possible area of intervention.

- **Low fish productivity levels.** SMEs and cooperatives are producing low volumes of fish compared to the current demand which is being met by large producers and imports. This is specifically due to the high the cost of feed, coupled with poor husbandry practices and weak business acumen.
- **Limited access to technical, business management and financial services**. Farmers in SMEs and cooperatives need assistance such as finance and business/technical skills capacity building to commercialise their fish production and marketing. They have limited knowledge and skills on aquaculture production and business management which in turn affects their ability to access finance for working capital and investment needs.
- **Lack of value addition and processing**. Weak downstream functions further undermine production and drives demand for imported products. With the current limitations on increasing productivity to meet growing demand, SMEs and cooperatives are not incentivised to invest in any value addition activities. A lack of processing is caused by both the increasing level of imports as well as limited skills and investment for SHFs and SMEs.

Based on the above constraints, this report sets the basis on the following possible intervention areas and projects for CASA investment in aquaculture for the next two years.

Strategy focus areas

CASA's strategy for aquaculture is to deepen the commercial participation of key value chain actors in viable input and output markets, while enhancing resilience and food security, nutrition security, animal welfare as well as resilience to climate change.

CASA will pursue this strategy by improving the capacity of emerging commercial producers to access working capital finance and leverage investments into SMEs to provide key business support services such as inputs and markets to smallholders.

Aquaculture production and consumption are growing driven by the population growth, high urbanisation and increasing demand for animal protein for nutrition. The Government of Rwanda (GoR) has committed to support the growth of the aquaculture system through various initiatives including mobilisation of stakeholders to invest into the sector. However, this growth can only be achieved by addressing the underlying causes of key blockages and taking

advantage of the opportunities present in the sector to ensure inclusive growth. This includes promoting locally produced inputs; encouraging local value addition and processing; leveraging increased investments into the sector; enhancing technical assistance and service provision; strengthening business performance via business development services (BDS) provision; and stimulating local fish consumption.

Despite weak private sector involvement, there are some promising SMEs that could be leveraged to help grow the sector in a more competitive manner which CASA has identified. They could be supported to prepare for and access investment to venture in more lucrative downstream value chain functions and develop their smallholder supply chains.

To implement the strategy, the following six broad intervention areas have been identified to anchor projects that will drive aquaculture commercialisation and inclusive growth.

- **Promote locally produced inputs**: addressing expensive feed by encouraging local feed production and pursuing the production of local alternative raw ingredients (such as BSF) for feed production.
- **Encourage local value addition and processing**: for additional revenue generation by cooperatives and SMEs, job creation and effective post-harvest management. Commercialisation, import substitution and demand can be further driven via value addition and the production of local fish products to fish industry and food technology specifications/standards.
- **Leverage increased investments into the sector**: promoting investments for feed production and processing activities. This may include working with financial service providers to finance SMEs and cooperatives, and supporting actors to identify, prepare for, and access financing.
- **Enhancing technical assistance and enhancing service provision**: including developing relevant and affordable services by upskilling training providers and supporting them to develop viable business models and tailor technical products and services to the needs of aquaculture SMEs and cooperatives; and supporting private sector intermediaries to develop and offer embedded technical services.
- **Strengthening business performance via Business Development Service (BDS) provision**: including mapping the business skills needs of SMEs and cooperatives, raising their awareness on the benefits of BDS and linking them to BDS providers.
- **Stimulate local fish consumption**: including supporting actors (public and private) to develop relevant campaigns and marketing activities that raise awareness on the benefits of consuming fish products. In turn this will incentivise increased production and ensure improved food and nutrition security.

1. Background

1.1. CASA Programme Overview

The Commercial Agriculture for Smallholders and Agribusinesses (CASA) programme makes the commercial and development case for investing in agribusinesses that source produce from smallholders. It aims to demonstrate how this can be done effectively by bridging evidence gaps and by ensuring investors and policymakers have access to the right information and people to make inclusive agribusiness models succeed.

In support of this approach, FCDO has been funding the Commercial Agriculture for Smallholders and Agribusiness (CASA) programme since 2019 with the aim of changing how investors, donors and governments view and invest in agribusinesses that work with smallholder supply chains. In doing so, CASA is increasing economic opportunities for thousands of smallholder producers by:

a. Demonstrating the commercial viability of small and medium-sized (SME) agribusinesses with significant smallholder supply chains and attracting more investment into these businesses.

b. Deepening the smallholder impact of existing investments made by Development Finance Institutions and impact investors.

c. Enabling poor smallholder farmers to engage with and trade in commercial markets; and,

d. Researching and communicating the case for successful engagement with smallholder-linked agribusiness.

e. Improving food production and security, and fertiliser production.

CASA's Components A and C are managed by NIRAS in partnership with Swisscontact and CABI. Component A is currently managing interventions on the ground in Malawi and Nepal, (and previously Uganda) and, with partner agri-businesses (including commercially minded producer groups), while Component C is a learning and knowledge-sharing component for upscaling and replication.

Having received additional funds from FCDO to combat against the global impact caused by the Russian invasion of Ukraine, CASA is now working towards expanding its work with agribusinesses on the ground into two new countries, Rwanda, and Ethiopia.

1.2. Background and Process

In line with the agreed expansion plan, CASA began work in Rwanda in October 2022. The first six months were dedicated to inception phase activities. This involved carrying out an assessment to identify two focus sectors, conducting detailed market analyses of each sector, and developing inclusive growth strategies for each identified value chain. The country team concluded the value chain selection process in February 2023, using several parameters of consideration to rank the different value chains.

Aquaculture ranked as one of the highest and was selected as one of CASA's value chains of focus in Rwanda. Fish farming is considered an innovative and economic strategy for promoting food security and dietary diversity among low-income households, as well as generating employment.

CASA employed the Inclusive Market Systems Development approach to arrive at this Inclusive Growth Strategy document and the intervention areas and indicative project ideas within. Supported by the project's technical advisors, the CASA country teams completed the following steps of the approach:

- A desk review of existing material and analysis of production and market trends.
- A preliminary system mapping and problem analysis exercise to define existing knowledge and identify key information gaps in readiness for in-depth stakeholder consultations. This included an analysis of systemic constraints and underlying causes of rather slow investment uptake for commercialisation of the sector.
- Identification of key actors in the market including about 113 active Cooperatives distributed across the country, around 10 SMEs and 17 large producers growing tilapia fish in cages in Lake Kivu and Lake Muhazi as well as feed millers, cold room providers etc. Visits were made to these market actors to gather their perspectives on the constraints affecting the development of the sector and the challenges faced as individuals or companies as well as their vision for the sector and possible solutions and opportunities.
- Based on the identified information gaps from the preliminary mapping and analysis, the team selected stakeholders to consult to fill these gaps and implemented a field investigation stage.
- Field investigations involved a range of visits to different market actors, such as cooperatives, service providers, feed millers, associations. This also included industry stakeholder such as the Ministry of Agriculture and Animal Resources (MINAGRI) and the Rwanda Agriculture Board (RAB) as two of the primary actors in the enabling environment.
- The team also met with development agencies and international organisations including Belgian Development Agency (ENABEL), Orora Wihaze, HEIFER International, the World Bank, and the International Fund for Agriculture Development (IFAD) to understand their current projects, identify scope for collaboration and avoid potential duplications with other entities supporting the development of the sector.
- Participatory workshops with actors were also implemented to co-analyse the system and co-create solutions. This included participatory mapping the market system, problem analyses and defining of indicative solutions.

This document presents the detailed assessment of the aquaculture market system in Rwanda and its key bottlenecks. In addition, it defines the vision of change for the aquaculture sector based on the prevailing constraints and identified aspirations of the actors. It further presents the strategy for attaining this vision and identifies the possible intervention areas that CASA can support to achieve the vision.

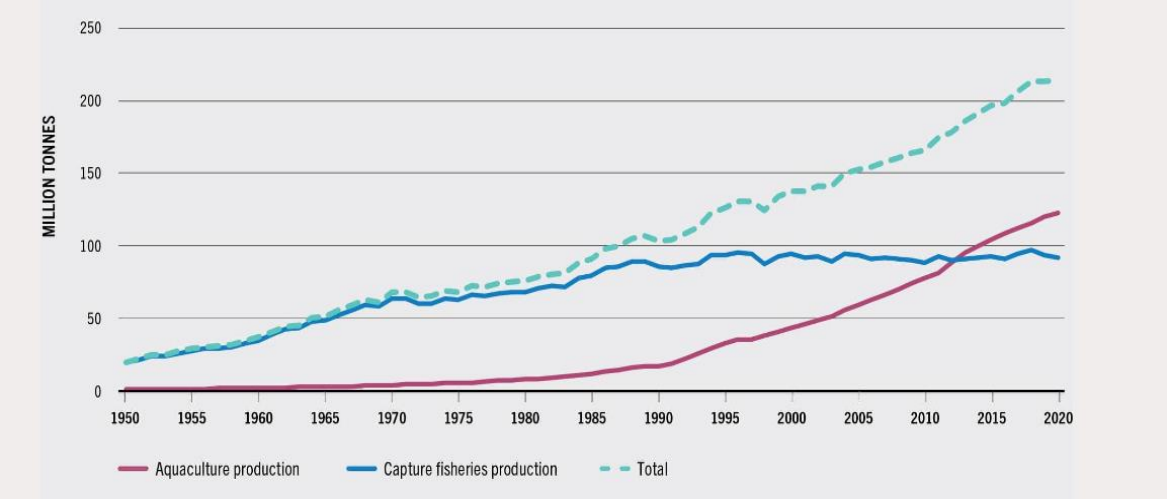
2. Sector Overview

2.1. International Context

Global fisheries and aquaculture production (excluding algae) has significantly expanded in the past seven decades, from 19 million Metric Tons (MT) in 1950 to 178 million MT in 2020 (see Fig 2). The total value of fisheries and aquaculture production of aquatic animals in 2020 was estimated at USD 406 billion, of which USD 265 billion came from aquaculture production.

The stagnation experienced in the last two years is mainly linked to a decline in capture fisheries, by 4.5% in 2019 from a 2018 peak of 96 million MT, and a further 2.1% in 2020. This decline was due to various factors, including fluctuating catches of pelagic species, the recent reduction in China's catches and the impacts of COVID-19 on the sector in 2020.

Figure 1: Global capture fisheries and aquaculture production for past 7 decades.



Source: www.fao.org

The African contribution to world aquaculture production is still insignificant (2.7%) albeit having significantly increased with larger-scale investments in Egypt, Nigeria, Uganda, and Ghana to produce more substantial quantities of fish. The region recorded a twenty-fold production increase from 110,200 to 2,196,000 tons from 1995 to 2018 with a compound annual growth rate (CAGR) of 15.55%. This growth of aquaculture production was due to the advent of the private sector, including both SMEs and the development of big commercial enterprises. This has been mostly stimulated by a combination of burgeoning public support, improving expertise, increasing foreign direct investment, more interest in aquaculture; and global awareness raised through the New Partnership for Africa's Development (NEPAD) Fish for All Summit of 2005 as well as the implementation of the FAO Special Program for Aquaculture Development in Africa (SPADA). Most of the production (99%) is from inland freshwater systems and is dominated by the culture of indigenous and abundant species of tilapia and African catfish. Mariculture (or marine farming) contributes just 1% to the total production quantity, although it is an emerging and promising subsector. New aquaculture production systems such as tanks and cages have been introduced, reflecting improvements in production techniques.

