

An ecosystem approach for tilapia value chain development in Kenya

Service Delivery Model Analysis

March 2023



idh
transforming markets





Disclaimer

Note that this Service Delivery Model was being designed at the time of the analysis. The report explores possible ways of implementing the designed farmer development strategies together with identified value chain players in the aquaculture value chain in Kenya. The analyses provided are based on projections and assumptions; only limited actual data was available.

IDH, Lattice Aquaculture, and involved value chain players have used the results of this report to inform their strategy, project design, and future business models, but cannot be held accountable for meeting any targets included in the report.

If you are interested on more detailed information, [please contact us](#).

Preface

Smallholder livelihoods

Aquaculture in Kenya has been promoted as a means of improving nutrition, income generation, alternative livelihood option and job creation, particularly in the rural areas. Aquaculture in the country has mainly been extensive with the full potential yet to be achieved. This is due to challenges such as insufficient production skills and knowledge, lack of high-quality inputs, limited access to finance and knowledge for farmers.

Service Delivery Models (SDMs)

SDMs are supply chain structures which provide farmers with services such as training, access to inputs, finance and information. SDMs can sustainably increase the performance of farms while providing a business opportunity for the service provider. Using IDH's data-driven SDM methodology, IDH analyzes these models to create a solid understanding of the relation between impact on the farmer and impact on the service provider's business.

Insights & Innovations

Our data and insights enable businesses to formulate new strategies for operating and funding service delivery, making the model more sustainable, less dependent on external funding and more commercially viable. By further prototyping efficiency improvements in service delivery and gathering aggregate insights across sectors and geographies, IDH aims to inform the agricultural sector and catalyze innovations and investment in service delivery that positively impact people, planet, and profit.



An Integrated Approach to Enhancing Tilapia Farmer Productivity and Market Linkages

IDH Kenya has partnered with Lattice Aquaculture to improve the productivity, profitability and sustainability of fish farms in Kenya through an integrated ecosystem approach. This approach is incorporated in a first phase technical assistance project for the period 2021 – 2023.

The project focusses on the Western and Eastern regions of Kenya with the objective to scale up the productivity of smallholder tilapia farmers (SHFs) and enhance market linkages, specifically by implementing interventions in the areas of:

- Production efficiency: Increase fish productivity and reduce cost of production by reducing the production cycle length and lowering the feed conversion ratio.
- Distribution: Provide market access for tilapia produced by the SHFs.
- Access to finance: Improve farmers access to finance by facilitating linkages to financial service providers.

Special thanks to [all partners](#) who have contributed to the development of this report and the establishment of the project.



Report outline

To navigate between the different chapters, simply click on the corresponding name in the reading guide on the right of each page, and you will be taken to the first page of that chapter

1 Executive summary

2 Key recommendations

3 State of the sector

4 The Service Delivery Model

5 VCPs cases

6 Impact case

7 Annex





Abbreviations

AA	Aquaculture Academy
BMUs	Beach Management Units
CAPEX	Capital expenditure
FCR	Feed conversion ratio
FO	Farmer organizations
FSPs	Financial service providers
HH	Household
KMRFI	Kenya Marine & Fisheries Research Institute
OLB	Outstanding loan balance
RAS	Recirculating aquaculture systems
SDM	Service delivery model
SHFs	Small holder farmers
USD	United States Dollar
VCPs	Value chain partners
VSLAs	Village savings and loans associations



1

Executive summary



The opportunity | The potential for Kenya's fisheries sector (particularly aquaculture) is yet to be met presenting significant untapped opportunities for key value chain players (VCPs).



Fish (aquaculture) farming in Kenya

- Current production of fish in Kenya (est. 147,000mt in 2019) is not enough to maintain the already low per capita fish consumption (<5kgs) for the growing population with an estimated supply-demand gap of 116,000mt in 2019.
- The high population growth, increasing incomes, and per capita consumption is expected to further drive the demand to 333,000mt by 2030.
- Cheap imports from countries such as China have been on the rise to supplement the rising demand but in turn affect local fish prices.
- Despite its current low contribution to total production (13%) aquaculture is essential in bridging the widening gap between supply and demand as inland fresh water sources have exceeded their maximum sustainable yields.
- Aquaculture farming, is dominated by small scale pond farmers (owning 1-2 ponds). Most volumes however, come from cage farmers located around the lakes.
- The highly fragmented value chain presents multiple challenges for farmers who not only struggle to access quality and affordable inputs but also premium markets.



About the SDM (Service coalition)

- To enhance tilapia production in Kenya, IDH and Lattice Aquaculture have brought together a consortium of partners to tackle different challenges facing smallholder producers;
 - [Aquaculture Academy \(AA\)](#): The knowledge arm of Lattice Aquaculture provides training on good aquaculture practices.
 - [Aquarech Limited \(Aquarech\)](#): A fish off-taking company leveraging technology to enhance access to inputs, credit and facilitate market.
 - [Tunga Nutrition \(K\) Limited \(Tunga\)](#): Established as a joint venture between Unga Group Ltd and Skretting, the company provides quality fish feed both locally produced and imported.
 - [Jewlet Enterprises \(Jewlet\)](#): Located in the Western region of Kenya, Jewlet is involved in the production of fingerlings and market-size tilapia fish using Recirculating aquaculture systems (RAS), ponds, and cages.
 - [Kamuthanga Farm Limited \(Kamuthanga\)](#): Located in the Eastern region, Kamuthanga is an EcoMark Africa certified farm that leverages RAS in the production of fingerlings and market-size fish.
 - [Finance providers](#): Provide tailored credit to the farmers.
- This pilot project will initially – in the first 2 years - target 50 farmers spread across Eastern and Western regions with the vision of scaling it to 1,350 farmers by 2026.



Summary | While SDM farmers experience a significant income uplift as a result of the project services, it is still not sufficient to reach the living income benchmark.

	Observation	Recommendation
Farmer value/ income uplift	<ul style="list-style-type: none"> The study established <u>3 pond and 3 cage farmer segments</u> based on the average number of production units. Performance of the SDM farmers (those receiving services from the service coalition) is compared to baseline farmers (those that don't receive services). Annual revenue of SDM pond farmers is estimated to increase by an <u>average of +110% generating additional income of \$ 12,000, \$12,300 and \$ 18,700</u> for small, medium and large farmers respectively by YR 5. The highest revenue increase (+182%) is projected for medium scale farmers as they increase their production units over the 5-year period. However, despite the revenue increase none of the pond farmer segments <u>achieves a positive net income year on year</u> as the costs outweigh the income. Net income for the small-scale pond farmers particularly, decrease by <u>-282% to -\$1,496 by YR 5</u> due to the higher investments made to transition to nurseries. Further, <u>the five-year average net income for all the pond farmers falls below the living income benchmark</u>. SDM cage farmers on the other hand increase revenues by an average of <u>210% generating additional income of \$ 124,000, 176,000 and 228,000</u> for small, medium and large farmers respectively by YR 5. All the SDM cage farmer are estimated to generate positive net incomes from YR 1. However, only the <u>large cage farmers achieve living income</u> on a five-year average. 	<ul style="list-style-type: none"> Price will be a critical driver in achieving living income for all farmer segments. Nursery farmers can consider selling some of the fingerlings to end consumers as well as growing bigger fingerlings(+10g) to fetch higher prices. Price for a kg table fish also needs to increase from Ksh 300 to atleast <u>Ksh 400 for pond farmers and Ksh 325 for cage farmers</u>.¹⁾ This will require farmers/farmer groups to undertake proper marketing and identify niche markets for their produce.
Farm productivity	<ul style="list-style-type: none"> By employing good aquaculture practices, including proper feed management, monitoring of temperature and water quality the SDM pond farmers can potentially reduce the cycle length from 8 months to 6 months while SDM cage farmers reduces the same from 10 months to 6 months. As a result, farmers can achieve upto 1.5 cycles/year for pond farmers and upto 2 cycles/year for cage farmers. This contributes to lower fixed costs such as salaries. Most of the farmers, however, lack the necessary equipment to monitor production. Further, only <u>24% of farmers</u> access aquaculture training. 	<ul style="list-style-type: none"> Support farmers in acquisition of the necessary equipment e.g., PH and oxygen meters. This could be through subsidised equipment prices. Need to also ensure continuous access to practical training and mentorship services.