The aquaculture sector employs about 6.2 million people in Africa. Women play a significant role in the sector, being engaged as employees in large scale commercial farms. Women are also heavily involved in the downstream postharvest and marketing operations of the aquaculture value chain.

Table 1: Top 10 aquaculture producers in Africa in 2018

No	Country	Production (MT)	Regional share (%)	Global share (%)
1	Egypt	1,561,457	71.10	1.90
2	Nigeria	291,233	13.26	0.35
3	Uganda	103,737	4.72	0.13
4	Ghana	76,630	3.49	0.09
5	Zambia	24,300	1.11	0.03
6	Tunisia	21,756	0.99	0.03
7	Kenya	15,124	0.69	0.02
8	Malawi	9014	0.41	0.01
9	Madagascar	7421	0.34	0.01
10	South Africa	6181	0.28	0.01

Africa's key aquaculture producers have experienced remarkable growth in the past decade because of several factors such as capacity building in critical subject areas, embracing good governance, research and development, access to credit facilities and the promotion of private sector-led aquaculture development. Private sector-led initiatives have given rise to investments in sound management, emerging production systems, the formulation and utilization of aqua-feeds and the emergence of dynamic and robust producer associations and service providers. The aquaculture sector has the potential to create significant employment opportunities and to contribute to economic development and reduced food security across Africa.

2.2. National Context

In Rwanda, production of capture fisheries has been decreasing due to increased illegal fishing activities accompanied with traditional fishing methods that exhaust fish reproduction cycles. There are 24 lakes in Rwanda including three shared lakes (Lake Kivu shared with the Democratic Republic of Congo (DRC) and Lakes Cyohoha and Rweru shared with Burundi).

The level of fish consumption in Rwanda is estimated at 2.3kg per capita – one of the lowest in East Africa (per capita fish consumption is 8.5kg in Tanzania, 12.5kg in Uganda, 4.5kg in Kenya and 3.6kg in Burundi) and is below the sub-Saharan African and global estimates of 6.7kg and 16.6kg, respectively.

In general, Rwanda is not a fish consuming country compared to other East African countries since Rwandans (who are traditionally cattle rearers) prefer to consume beef more than other meat proteins. However, with increased urbanisation and a shift from the consumption of red meat to white meat, the demand for fish has increased and current domestic supply is unable to keep up with demand. There is also increased demand for dairy products such as milk, cheese, yoghurt, etc which has reduced the production of beef thereby driving demand for alternatives meat products, including fish. Consumers have increasingly recognized the health and nutritional benefits of eating fish. Fish is comparatively low in calories, fat, and harmful forms of cholesterol, and comparatively high in protein, vitamins, and Omega-3 fatty acids which are implicated in the prevention of heart disease and others. Aquaculture is one way to increase the supply of high-value animal protein to the Rwandan population.

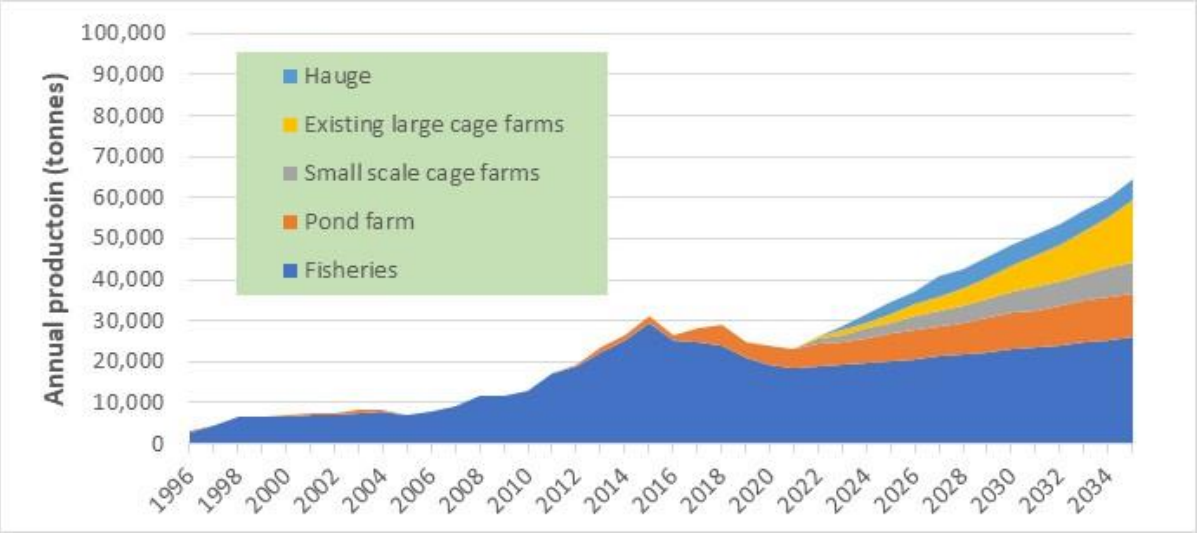
According to the National Institute of Statistics of Rwanda (NISR) and the Ministry of Agriculture and Animal Resources (MINAGRI), fish production in Rwanda increased in the last 15 years by at least 10%. In 2006, the African Development Bank (AfDB) through the Inland Lakes Integrated Development and Management Support Project (PAIGELAC) project, supported the Government of Rwanda (GoR) to restore the fisheries sector. The support covered both capture fisheries and aquaculture and the project provided infrastructure (cold

storage, ice making machines at selected sites, drying racks, smoking ovens, etc.), reducing post-harvest losses and increasing the value of landed fish.

In addition, fishermen organised into cooperatives were trained on fisheries management, and improved fishing techniques. By December 2012, 147 Cooperatives were trained on fisheries management and improved fishing techniques, and fish production had increased from 13,000 MT in 2006 to 17,400 MT by 2012. A few years after the completion of PAIGELAC, production fell as prices of feeds and extension service increased affecting the profitability of production. This led to many farmers and all cooperatives dropping out of the sector. These dynamics continue to affect the state of the sector and inhibit its growth. A common feature of state-run and donor funded interventions have showed a boom during project times, followed by declined production, demonstrating a lack of sustainability.

Nevertheless, fish production has been increasing at a relatively high rate in Rwanda, but still, the fish produced is unable to meet the growing demand. In 2020, fish production reached 36,047 MT – an almost five-fold increase from 7,300 MT in 2001, according to statistics from the Ministry of Agriculture and Animal Resources and the National Institute of Statistics of Rwanda (NISR).

Figure 2: Rwandan annual fish production trends and projections (1996 – 2020)



Source: MINAGRI (2020)

Table 2: Rwandan production of specific fish species

Type of fish	Annual production 2022(MT)
Nile tilapia (Oreochromis niloticus)	4,028
African catfish (Clarias gariepinus)	202
Other species	276
Total Production	4,876

Tilapia and catfish are the most popular fish species produced. This is primarily driven by consumer tastes and preference but also because these are the most suitable varieties for prevailing weather conditions in Rwanda.

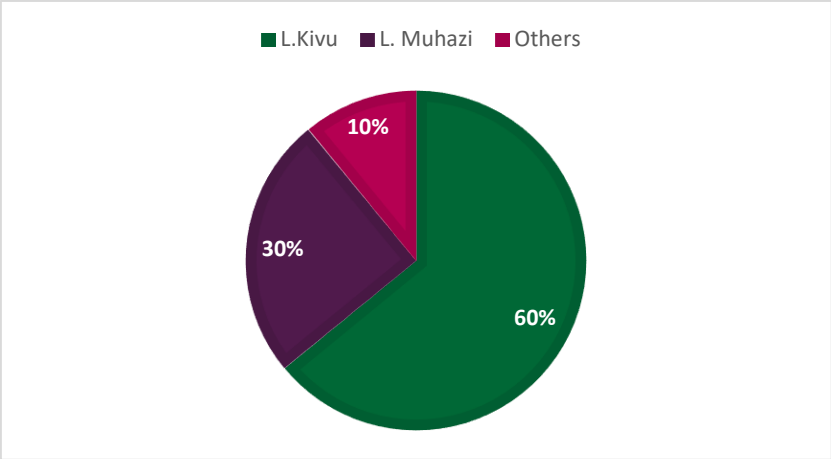
Production of catfish and common carp is primarily done in small earthen ponds which are currently estimated to be around 3,000 in the country. These were introduced as a test by the Government in 2012 but the market has responded negatively to the taste and shape of these species. Many of these ponds have now shifted to tilapia production.

In terms of typical fish culture systems, the production of tilapia is primarily done in medium sized floating cages installed mainly in Lake Kivu and in the shallower Lake Muhazi. The estimated total number of cages is around 1,500 in the country. On Lake Kivu and Lake Muhazi, there are more than 17 large producers growing tilapia fish in cages. These producers are relatively successful, producing at maximum capacity and enjoying high existing demand.

There are more than 113 active cooperatives and 10 SMEs growing tilapia in ponds and dams across the country. Many of the cooperatives are found in the southern province. The performance of cooperatives is generally weak. The government had provided some extension services related to pond management and feed application, but this provision has now ended.

The number of SME producers is few due to high-priced feeds that increases cost of production, thereby reducing profitability. This has forced some to close and limits new SMEs from venturing into the fish production business. Due to high prices and inconsistencies in supply of manufactured feeds, most producers (especially SHFs) often opt to use farm-made fish feed. In contrast, the large producers import feed and enjoy economies of scale.

Figure 3: Distribution of fish cages across the country, by Lake.



Large producers also function as hatcheries predominantly operating in Lake Kivu, Lake Muhazi and a few other smaller lakes distributed across the country. Cooperatives and SMEs buy fingerlings from these large producers since the hatcheries of large companies produce fingerlings both for own use and to meet any external demand. As of now there is no issue with access, quality, and affordability of fingerlings from these hatcheries. The key issue faced by SHFs organised in cooperatives and SMEs is the availability of affordable feeds to produce the fish. The high price of raw materials (maize and soya) used in feed production, and its competition for human consumption, is the key factor that drives up feed costs.

According to MINAGRI the demand for fish in the country is estimated to exceed 80,000 MT annually, compared to a supply of 48,760 MT in 2021. This suggests an opportunity for producers to increase production to meet local demand which is increasingly being met by imported frozen fish. It is imperative that the issue of access to affordable feed be addressed if demand is to be met by local production.