1) Assuming all other factors are held constant



Summary | Cost of production, largely driven by feed cost (a daily cost) is estimated to increase significantly with most of the farmers experiencing volatility in their cashflow throughout the year.

	Observation	Recommendation
Cost of production	<ul style="list-style-type: none"> Cost of production is estimated to increase significantly for <u>both the SDM pond and cage farmers</u> as they transition to use quality fingerlings and feed compared to the baseline farmers. Small scale pond farmers particularly increase <u>cost of production by 262%</u> as specialisation in nursery activities require higher fry stocking density. Production cycles in a year also increase from one (when involved in grow-out activities) to four (when involved in nursery activities). Despite the projected reduction in feed conversion ratio from 1.9 to 1.5, the overall cost of feed remains quite high due to the high prices of good quality feed. Feed cost account for average of <u>56% of cost of production</u> for pond farmers although this is lower than the baseline farmer at 69%. On the other hand, cost of feed is <u>82% of total cost of production for cage farmers compared to the baseline farmers at 87%</u>. This is due to the higher stocking density and thus higher volumes of feed required for cage farmers. Current feed prices avg. <u>(Ksh 170/kg)</u> in the country are significantly higher than the direct import cost of the same feed avg. <u>(Ksh 105/kg)</u>. SHFs, however, lack critical mass to justify direct imports. 	<ul style="list-style-type: none"> Re-negotiate the feed prices with the feed provider to further reduce the cost of production for the project farmers. Establish sector-wide collaboration to explore solutions to challenges facing the feed industry in the country such as raw materials availability.
Farmer cash-flow	<ul style="list-style-type: none"> Monthly cashflows for the small-scale pond farmer <u>remains volatile and in negative condition</u> throughout the year. Despite the critical need for financing, <u>provision of finance makes the farmers debt trapped as they are not able to repay the loans.</u> Medium and large-scale pond farmers are only cash strapped for <u>3 months with the cash position</u> smoothened with provision of finance. However, similar to the <u>small-scale pond farmer medium scale pond farmers are also debt trapped and unable to repay the loans.</u> Reaching the <u>critical number of production units in Y5</u>, the small-scale cage farmer will be able to gradually repay pending outstanding loan balance (OLB) from YR5 onwards. <u>Medium and large-scale cage farmers on the other hand earn a sufficient margin</u> to completely repay the provided working capital from YR1. 	<ul style="list-style-type: none"> Working capital and investment financing especially for the small and medium pond farmers will require a <u>combination of both commercial and subsidized/patient capital.</u> Need therefore to leverage multiple finance providers.



Summary | The SDM is projected to create up to 21mn USD/year over the next five years. The value generated can be redistributed to enhance sustainability of the Aquaculture Academy.

Observation	Recommendation
Value for feed provider <ul style="list-style-type: none"> The <u>majority (71%) of the project farmers</u> use local commercial feed which impacts on their FCR indicating a clear need for quality feeds. The SDM is projected to generate an <u>average of 14,000 - 26,000 Mt demand of</u> feed annually from the project farmers. Feed demand is projected to grow by <u>more than 2,700%</u> between YR 1 and YR 5. The volume of soy (<u>accounting for 31% of raw materials</u>) needed to meet the feed demand is expected to grow <u>thirty-fold over the five-year period</u> to meet the highest feed demand. This is expected to pose a major challenge given current shortage of soy in the country. 	<ul style="list-style-type: none"> Explore alternative protein sources to replace soy while establishing broader linkages to develop the soy value chain.
Value for fingerlings providers <ul style="list-style-type: none"> Given the highest proportion (90%) of the farmers are in the Western region, Jewlet is projected to supply more fry/juveniles (up to 0.5g) to the project farmers than Kamuthanga. Kamuthanga is estimated to <u>supply 22Mn fry/fingerling</u> and source <u>upto 324,000Mt of fish</u> (from farmers based in the Eastern region). 	
Value for off-taker <ul style="list-style-type: none"> Aquarech can source <u>43,000 Mt fish</u> and distribute 26,000 Mt feed by YR 5. Sourcing volumes from the project farmers are estimated to surpass the current <u>processing capacity of Aquarech by YR 4</u>. 	<ul style="list-style-type: none"> Provide support to the off-taker to acquire additional infrastructure needed to meet the growing volumes.
Value for FSPs <ul style="list-style-type: none"> <u>+81% of the project farmers</u> rely on their own capital for their fish operations which limits growth. Working capital needs of the project farmers grow from <u>\$1.1Mn in YR1 to \$53Mn by YR 5</u> while the <u>investment capital needs grow to \$410,000</u> as more farmers acquire additional production units. 	<ul style="list-style-type: none"> Explore multiple sources of financing that meet the needs of the farmers.
Value for Aquaculture Academy <ul style="list-style-type: none"> They provide the trainings at very subsidized rates of Ksh 5,000 and Ksh 10,000 for light and intense training programs respectively. This is however, less than 10% of the total costs incurred to deliver the trainings. 	<ul style="list-style-type: none"> Explore measures to redistribute <u>value from the other VCPs to the academy to enhance its sustainability</u>.



Summary | There is a need to integrate gender interventions in the implementation of the project as well as building capacity of the of the AA to manage the farmer groups.

	Observation	Recommendation
Capacity of the VCPs	<ul style="list-style-type: none"> The coalition is able to leverage strengths , capabilities and capacity of the VCPs to effectively deliver the services to farmers. <u>Some capacity gaps were however</u>, identified on farmer organisation, management and professionalization. Given the importance of the farmer groups in the scale up process, this capacity needs to be built. 	<ul style="list-style-type: none"> Engage organizations that specialise in capacity building of groups in order to build the capacity of both the AA and the farmers. Collaboration between the implementing partners will be crucial for this.
Gender integration	<ul style="list-style-type: none"> Although having high control over their own earnings, women are hindered to perform capital intensive business investments, <u>due to relatively low incomes and a limited ownership of assets</u>. While women perform most of the production activities (79%), they only own on average 7% of the production facilities. Women face multiple challenges related to access to capital, land ownership, and access to the required skills of operating the fish farms. Most of the VCPs do not have a documented gender policy/strategy. While in some gender balance in employment has been achieved, this has in most cases been unintentional. Service provision is also not tailored based on gender needs. Lattice Aquaculture (the project implementer) has drafted a gender strategy to ensure gender is mainstreamed in all internal and project external activities. Gender outcomes have however not been defined at the project level. 	<ul style="list-style-type: none"> The project needs to incorporate gender interventions (such as inclusive consultation, ensuring equitable access to resources etc.) <u>and define gender outcomes that need to be achieved</u>.



Barriers and risks | While the SDM service coalition revolutionises service delivery to tilapia farmers, there are critical barriers and risks that need to be overcome for scale-up.