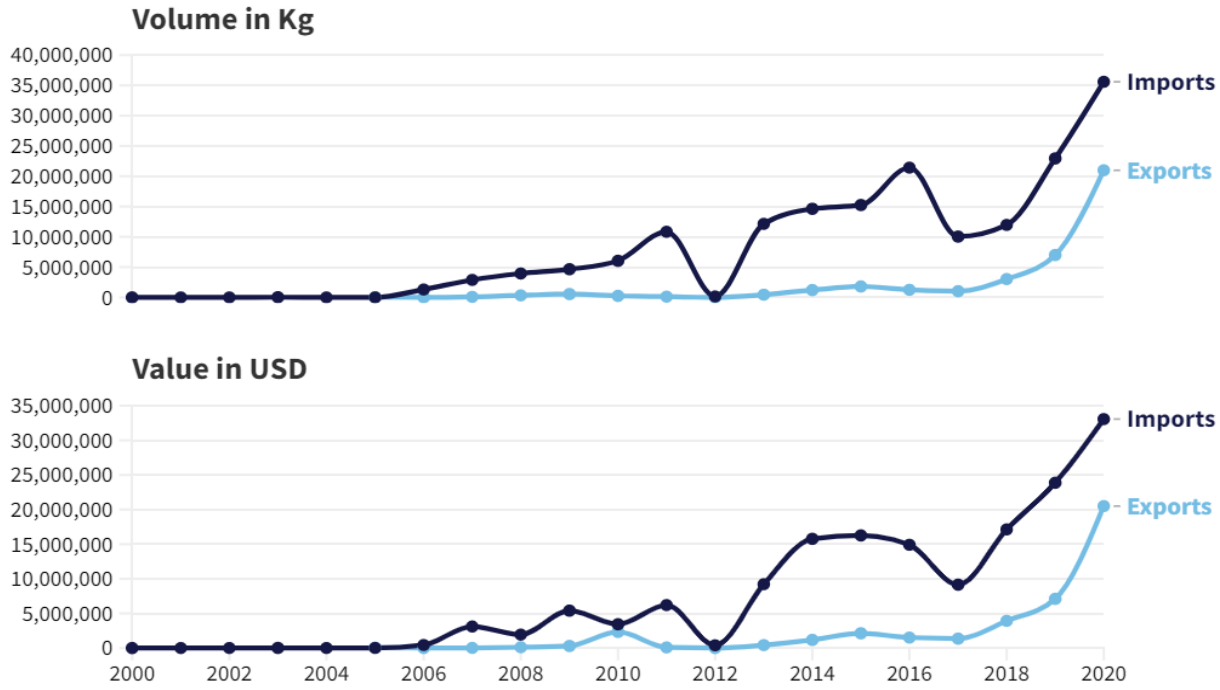
Fish imports have risen sharply since 2000, from just 144 kilograms to over 35,000 MT in 2020[1], to meet demand as seen in the Fig 4). Imports are mainly from Tanzania and Kenya, and some from Asia, especially China. As relations between Rwanda and its two immediate (Burundi and Uganda) neighbours have been strained, imports have been affected.

There has also been an increase in the volume of fish exports due to a few large producers that grow fish on Lake Kivu exporting up to 50% of their produce to neighbouring DRC where they fetch a higher price than on the domestic market – 1 kg of tilapia fish sells in DRC for at

[1] Trade and Industry Ministry (MINICOM)

least USD7.00 compared to USD3.50 in Rwanda. It is worth noting that Lake Kivu sits on the border between Rwanda and DRC making cross border trade between the countries easy.

Figure 4: Annual importation of fish from 2000-2020.



Source: MINICOM, 2020

Political and environmental landscape:

The Strategic Plan for Transformation of Agriculture 4 (PSTA 4) puts emphasis on climate change adaptation and mitigation as well as environmental protection through climate-resilient activities[2]. The PSTA 4 is designed to contribute directly to the Rwanda governance agenda focused on creating the enabling conditions for becoming a green economy country and reducing emission by 38% by 2030. This includes commitments to reforms, renewable energy, and sustainable agriculture[3]. Aquaculture in Rwanda is considered to have a low impact on the environment as new technologies such as recirculating aquaculture system (RAS)[4] are being adopted and used by large producers. With this technology water is recycled and reused after mechanical and biological filtration and removal of suspended matter and metabolites. Additions of chemicals to the natural environment is also limited to small quantities of proteins used in feeds production.

To support its vision, Rwanda has established a Green Growth Strategy as well as the Green Fund, an investment fund that supports the public and private projects that have the potential for transformative change. These drive a focus on sustainable agriculture, water resource management, renewable energy, green industry, climate-compatible mining, green transport, low carbon urban settlements, ecotourism, forestry, disaster management and others.

The Government of Rwandan's national aquaculture strategy 2023 – 2035, currently under validation, is expected to act as a roadmap for the growth of the aquaculture value chain to achieve a desired increase in fish production of 90% by 2035 to reach 104MT from the

[2] Minagri, Annual report 2021 - 2022
[3] https://rdb.rw/investment-opportunities/green-economy/

current 48,000 MT (2021). The government's strategy has 4 goals, which fit with CASA's mandate of increasing SHFs incomes through increased production:

- G1: A policy and regulatory framework for Rwandan aquaculture that provides both clear direction and support for the sustainable development of fish farming in Rwanda.
- G2: An active public administration that supports and manages the sustainable development of aquaculture in Rwanda.
- G3: Spatial planning of Rwandan aquaculture to allow the identification and sustainable management of aquaculture areas and their integration into the wider rural and lake economies.
- G4: Partnership approach between the public and private sectors involved in Rwandan aquaculture.

The growth of the aquaculture sector is a government priority in Rwanda fully supported by MINAGRI. Interestingly the development of this current strategy has involved many stakeholders including Cooperatives, SMEs, feed millers and hatcheries. This suggest that the new strategy is more responsive to the specific concerns and issues of the sector players. This focus of Government importance provides a favourable combination of circumstance for CASA engagement.

Financial sector landscape:

The financial sector is growing when it comes to agricultural lending and savings products especially from Micro Finance Institutions (MFIs) and saving groups for Micro and Small Enterprise (MSMEs). There are currently 16 commercial banks, one development bank (Banque Rwandaise de Development (BRD)) as well as more than 500 MFIs and rural savings and credit cooperatives in Rwanda. In addition, the sector is served with Village Savings and Lending Associations (VSLAs) as informal but well-structured lenders. Bilateral and multilateral development finance and various international development financial institutions provide different instruments to support the agricultural sector. Most of the support provided is in the form of grants either administered through the government's budget or directly through projects they are implementing.

There are also development finance institutions that support specific sectors (exports) with a guarantee facility implemented by BRD. Finally, there are impact funds and social enterprises actors such as One Acre Fund, AgDevCo and Inkomoko, to mention a few, that have come into the market to fill the gap around input provision and extension services respectively. One Acre Fund is a social enterprise that supplies smallholder farmers with asset-based financing and agriculture training services to reduce hunger and poverty. Inkomoko provides BDS services to SMEs through its incubation programme coupled with the provision of micro loans[5].

[5] Minagri, National Agriculture Financial Services Strategy, 2022

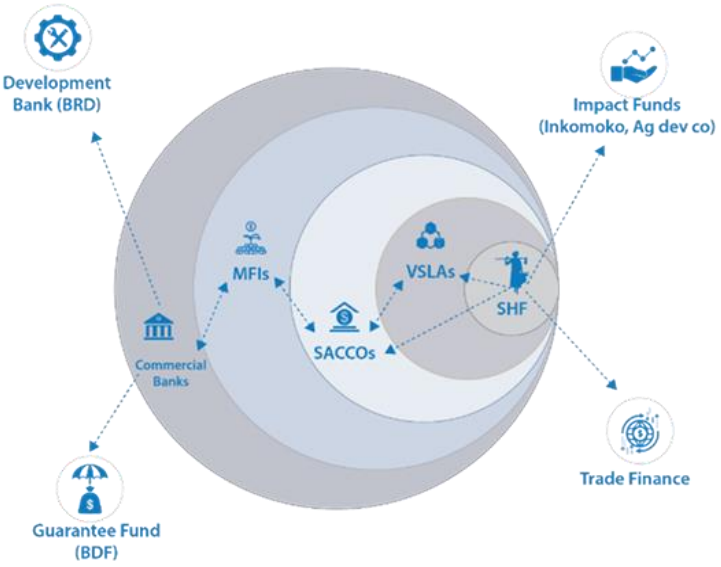


Figure 5: Agriculture Finance Mapping Supply

Nonetheless, credit extended to agriculture from the formal financial sector is extremely small compared to other sectors, with just 1.5% of new authorised loans in 2021 having gone to agricultural related activities[6]. This is low particularly considering the fact that agriculture contributes up to 25% to national GDP and employs an estimated 70% of the labour force in Rwanda. The financial sector is improving when it comes to agriculture lending since some commercial banks have invested in dedicated agricultural loans. Different suppliers offer different financial products to the whole agriculture value chain (see Annexes 4 and 5). These include inputs, farm production, post-harvest, agro-processing, and agriculture assets finance. However, farmers reported that one of their main challenges is to access finance to improve their businesses. Loans are not easily obtained especially by small farmers. When this happens, farmers face very high interest rates that can reach up to 25% (MFIs).

VLSAs are the most frequent source of agriculture credit. About 6% of farming households have borrowed from these for farming purposes, while only 0.35% of households have an agriculture loan from a commercial bank. The percentage of households that typically borrow from the formal financial sector (i.e. commercial banks, MFIs and Savings and Credit Cooperative Organisations (SACCOs)) is substantially higher in urban areas than in the rural parts of the country and is more prevalent among economically well-off households.

Although BRD's loan portfolio to the agriculture sector still represents more or less 5% of its total outstanding loans, its contribution to the total agriculture loan portfolio of all financial institutions remains the largest (41% in 2017) while the share of MFIs is growing every year (e.g. from 8% in 2012 to 20% in 2016)[7].

[6] BNR, Annual report, 2022
[7] AFR, Agriculture Finance Year Book, 2018

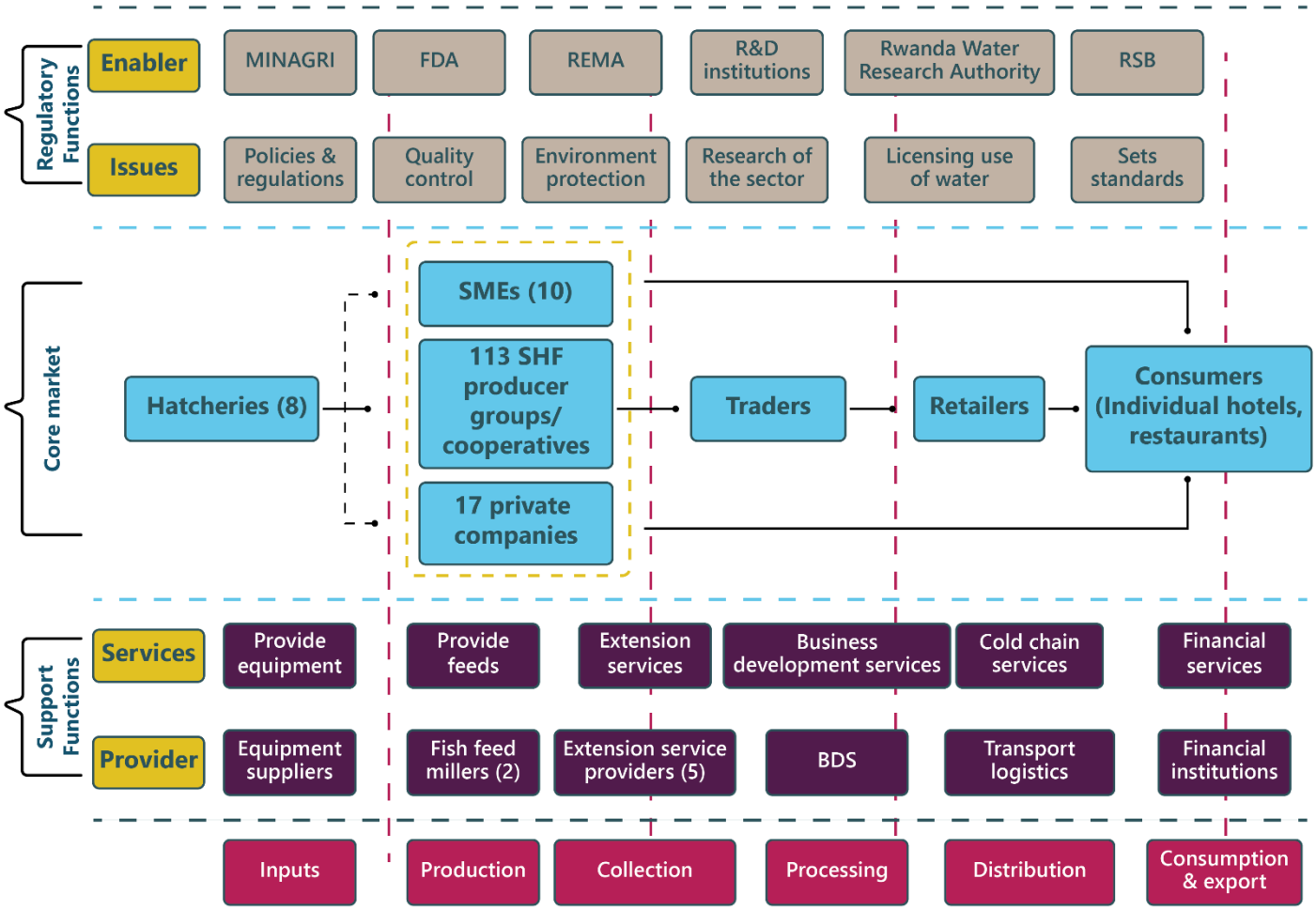
3. Market System

The purpose of analysing the system is to define how smallholder farmers are currently engaging with (or buying and selling) core products or services within the system, and how the supporting functions and regulatory environment influence this core exchange or transaction. The sector map is the output of the system analysis process that starts to define the existing system and enables a better understanding of system actor relationships and dynamics including identification of key constraints, opportunities, and information gaps.

3.1. Sector Map

This sector map highlights the main actors in Rwanda's aquaculture system and how they interact with each other. The map is comprised of the core market in the centre, supporting functions below, and the formal and informal rules that govern the market above.

Figure 6: Aquaculture sector map



3.2. Core Market Functions and Actors

The core market encompasses all the key actors in the supply and demand interaction between producers and consumers in the aquaculture value chain. It depicts all the transactions and linkages through which the primary product moves from the producers to the final consumers.

The aquaculture value chain starts with input providers such as hatcheries producing fingerlings and feed millers producing feeds. These supply key inputs for fish production to Cooperatives, private companies, and individual farmers. At the production level, actors predominantly produce tilapia fish and sell directly to local, high end and export markets. Producers sell through traders and retailers, or via a few informal processors. Although the sector is young it also involves a few larger private companies that are vertically integrated and provide all functions along the value chain from input supply to end consumer retailing.

The sections below provide specific details at each stage or function of the core market value chain.

3.2.1. Hatcheries

Currently in Rwanda, there are eight certified private hatcheries producing seed/fingerlings – of which 80% of production is for their own use and 20% to address external demand from local SMEs and Cooperatives. These hatcheries are also fish producers, and they grow mature tilapia fish in cages on both Lake Kivu and Lake Muhazi. The table below shows hatcheries and their production capacity of fingerlings.

Table 3: Capacity of Small-Scale Private Hatcheries across the country

#	Name of Hatchery	Total Monthly Capacity (numbers)	Current Monthly Production (numbers)	Capacity Utilisation (%)	Location
1	Fine Fish	500,000	400,000	80	Rwamagana
2	Kivu Choice	800,000	500,000	62.5	Rusizi
3	Kivu tilapia Farm	1,000,000	800,000	80	Rusizi
4	Gishanda Farms	350,000	300,000	85	Kayonza
5	Fresh Fish	250,000	150,000	60	Rwamagana
6	Rwafil	100,000	50,000	50	Kayonza
7	Lake Side Fish Farm	100,000	30,000	30	Bugesera
8	Rwasave Farm	20,000	5,000	25	Huye
	Total	**3,120,000**	**1,875,000**	**60%**	

It is interesting to note the presence of many women workers in fingerling production due to the nature of work that is involved – the work is very delicate and time consuming and women are perceived to be patient and productive in these tasks. These activities include fingerlings sex segregation, egg segregation, incubation inspection, temperature testing, etc.

As stated, the persistently high cost of feeds directly affects the demand for fingerlings and therefore fingerling production. All year-round availability of fingerlings is a bottleneck as feed costs remain high, despite the fact the Government has removed all taxes on imported fingerling feed. Farmers are less likely to demand fingerlings without an assured supply of affordable feed. With the demand for fingerlings dropping, the price per fingerling has risen from 20 RWF to 40 RWF as hatcheries concentrate on production for their own use. They generally only produce sizeable quantities for sale when they receive big orders from the GoR or NGOs – leading to shortages of fingerings in the open market.

An opportunity exists to look further into the feed system and address issues with feed supply and price. This could result in a boost of demand for fingerlings and motivate hatcheries to increase fingerling production and drive new entrants into both hatchery and fish production businesses.

3.2.2. Production

Fish production primarily entails the growing of fingerlings, the management of ponds/cages, administering of feeds and management of diseases/medicine application.

The hatcheries use fingerlings to produce their own fish but also sell to both SMEs and cooperatives. These SHF based businesses then grow “table fish” for sale mainly in local markets as fresh fish and with a portion being traded informally across the border into DRC.

There are more than 100 active cooperatives/farmer organisations, around 10 SMEs and about 17 large companies producing and selling fish. Cooperatives, with an average of 15 members each and SMEs produce mainly tilapia fish both in dams and in ponds. These are harvested twice a year as production of table fish takes between 6 to 8 months. Both cooperatives and SMEs harvest around 150 kgs per pond or dam and sold to local markets or at farmgate. At the time of the assessment, the minimum price of fish was 3,500 RWF per kg.

Large companies produce tilapia in cages (harvesting on a constant daily basis) with capacity to produce more than 1MT per day. Often these large companies import feed from Mauritius, Brazil and Zambia. They sell to key open markets such Kimironko and Nyabugogo markets, high end markets like restaurants, hotels and supermarkets and exports to DRC. The selling price in local markets is the same price as cooperatives and SMEs at 3,500 RWF per kg.

Currently there are no preservation or minimal value adding activities (such as filleting and packaging) being undertaken by producers.

Men are most often responsible for the technical management of fishponds and dams and fewer women are evident in this production function of the value chain. The cooperatives/farmer organisations are constituted on average of 70% men and 30% women.

Table 4: Annual Tilapia fish production

#	Types of producers	Number of actors	Number (or hectare) of ponds and cages each	Capacity (fish per year)	Total Annual production (MT)
1	Large producers	17	1,500 cages	40,000	35,000
2	SMEs	10	100 ponds	30,000	3,760
3	Cooperatives	113	3,000 ponds	90,000	10,000
	Total	**130**		**130,000**	**48,760**

Currently demand is met by large producers and by fish imports, due to a shortage in the constant supply of locally produced fish compared to the expected demand (80,000 MT). As stated, this is mainly because of high cost of quality feeds limiting increased production by cooperatives and SMEs but also due to a lack of processing and value addition activities along the value chain.

The increase in price of feeds due to increased cost of raw materials such as maize and soya beans has undermined SHF engagement and organisation, and cooperatives and SMEs continue to close due to unprofitability, as feed account for some 70% of production costs. This has also limited the number of new Cooperatives or SMEs joining the aquaculture business.

This constraint relating to expensive feed is further exacerbated by a lack of technical skills in fish production as well as limited access to finance and business management skills for

cooperatives and SMEs. The few cooperatives and SMEs that are still active have also limited access to extension services as the cost is high compared to profitability. This results in poor husbandry practises among SHFs which further affects productivity and production. MINAGRI through RAB had supported SHFs organised in cooperatives in the past with subsidised extension services but without proper monitoring systems. However, this has not continued due to a lack of financial resources.

Regardless, there are several opportunities emerging at the production level.

For example, Fine Fish Ltd is investing in a new feed plant (opening April 2023) that will be producing up to 40 MT per day of affordable feeds for SMEs and cooperatives. They will buy and store raw materials in bulk and take advantage of economies of scale to reduce production costs. This can potentially increase production of fish and enhance profitability for Cooperatives and SMEs as volumes produced will increase as a consequence of an expected reduction in cost of production.

In addition, SMEs and cooperatives will be able to produce more fish at a reasonable cost of production if they had relevant business management skills and good husbandry practises. With increased skills and improved knowledge, they could sell more produce and increase incomes. There is an opportunity to partner with both technical extension service and BDS providers to develop affordable and demand led services to active SMEs and cooperatives.

There is also the potential for enhanced value addition of fish at the production level by processing fish, packaging fish, and developing fish products. This may also drive an increase in production over time which can reduce both the price of fish and the amount of imported frozen fish; and avoid post-harvest losses. Fish marketing and processing with the associated Quality and Safety Assurance and Management systems for fish is pivotal in sector transformation.

3.2.3 Distribution and Trading

After production, there are a small number of traders and small retailers that buy from SMEs, cooperatives and private companies and sell directly to established markets and high-end markets of hotels, restaurants, and supermarkets. The actual number acting in this function is not known. As cooperatives and SMEs harvest fish twice a year, the harvest times are well communicated to traders, retailers and consumers who buy all the offtake and sell the fresh fish quickly onto consumers. There is no well-functioning cold chain in place to enable the movement and broad marketing of fresh fish. There are fisheries products promotion centres located in Kigali, Rwamagana and Musanze that are equipped with ice making machines for the improvement of the cold chain system in the transportation of fish. These are managed by the University of Rwanda and the Integrated Polytechnical Regional College (IPRC) as demonstration centres.

The large processors manage their own distribution channels using refrigerated vans and sell their produce directly to the end markets. These producers are selling to high end consumers and key open markets in Kigali and secondary cities.

Traders and retailers struggle to aggregate large volumes as supply is low which leads to increased prices. At this stage some traders and retailers undertake limited value addition such as filleting the fish to attract better prices from restaurants, hotels, and supermarkets.

Women make up 80% of traders mostly because of the low capital requirement to start a trading business. With only 50,000 RWF, traders can buy up to 16kgs of tilapia fish from larger producers at the farmgate and then sell these for 60,000 RWF in niche markets the same day – earning themselves approximately 20% profit for one day's work.

If production increases, then aggregation to meet demand is an opportunity at this level. But traders also need support to grow their small businesses. This includes tailored BDS and

financial services that encourage individuals (and potentially more women) to venture into this business to aggregate and sell more fish.

3.2.4. Consumers/market

Consumers of fish are categorised as high end and low end and are served by different producers in the value chain. High end consumers buy from supermarkets, restaurants, and hotels supplied by the larger fish producers such as Fine Fish and Kivu Tilapia, with prices reaching 5,000 RWF/kg. Due to the use of refrigerated vans, there are no issues relating to health and safety. These large producers also export to consumers in DRC at premium prices.

Lower end consumers mainly buy fresh fish at the farmgate, from cooperative and from SMEs during harvest times, at 3,500 RWF/kg.

The fish market and fish consumption are growing with the increase of a middle-class population in urban areas, presenting the opportunity for increased local production, new entrants and value addition.

3.3. Key Support Function Services and Actors

Supporting functions include key processes which lead to increased production and commercialisation of core value chain functions. Support functions usually influence several actors in the core market or value chain at the same time and are therefore of crucial importance. The key support services required by the value chain functions include:

3.3.1 Inputs and equipment

Feed: Fish feeds is the main component of fish production as it constitutes most of the cost of production and is a fundamental requirement for producing quality fish.

There are more than 10 feed millers in the country producing feeds for livestock but only two of these millers produce fish feeds as shown in Table 5 below. Huye Feeds and Aquahort produce fish feeds at a minimum capacity compared to the local demand for feed mainly due to the high cost of raw materials. Both can produce around 15MT fish feeds daily compared to the 40MT of feeds demanded collectively by fish producers daily.

Maize and soya beans are the main component of raw materials in feed production, but they are increasingly expensive due to competition with human consumption. They also experience wide price fluctuations throughout the year; for instance, 1kg of maize costs 300 RWF during high season but reaches 800 RWF after 4 months. These fluctuation in prices have pushed the price for locally produced feed to 1,200 RWF/Kg as of this report compared to 800 RWF/kg during high season.

Table 5: Summary of Available & Potential Aquaculture Feed Millers

#	Producer/ Potential Producer	Type of Feed	Operational status (Yes/No)	Capacity (MT/ day)	Actual production (MT)	Remarks
1	Aquahort	Floating	Yes	5	5	Internal use only
2	Huye Feeds	Floating	Yes	20	10	Producing under capacity due to insufficient equipment (intruders & graders)
3	Fine Fish	Floating	No	40	0	Finalising installation of equipment
	Total			**65**	**15**	

As stated, Fine Fish Limited is building a new plant for fish feeds that aims to produce 40 MT of feeds daily. The plant is expected to start operations soon and to vastly reduce the existing shortage in the market and cover most (if not all) of the current demand gap. Nevertheless, feed producers such as Fine Feeds require working capital to bulk purchase raw materials as well as access to investment to ensure adequate storage capacity. Increased availability of affordable feed has the potential to directly increase the overall production of fish that is hindered by both price and quality of available feeds.

There is a possibility for other local feed millers to produce affordable fish feeds for the market. This would reduce the volume of imported expensive feeds and stimulate demand for fish feeds. However, local feed millers require investment and working capital loans to operate and expand. Currently they lack the skills to access commercial finance and rarely pay for technical support to fulfil their business and investment planning needs. Without investment, millers are not able to bulk purchase low-priced raw material and avoid exposure to price fluctuations; and they will not expand their storage facilities for holding the raw ingredients. Alternatively, there is also an opportunity to explore and invest into substitutes of main raw materials by exploring alternatives such as Black Soldier Fly (BSF). MINAGRI estimates that BSF meal is considered as one of the best alternatives for partial or complete replacement of soybean meal in Nile tilapia diets. Based on this and the low cost of producing the BSF, as they feed off unwanted waste, the adoption of this animal protein source to fish farmers is recommended by MINAGRI to sustainably produce cheap and nutritious fish feed[8].

The RAB is working with other actors in the livestock sector on research on the potential use of BSF for affordable protein-rich animal feed. This can provide an alternative and cheaper source of protein needed in the production of feed and help SHFs access affordable feed. In addition, the leftover product from growing insects, is an organic fertiliser that contains a nutrient-dense blend of nitrogen, phosphorous and potassium (N-P-K) and minerals.

Tackling the issues related to fish feeds will drive the entire growth of the sector and boost demand for fingerlings. This in turn will motivate hatcheries to increase fingerling production and drive new entrants into both hatchery and fish production businesses.

Veterinary products and services

Currently fish diseases are not a major concern but medication to manage disease is a necessary input. Rwanda's farmers enjoy relatively easy access to veterinary pharmaceutical products, through a large agro-dealers network with more than 1,200 outlets. Veterinary pharmacies are regulated by the GoR, managed by a similarly large network of veterinary doctors, and supported by a statutory council, also regulated by law[9].

Other equipment: Equipment, such as nets and cages, is also important for the growth of the aquaculture sector. Using appropriate equipment can increase production volumes and enhance value addition options at the processing level.

There are no specific suppliers of aquaculture equipment such as fingerling seine, cast nets, water testers, water pumps, fish graders etc. There are general suppliers of livestock equipment that procure aquaculture equipment based on specific orders. This reveals a shortage of available aquaculture equipment in the local market; and hinders the growth of the value chain as it takes time for producers to replace aging cages and nets. Currently, there is no strong business case for general livestock suppliers to invest in aquaculture equipment as the demand is still low, even though the GoR has removed all taxes on imported fish farming materials. This situation further exacerbates the closure of businesses and limits new entrants. Larger producers such as Fine Fish, Kivu Choice and Gishanda Farms mainly import the equipment they need from China, while SMEs and Cooperatives struggle to acquire appropriate equipment due to poor availability and high costs.

[8] Minagri, Annual report 2021 - 2022
[9] Law n° 56/2013 of 09/08/2013 establishing Rwanda Council of Veterinary Doctors

As the aquaculture transformation process evolves, availability of the required inputs is becoming crucial and needs the private sector for its development. There will be increased demand for equipment thus opening investment opportunities.

3.3.2. Extension and Technical Services

SHFs organised into cooperatives and SMEs require extension services on a regular basis to ensure good fish husbandry practices. This includes site selection, pond construction and management/maintenance, feed application, fish nutrition/health, disease prevention and management, and harvesting to improve both quality and quantity of fish produced.

There are a number of technical training institutions in the aquaculture value chain such as Rwanda Animal Resources Improvement Cooperative (RARICO) and some other small training institutions such Aqua Bio Ltd, Fortune Bright Vision (FBV Ltd), AFTCO Ltd and Rural Development Initiative (RDI). These have the technical expertise to train farmers on good fish husbandry practises (GHPs) but often their training products/technical services and delivery mechanisms are not tailored for smallholder fish farmers. There are very few private companies offering extension services and the price of these services is high for SHFs. The large producers such as Fine Fish and Kivu Tilapia integrate their own support and have invested in hiring technical expertise to provide these services.

At the District level, there is only one agronomist from MINAGRI who offers extension services to farmers; and this agronomist has limited knowledge on aquaculture. In addition, there are no specific agrovet service providers with relevant knowledge and skills in aquaculture. Smallholder fish farmers persistently struggle to access extension services such as pond and cage management and feed application advice. Though MINAGRI, through RAB, has provided subsidized extension services to most of the cooperatives, this on-demand support ended three years ago mainly due to financial resources available.

There is need to map all cooperatives and SMEs in the sector for a better understanding of their individual performance and the constraints they face is accessing relevant and affordable technical support. Integrating the supply and demand of technical services is fundamental to the growth of the sector. There is an anticipation that the government will invest more as the sector grows which may play out during the implementation of the new national aquaculture strategy.

3.3.3. Business Development Services

SMEs and cooperatives need BDS to improve their business performance. Most cooperatives and SMEs have insufficient inhouse business management skills in the areas of financial planning and management, human resource management and marketing. This has limited their profitability alongside the high cost of production and the mismanagement of revenues. There is an urgent need for these services by cooperatives and SMEs, but the cost is too high, and profits too minimal to invest in BDS.

There are a good number of BDS providers, such as Inkomoko and Royal Partners, that offer training in accounting, human resource management, finance and marketing to Cooperatives and SMEs. However, many of these providers have a limited understanding of the actual needs of smallholder fish farmers and their collectives and simply offer supply led products or services which do not adequately address the needs of this client group. BDS providers need research mechanisms that allow them to understand different client segments; and technical support to tailor their services for SHFs, cooperatives and SMEs.

3.3.4 Financial Services

Financial services, such as loans for assets and working capital are required by actors in all the functions of the value chain. However, on the demand side, there are several constraints limiting SHFs and SMEs from accessing finance. These include stringent requirement such as collateral and guarantees, lack of information on available financial products and providers,

lack of financial and managerial skills as well as the high perceived risks of lending to MSMEs. These constraints limit availability and accessibility to finance for actors and hamper investment into more advanced and/or larger scale production and processing.

On the supply side, the key constraints relate to the ability and capacity to assess risk by staff within financial institutions, lack of diversified and tailored agri-financing products, and high cost of capital to serve risky sectors like agriculture. Women farmers have unique constraints due to cultural beliefs and a lack of agency to obtain financing. So far Access Bank is one of the few banks with tailored product for women. This product support women into accessing finance by providing different requirements to ease them and encourage them into accessing finance.

An opportunity exists to support the financial institutions to tailor financial products to the needs of aquaculture farmers, as well as supporting farmers to obtain and benefit from financial services. This implies the provision of technical assistance in terms of capacity building to financial institutions in understanding the needs of the different aquaculture actors and designing relevant financial products. There is also a need to support SHFs and SMEs in financial management tools and trainings, business planning and legal assistance to be able to fulfil the financial institutions requirements to obtain financing or investments.

3.3.5 Transport and Logistics Services

Large producers such as Fine Fish, Kivu Tilapia and Kivu Choice Ltd use their own cold trucks and oxygenated tanks to transport fish from cages to established selling points in Kigali and other secondary cities. The cost of these trucks and tanks is high but still affordable to these producers who enjoy economies of scale. For SMEs and cooperatives, the need for these services remains low as everything produced is bought at the farmgate directly by consumers.

Currently there are more than 52 privately owned refrigerated trucks mostly used to transport frozen meat from slaughterhouses to selling points. With increased production, the need for SMEs and cooperatives to target open markets will lead to greater demand for dedicated and customised refrigerated truck services for fish transportation.

3.4 Enabling Environment issues and actors

Formal and informal rules and regulations guide actors in the market and directly impact on the ability of the value chain and support system to develop. These include trade policies, agricultural policies, and laws as well as informal traditions and values set that influence behaviours and functional relationships in the market. The key issues in the enabling environment that directly affect the aquaculture value chain, either enabling it to grow or hindering growth, include:

3.4.1 Subsidised insurance scheme

MINAGRI is implementing a National Agriculture Insurance Scheme as a derisking tool to support agri-sector growth. Aquaculture has been included in the subsidised insurance scheme for livestock, which is also a development of the national aquaculture strategy that is still under validation. The scheme will mitigate risks and losses incurred by farmers due to unpredictable natural disasters, pests and diseases that affect their livestock and crops. The scheme, which is subsidized up to 40% by the GoR, will also enable the farmers to easily access financial services and ensure flow of credit to the agriculture sector.

3.4.2 Advancing research and development

Research and Development (R&D) is an important enabler for agricultural growth and a potential key driver. For example, work to promote BSF meal as an alternative ingredient for feed alongside research on fingerling production and diseases have the potential to transform

the sector. RAB Strategic Plan 2020-2024 states that to increase animal production, it will focus on animal feed production through public private partnerships (PPPs).

RAB is working with other actors in the livestock sector on research on the potential use of black soldier flies (BSF) for affordable protein-rich animal feed. This can provide an alternative and cheaper source of protein needed in the production of feed and help SHFs access affordable feed. In addition, the leftover product from growing insects, is an organic fertiliser that contains a nutrient-dense blend of nitrogen, phosphorous and potassium (N-P-K) and minerals.

3.4.3 Necessity for standards of compliance

There are a variety of standards and codes of practice and specifications relating to aquaculture equipment, fish farming medicines and animal feed, as well as fish industry and food technology specifications and standards, and food safety regulations. These are primarily overseen by the Rwanda Standard Board (RSB) and the Food and Drugs Authority (FDA). An opportunity exists to support producers and processors to understand the commercial benefits of the standards and to comply via awareness raising and technical skills training.

3.4.4 Increasing awareness on benefits of fish consumption

There is growing awareness on the nutritional value of fish products which can help to drive the growth of the sector.

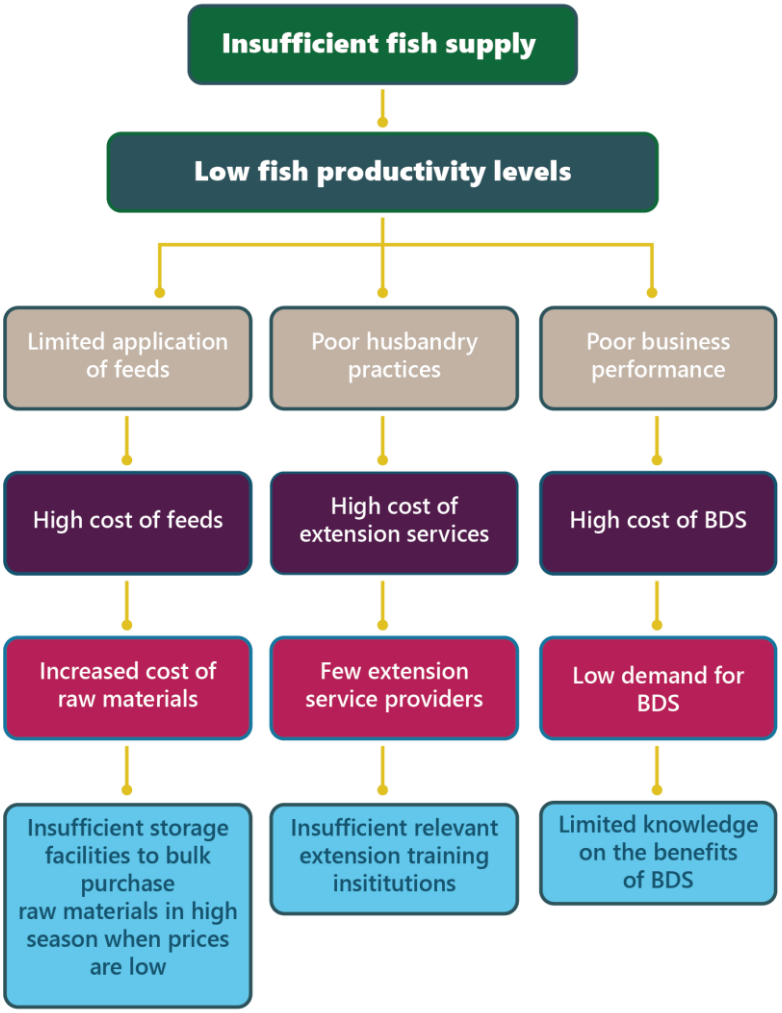
4. Problem Analysis

There are numerous problems that smallholder farmers in Rwanda face when trying to improve and commercialise aquaculture production and they can be found in almost all areas of the market system.

The problem analysis draws from the constraints identified throughout the sections above and seeks to define and prioritise the issues which are currently affecting the performance of the aquaculture system. This has been done through an underlying cause analysis to understand the root cause of why each of the key problems are occurring - to ensure that subsequent projects address systemic causes rather than just responding to the symptoms. These are also presented in the Intervention Logic Analysis Framework (ILAF) table.

The key blockages in the system that needs to be addressed are (1) low productivity, (2) limited access to support services and (3) a lack of value addition. It is important to note that some of these broad problem areas have the same underlying causes; and that common root causes suggest a possible area of intervention.

4.1. Low fish productivity levels

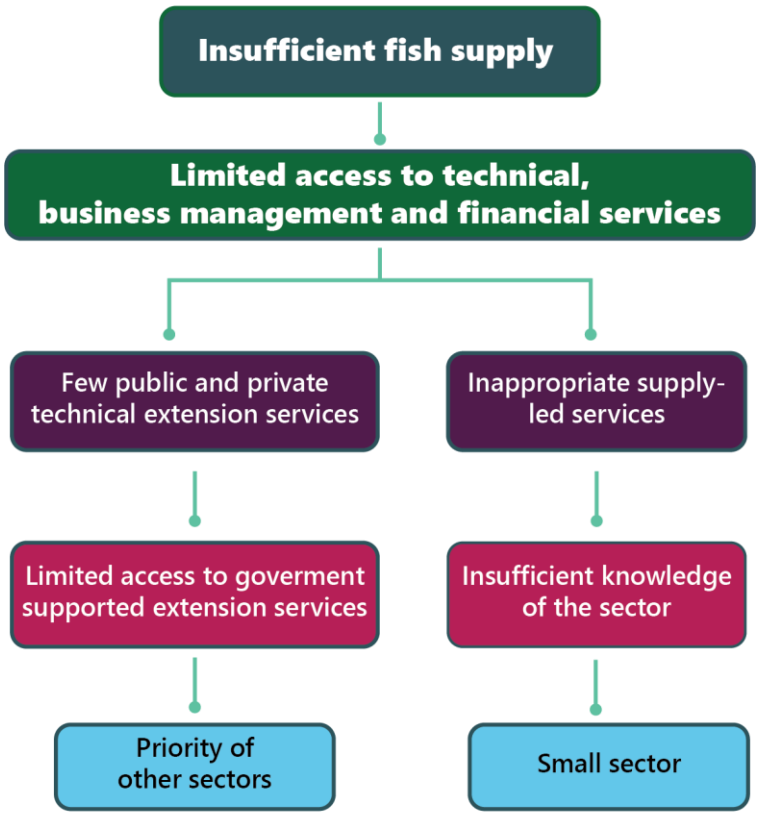


SMEs, cooperatives large producers and imports are supplying lower volumes of fish compared to the current demand. This is specifically due to the high the cost of feed, coupled with poor husbandry practices and weak business acumen.

Low production levels are caused by:

- **Limited application of feeds**: Farmers in SMEs and Cooperatives are struggling to access quality affordable feed due to limited local feed production. The root causes of this relates to limited availability and high cost of local raw materials, which holds back any potential investments in feed production processes and infrastructure. The price of raw materials such as maize and soyabeans has been increasing due to competition with human consumption but also price fluctuations between high and low seasons.
- **Poor husbandry practises**: Farmers in SMEs and Cooperatives have poor knowledge in production techniques due to limited access to public extension services and the high cost of privately delivered services that are often not demand led. The root cause relates to the limited number and poor capacity of extension service providers, the supply-led nature of technical assistance providers, and the inability of consumers to pay for the services.
- **Poor business performance**: SMEs and cooperatives suffer from poor inhouse managerial skills that affects productivity as resources are often mismanaged. This can directly lead to mismanagement of funds and even result in business closures. The root cause relates to the costs and appropriateness of business management services and poor understanding among consumers regarding the availability and benefits of such services.

4.2. Limited access to technical, business management and financial services



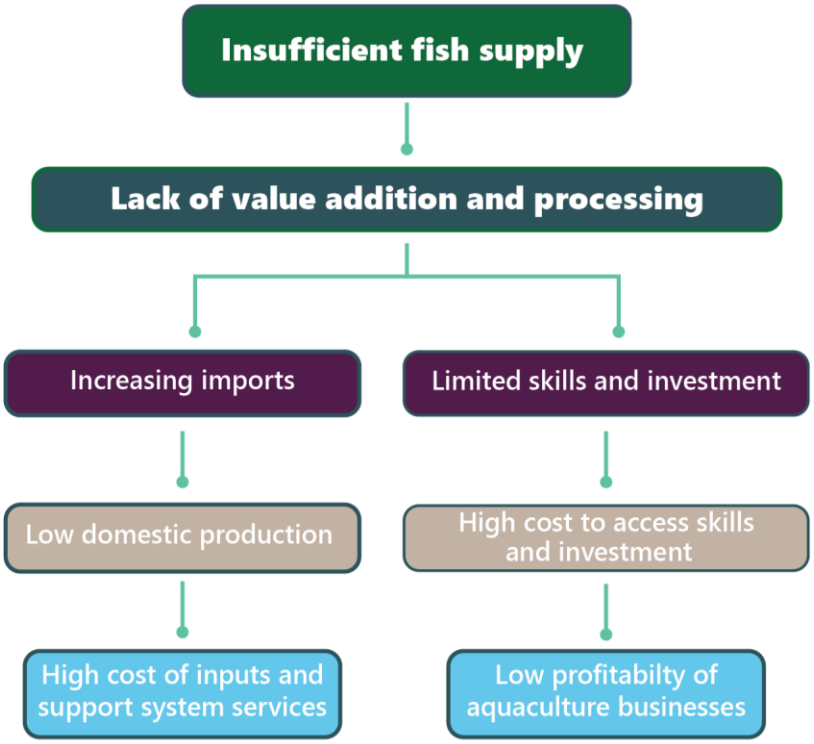
Farmers in SMEs and Cooperatives need assistance such as finance and business/technical skills capacity building to commercialise their fish production and marketing. They have

limited knowledge and skills on aquaculture production and business management which in turn affects their ability to access finance for working capital and investment needs.

Limited access to relevant services is caused by:

- **Few public and private technical extension services:** SMEs and Cooperatives are struggling to access technical support due to a lack of Government delivered services, district agronomists and specialist agrovets. This is rooted in a lack of understanding of the needs of SMEs and Cooperatives among public and private service providers and intermediaries.
- **Inappropriate supply led services:** Technical, financial and business development service providers offer 'off the shelf' standalone products and services due to a limited understanding of the needs of SHFs, cooperatives and SMEs, and the potential demand for certain relevant tailored services. This is coupled with the unwillingness or inability of providers to target and respond to the technical, business and financial needs of aquaculture actors.

4.3. Lack of value addition and processing



Weak downstream functions further undermine production and drives demand for imported products. With the current limitations on increasing productivity to meet growing demand, SMEs and Cooperatives are not incentivised to invest in any value addition activities.

A lack of processing is caused by:

- **Increasing imports:** Imports have been increasing to meet the demand for processed fish products and will keep increasing as long as local aquaculture productivity remains low. As stated, poor productivity is rooted in the feed system and aquaculture support system.
- **Limited skills and investment:** Poor productivity continues to limit investments in skills and assets for processing. This is exacerbated by the requirements of financial institutions and poor business management skills among SMEs and cooperatives.

5. Strategy for Change

The inclusive growth strategy is designed to respond to and strengthen the weaknesses in the current service provision and enabling environment in the market system. This takes the form of defining the growth potential and opportunities of the sector, developing the sector vision of change for an inclusive and competitive sector, and ultimately identifying opportunities to demonstrate smallholder and SME commercialisation.

5.1. The growth potential and opportunities of the sector

Aquaculture production and consumption in Rwanda is growing rapidly due to population growth, high urbanisation and increasing demand for animal protein. It can help to meet the nutritional demands of the increasing population and diversify and intensify food production by small-scale farmers. In addition, it can raise rural incomes and generate rural employment. Continued year on year growth in the production tilapia fish can be expected as well as continued increasing demand for fish products. However, supply and demand can only be integrated by addressing the underlying causes of key blockages and taking advantage of the opportunities present in the sector. These include:

Promoting locally produced inputs: addressing expensive feed by encouraging local feed production and pursuing the production of local alternative raw ingredients (such as BSF) for feed production. Commercialisation of production can be driven to keep up with demand if issues regarding feed are addressed. This requires potential and existing feed manufacturers to bulk buy raw materials to achieve economies of scale, the expansion of storage facilities for raw feed ingredients and adherence to animal feed standards. The promotion of feed production is also an opportunity to increase quality employment opportunities for women.

Encouraging local value addition and processing: for additional revenue generation, job creation and effective post-harvest management. Commercialisation, import substitution and demand can be further driven via value addition and the production of local fish products to fish industry and food technology specifications/standards. Not only does value addition offer higher economic value and higher incomes, but also address market competition, post-harvest losses and food security. This includes basic fish handling, as well as the primary processing activities of filleting and freezing of fresh fish for onward distribution to fresh fish retail and catering outlets. Such activities may increase engagement of women and offer income generating opportunities. With increased production it may also include preserving and/processing to produce chilled, frozen, canned, and smoked products for the retail, catering, and trades.

Leveraging increased investments into the sector: promoting investments for feed production and processing activities. To produce feed and value-add fish products locally, actors need to access both investment and working capital financing from financial service providers. This may include working with financial service providers to SMEs and cooperatives and supporting actors to identify, prepare for, and access financing.

Enhancing technical assistance and enhancing service provision: including developing relevant and affordable services by upskilling training providers and supporting them to develop viable business models and tailor technical products and services to the needs of aquaculture SMEs and cooperatives; and supporting private sector intermediaries to develop and offer embedded technical services. This could also include raising awareness among SMEs and cooperatives of BDS and linking SMEs and cooperatives to service providers.

Strengthening business performance via BDS provision: including mapping the business skills needs of SMEs and Cooperatives, raising their awareness on the benefits of BDS and linking them to BDS providers. Providers may require support to develop, test and market viable services that strengthen the business capacity of SMEs and Cooperatives.

Stimulating local fish consumption: including supporting actors to develop relevant campaigns and marketing activities that raise awareness on the benefits of consuming fish products. In turn this will incentivise increased production and ensure improved food and nutrition security.

5.2. Vision of Change

The purpose of the Vision of Change is to envisage how the system would operate if identified constraints and underlying causes were to be resolved.

Vision of change for the overall system:

- A commercial and compliant sector with growing levels of production and processing due to locally available good quality inputs, enhanced technical and business management skills and access to investment.

Vision of change for SHFs

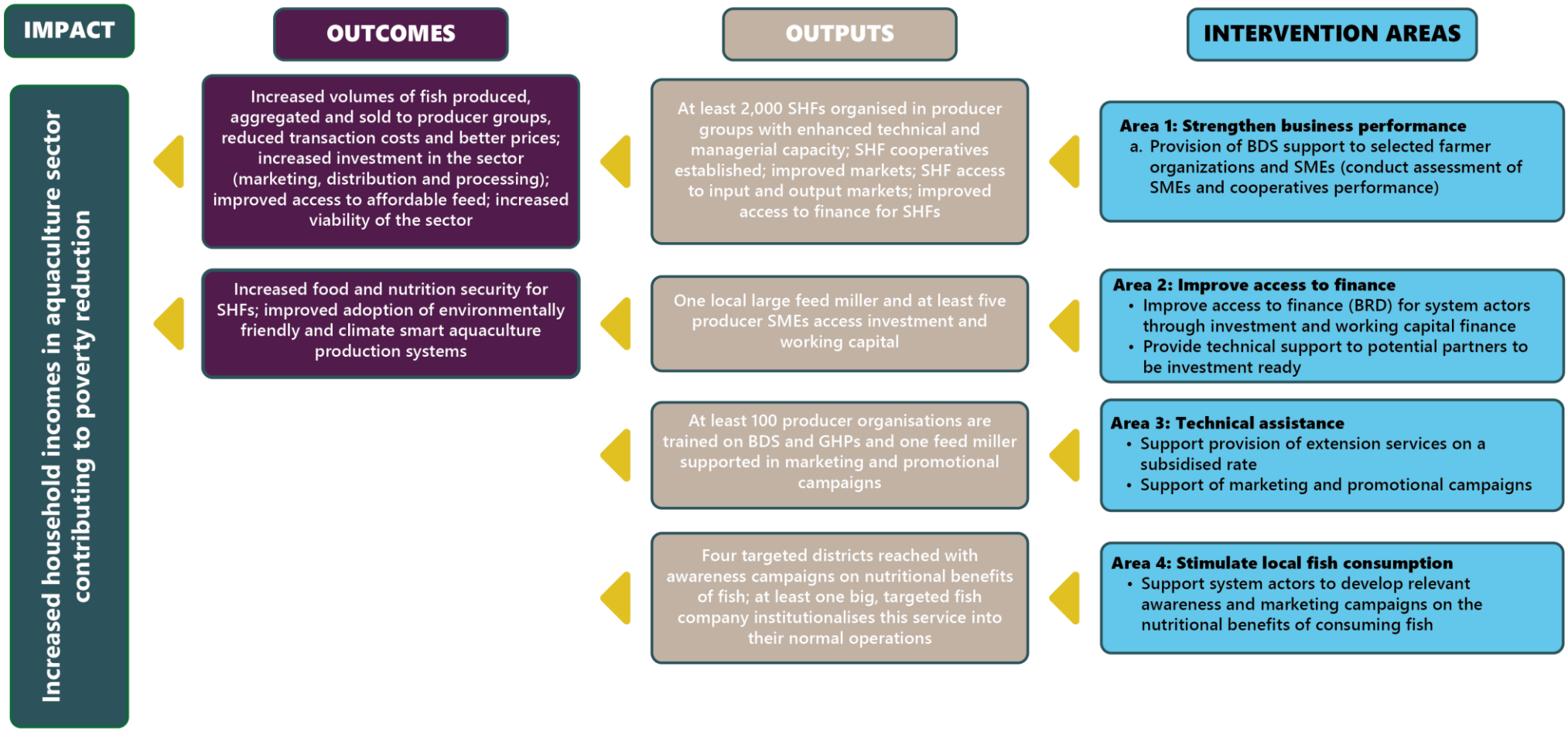
- SHFs working in cooperatives and SMEs enjoy increased incomes generated from growing sales that meet growing demand for fish products.

Vison of change for Input providers

- A vibrant support system that delivers affordable products and services to SMEs and Cooperatives.

The purpose of the Vision of Change is to envisage how the system would operate if identified constraints and underlying causes were to be resolved and the opportunities were realised.

Theory of Change



The Vision of Change can be achieved through the identified intervention areas described in the subsequent chapter

6. Interventions

The strategy suggests which indicative interventions are possible and required to deliver sustainable changes in the system(s) to achieve the vision of systemic change. It identifies actions suitable to overcome the root causes of system failures that inhibit the growth of the poultry sector and or constrains smallholder farmers from benefitting from any growth.

6.1. Intervention Areas and Project ideas

The following Intervention Logic Analysis Framework (ILAF) shows the connections between the problems and the possible priority actions that can be deployed to solve them by strengthening the system.

Problem/ symptom	Underlying Cause	Support and Regulatory functions	Service weaknesses / underlying causes	Intervention Areas
Low productivity levels	High prices of imported raw materials for feed production	Input supply Finance service provision	Expensive raw material supply Minimal local production No support to identify, prepare for, and access financing	**IA.1 Promote locally produced inputs** via technical support to local millers to engage in local feed production, marketing and standards compliance; and increase production and sales of feed produced from local alternative raw ingredients such as BSF with private companies. **IA.2 Leverage increased investments for feed production and expansion** via feasibility studies, business planning, investment readiness support and matchmaking for new and existing feed millers.
	Limited knowledge and skills in production Poor business management skills among SHFs and SMEs	Technical (inc equipment) and business skills support	Poor linkages between SHFs and providers Poor understanding of service availability and benefits Poor application of services	**IA.3 Enhance cooperative and SMEs performance** via mapping of cooperatives and SMEs (status and needs) and support to cooperatives and SMEs to access and benefit from both technical and business support services (to increase productivity and compliance and drive both demand and consumption); and linkages to support providers.
Limited access to BDS (technical, business management and financial services)	Lack of extension services Inappropriate BDS services and service delivery	Finance service provision Business and technical (inc. veterinary) service provision	Limited number of providers Supply-driven, expensive support services	**IA.4 Enhance support service provision** via support to (new and existing) BDS service providers in the areas of research, skills upgrading, standalone service development, linkage creation and service provision; and support to private sector intermediaries to offer embedded services.

Lack of value addition and processing	Poor productivity Limited skills and assets	Input supply Finance service provision BDS and technical service provision	Unsuitable technical and investment products/services No support to identify, prepare for, and access financing	**IA.5 Leverage technical support and investments for processing** via business planning, investment readiness support and matchmaking for core market actors; and support to meet fish industry and food safety standards.

The listed intervention areas are not meant to be improvements or services conducted by CASA alone. They are based on the idea of an ineffective or inefficient market system which can be improved inherently so outcomes do not rely on CASA's continued support to be sustainable. It is crucial to act systemically for a sustained impact and intervene in the market as a facilitator for actions undertaken by the identified stakeholders themselves.

6.2. Sequencing and Prioritisation of Ideas

The following are the possible intervention ideas based on CASA objectives and project selection criteria along with their sequence for the next 2 years.

Phase 1

- **Promote locally produced inputs** via technical support to local millers to engage in local feed production, marketing and standards compliance
- **Leverage increased investments for feed production and expansion**via feasibility studies, business planning, investment readiness support and matchmaking for new and existing feed millers
- **Enhance Cooperative and SMEs performance** via mapping of Cooperatives and SMEs (status and needs) and support to Cooperatives and SMEs to access and benefit from both technical and business support services
- **Enhance support service provision** via support to (new and existing) BDS service providers in the areas of research, skills upgrading, standalone service development, linkage creation and service provision; and support to private sector intermediaries to offer embedded services.

Phase 2

- **Leverage technical support and investments for processing** via business planning, investment readiness support and matchmaking for core market actors; and support to meet fish industry and food safety standards.

7. Stakeholder Assessment

The Power-Interest Matrix is designed to help categorise relevant stakeholders and suggest engagement strategies for the different groups.

Power	Low Interest	High Interest
High	• Kivu tilapia farm • Huye feeds • Equity Bank	• RARICO • Fine Fish • Inkomoko • Gishanda farms • Development Bank of Rwanda • Kivu choice • Bank of Kigali
Low	• Victory farm • Rwasave farm	• Fresh fish • Aquahort • Rwafill farm • Aqua Bio Ltd, Fortune Bright • Vision (FBV Ltd), AFTCO Ltd • Rural Development Initiative (RDI • Royal Partners

CASA will adopt the following strategies for interacting with the sector stakeholders:

- **Low power, low interest**: CASA will stay receptive towards these actors: although they do not seem important, nor very relevant at this stage, they may still prove to be as the programme continues to build understanding of the system. If they show an interest, CASA will provide them with information about the iterative investigation and intervention preparation process.
- **High power, low interest**: CASA will stay open minded about these actors: they are powerful, and they may turn out to be important drivers of change, despite them not seeming very relevant at this stage. If they show an interest, CASA will be quick to provide them with information about process and subsequently keep them informed.
- **Low power, high interest**: CASA will stay open minded about these actors: they are an important part of the market system. Ignoring them may have severe unintended consequences. CASA will keep them informed about the investigation and preparation process.
- **High power, high interest**: CASA will actively target these actors: they are both important parts of the system and the 'movers and shakers' that have lots of power to change things. CASA is now engaging them and will do so throughout the intervention preparation process.

8. Preliminary Assessment of Potential Partners

High **Capacity** *Low*	• Kivu choice • Bank of Kigali • Kivu tilapia farm • Huye feeds • Equity Bank	• RARICO • Fine Fish • Inkomoko • Gishanda fish farms • Development Bank of Rwanda
		• Victory farms • Fresh fish • Aquahort • Rwafill farm • Aqua Bio Ltd, Fortune Bright • Vision (FBV Ltd), AFTCO Ltd Rural Development Initiative • Royal Partners
	Low ← **Willingness** → *High*	

The Willingness and Capacity matrix is designed to identify which players to target or prioritise as partners and the broad type of support required to change their behaviour.

There are five potential partners that have the capacity and willingness to invest in aquaculture activities. These include:

- **RARICO:** Rwanda Animal Resources Improvement Cooperative (RARICO) is a cooperative created in 2017 providing extension services to SMEs and Cooperatives in the aquaculture sector.
- **Fine Fish ltd:** Is among the largest local hatchery and fish producer companies and expanding to feed production soon.
- **Gishanda fish farms** is a sustainable socio-economic development project partnership between Akagera National Park managed by African Parks and FoodTechAfrica producing quality tilapia fingerlings (juvenile fish), as well as tilapia production for food: and serve as a model of circular agriculture with the farm effluent fertilizing an on-site organic vegetable farm.
- **BRD**: Rwanda Development Bank that support other commercial banks in Agriculture tailored product. Potential partner enhancing service provision via support to service providers (research product development and marketing) and linkages.
- **INKOMOKO**: Business development service provider that provides training in business management skills like marketing, financial management and so on. Potential partner on enhancing technical assistance, and leverage investment.

9. Information Gaps

The following are the information gaps for further analysis:

- The exact number of producer organisations in aquaculture including cooperatives and SMEs;
- Annual demand for fingerlings;
- Number of processors;
- Number of traders and retailers.

Annexes

Annex 1. Next Steps

During the inception phase, CASA Rwanda employed a market systems development approach to arrive at the inception deliverable of this Inclusive Growth Strategy document.

Supported by the project's technical advisors, the CASA country teams completed the following steps of the market systems development approach:

i) Development of the market dynamics and institutional landscape (combination of desk research, key informant interviews and participatory stakeholder workshops);
ii) Analysis of systemic constraints and underlying causes of slow investment uptake for commercialisation of the aquaculture market including validation with market actors;
iii) Development of the inclusive growth strategy for stimulating greater investment in the aquaculture sector along with theory of change and vision of change;
iv) Mainstreaming of CASA cross-cutting themes (gender and social inclusion, climate and environment, food security and nutrition, and animal welfare) in (i) and (ii) above;
v) Identification of intervention areas and design of outline projects, including initial interactions with potential SME and other partners and service providers, and completing pre-due-diligence assessments of SMEs;
vi) Developing an initial list of potential sources of finance and investment for SME matchmaking, including accelerators and incubators for potential BDS and support to SMEs for investment readiness preparation.

The next steps in the process are:

a. scoping of project concept notes (first three months of implementation), including mainstreaming of CASA crosscutting areas;
b. design of project plans, including mainstreaming of CASA crosscutting areas and monitoring and results measurement activities, as well as partner due-diligence exercises, negotiations and contracting;
c. implementation, monitoring, results measurement and evaluation;
d. collaborating with Component C on preparing aquaculture SME success stories and engaging with investment actors.

For FCDO to agree that a project is relevant, it may be necessary to make some changes to the outline projects portfolio during scoping of the project concept notes. CASA employs the following criteria to select relevant projects for producers, SMEs and the enabling environment:

- Does the project directly or indirectly target smallholders, especially women, with the capacity to step up – that is, increase production, productivity and quality to meet market requirements?
- Does the project directly respond to the food security needs of the region and/or the country?
- Are there suitable actors available to partner with?
- Does the project avoid distortion of the market and create a sustainable market?
- Does the project create access to commercial markets for target smallholders?
- Does the project demonstrate a business case or new business model that will attract investment to commercialise smallholder supply chains?

- Is the project feasible, sustainable, scalable and relevant (in terms of factors such as resources and timelines)?
- Are the cross-cutting issues incorporated where relevant?

CASA Component A employs the following guidelines to select partners:

- Businesses with an annual turnover under $2.0 million, or less than 50 employees, or is classed as an SME or producer organisation as defined in the country they are based;
- Wants to raise finance in the range of $10,000 to $1,000,000 either immediately or in the foreseeable future. (Exceptions could be possible to the lower limit, where there is expected to be a second round of finance meetings or the limit is expected to be exceeded during the life of the CASA project);
- Ideally has not received finance in the past and does not have any significant outstanding loans. (An exception may be an SME seeking finance within the above range for a new stage of expansion);
- Already engages or has potential to engage significant numbers of smallholders in the supply chain, and shows willingness to do this;
- Demonstrates commitment to a growth and development strategy or ambition, and demonstrates commitment to undertake their responsibilities under CASA support;
- CASA has the potential to add value to the partnership (ideally something that the partner would not achieve or undertake without CASA support);
- Lastly, all partners must pass CASA's due-diligence assessment.

Work on identifying a roster of potential BDS providers for engagement, including assessment of service and delivery capacity building needs, will commence early in implementation. CASA expects to focus on a small number of the most relevant providers. Capacity building may centre on services development, testing and service evaluations and consumer and other research. Provider selection criteria are expected to include:

- Capacity to deliver services;
- Close to SHFs and SMEs in culture, operating environment and geography;
- Low cost structure;
- Commercial focus, business culture and accounting and management systems;
- Organisational independence, especially from donor funds;
- Focus on services for SHFs and agri-business SMEs.

CASA will conduct an initial mapping of the investment landscape in Rwanda. A similar exercise for finance landscape mapping will also be conducted . The lists of actors from these exercises will be updated periodically.

The sector-inclusive growth strategy is responsive to weaknesses in service markets, the enabling environment and aggregation in the market system; and to the lack of investment needed for growth. Strategy formulation involves: (1) identifying the market potential, through calculations to show the sector's potential; (2) developing a sector vision of change for an inclusive, competitive sector; and (3) designing a portfolio of interventions that can be targeted at specific market actors or groups of market actors to drive changes in the market system and attract investment into target agribusinesses.

Annex 2. Existing Donor Initiatives

Donor	Intervention
USAID-Orora Wihaze	Promoting access to, and consumption of animal-sourced foods (ASF)
ENABEL	PRISM-ENABEL-Capacity Building and Access to Finance
IFAD	PRISM-IFAD- Infrastructure

Annex 3. List of Potential Partners

Partner Name	Profile	Location	Project Ideas
RARICO	Rwanda Animal Resources Improvement Cooperative is a cooperative created in 2017 by 36 members graduated in Animal Sciences, Veterinary Medicines, Wildlife and Aquatic Resource Management and related fields. The cooperative has 90 members (66 males and 24 females). Many of these members have done on-job trainings in Israel International Agriculture Training Center, Agrostudies and Kinneret College.	Kigali City	Provision of subsidized extension services to producer organisation.
Fine Fish	Fish Fish is a local company producing 20 tons of tilapia fish monthly. It has its own hatchery that can produce 500,000 fingerlings every month and is opening an aqua feeds factory soon that will have a capacity to produce 40,000 tons of aqua feeds daily.	Rwamagana	Provide technical support to fine fish to be investment ready. Facilitate marketing and promotional campaigns on the introduction of new feed product on the market.
Inkomoko	Inkomoko offers business advisory, access to finance, and market linkages to entrepreneurs to create thriving communities. Inkomoko started in Rwanda ten years ago and now has offices in Kenya and Ethiopia, working with more than 10,000 entrepreneurs a year.	Kigali City	Provision of BDS to producer organisations
Development Bank of Rwanda	Development Bank of Rwanda (BRD), is a Public Company Limited by Shares, with a share capital of RWF 57,808,931,000, registered at the Officer of the Registrar General, whose company code n° 100003547. For more than four decades, BRD has been the sole provider of long-term finance and has significantly facilitated	Kigali City	Leverage investment for feed millers to increase storage facilities and working capital for raw materials bulk purchasing.

	the emergence of different productive enterprises in the private sector.		
Gishanda fish farms	On October 18th, Gishanda Fish Farm introduced an innovative and new skills to accelerate aquaculture development in Rwanda, providing employment opportunities to surrounding communities and delivering an accessible source of protein to combat local nutritional deficits.	Kayonza	Facilitate awareness campaigns on nutritional benefits of consuming fish

Annex 4: Commercial banks landscape in Agriculture

Financial Institution	Dedicated Agri-finance unit	No. dedicated Agri-lending officers	Agriculture lending products offered	Agriculture lending as % of overall loan portfolio
Commercial Banks				
1) Bank of Kigali	Yes	1	Trader loans	Not known
2) I&M Bank	No	None	Coffee and tea processing	Not known
3) Compagnie Générale de Banque (Cogebanque)	No	N/A	Input/working capital credit	Not known
4) Kenya Commercial Bank (KCB) Rwanda	Yes	4	Input loans, inventory credit, cash cover loans to MFIs and Coops	3-5%
5) Ecobank Rwanda	No	-	Trader loans (WRS)	Not known
6) Banque Populaire du Rwanda SA (BPR)	No	None, though they had one in the past	Cooperative loans and trader loans, processing	Not known
7) Bank of Africa Rwanda	No	-	-	-
8) Equity Bank	Yes	5	Value chain financing	1.3%
9) Access Bank	No	-	-	-
10) Guaranty Trust Bank	No	-	Trader credit lines	Not known
11) Commercial Bank of Africa	No	-	-	-

Annex 5: Main Microfinance institutions landscape in Agriculture

Financial Institution	Dedicated Agri-finance unit	# dedicated Agri-lending officers	Agri lending products offered	Agri lending as % of overall loan portfolio
Microfinance Banks				
1) AB Bank Rwanda	No	-	-	-
2) Unguka Bank	Yes	3	Value chain finance products	12%
3) Urwego Opportunity Bank	Yes	11	Value chain finance products	17%
4) Commercial Bank of Africa Rwanda	No	-	-	-
Microfinance Institutions				
1) RIM	Yes	3	Value chain finance products	31%
2) Duterimbere	No	None but Loan officers were trained on agri products	Micro leasing, savings, inventory credit, Solidarity group loans and investment loans, ag input and post-harvest loans for group and individuals	18%
3) Clecam	No	Dominantly in agriculture	Input loans, group loans and trader loans	75%
4) Umutanguha	Yes	3	Value chain finance loans	23%

Annex 6: Intervention Areas, Projects, and Project Types for Year 1 and 2

INTERVENTION AREAs (IAs) and PROJECT TITLES	PROJECT TYPE			
	PO	SME	EE	Total
IA1: Strengthening sector performance				1
Project 1.2: Provision of BDS support to selected farmer organizations and SMEs		1		
IA2: Leverage investment for SMEs				2
Project 2.1: Improve access to finance for SMEs and Cooperatives through investment and working capital finance	1	1		
IA3: Technical assistance support				2
Project 3.1: Support provision of extension services on a subsidised rate, **Project 3.2** : Support provision of BDS to farmer organisation, **Project 3.3** Support of marketing and promotional campaigns of the new feed products in the market	2			
IA4: Raise awareness				1
Project 4.1: Support awareness campaigns on the nutritional benefits of consuming fish.		1		
TOTAL:	**2**	**4**	**1**	**6**