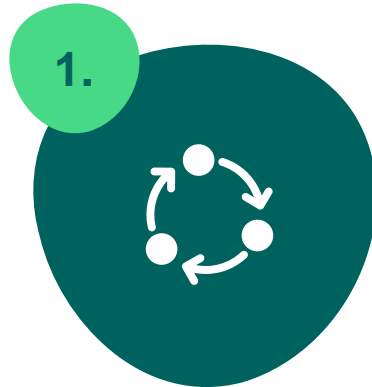
	Barriers and risks to scale	Recommendations
Narrow SDM	1 Farmer behavior and extension services: The willingness of farmers to change their current practices is crucial for the success of the pilot and the scale up. The assumptions on the business case of the VCPs and the farmers are largely pegged on the ability and willingness of the farmers to adopt good aquaculture practices and of the Aquaculture Academy to sustainably deliver extension services.	<ul style="list-style-type: none"> • Select lead/model farmers that will support in the behavior change process. • Enhance sustainability of the AA by redistributing value from other VCPs.
	2 Governance of the service coalition: While the current SDM set up has defined clear roles for all the partners involved, mechanisms for data and infrastructure sharing as well as mechanisms to distribute cost, risk and value have not been established which could result in conflict during scale up.	<ul style="list-style-type: none"> • Explore innovative data and infrastructure sharing mechanisms based on current data needs and existing infrastructure.
Scope	3 Group formalization and professionalization: The 50 farmers in the pilot will play a critical role in the project scale up. These farmers will be organized in a formal group with sub-groups through which services can be delivered to the individual farmers. Professionalization of the (sub) groups including proper corporate governance structures is crucial for scale up.	<ul style="list-style-type: none"> • Establish a farmer group development program that enhances the professionalization journey.
	4 Low interest/goodwill of financial service providers: Given the capital-intensive nature of fish farming, it will be critical to bring on board providers who demonstrate a willingness and higher risk appetite to lend to the farmers and/or other value chain players	<ul style="list-style-type: none"> • Explore alternative financing structures including blended finance and financiers such as impact investors.
Broad Sector-wide	5 Raw material availability for key inputs: The fish feed industry in Kenya has been facing challenges due to shortages in key raw materials such as soya bean. This consequently affects the quality and price of feed which is crucial for productivity enhancement.	<ul style="list-style-type: none"> • Develop broader agriculture industry linkages to facilitate access to alternative raw materials
	6 Lack of industry coordination: The aquaculture value chain in Kenya is highly fragmented with no industry body to lobby and conduct advocacy activities. Without a coordinated approach, the industry is unable to effectively solve most of the pressing challenges facing different value chain players.	<ul style="list-style-type: none"> • Set up a convening platform/working group to continuously innovate on challenges facing players.



2

**Recommen
ndations**

Recommendations | There are six pathways of interventions that are drafted to create an insight into the practical implication of our recommendations.



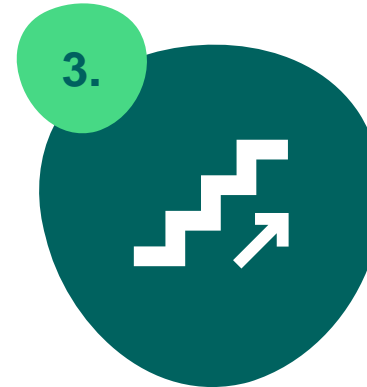
EXTENSION SERVICES

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GROUP FORMING

[HERE](#)



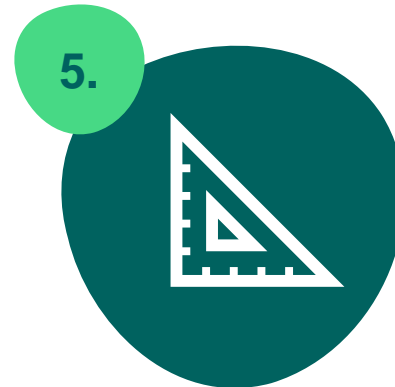
GROUP BUILDING

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GROUP FINANCING

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FINANCE TAILORING

[HERE](#)



GENDER INTEGRATION

[HERE](#)



Recommendation 1 | Sustainably financing the extension services, which is critical for scale up of the project, requires a combination of multiple funding sources and fair value distribution.

SCENARIO 1: PROPORTIONAL CONTRIBUTION

Amount contributed by all VCP players to the extension kit based on value generated for them.

VCPs	Avg. Annual contribution (US\$) ¹⁾
Tunga	5% of created value
Aquarech	
Jewlet	
Kamuthanga	
Total	x Mn

**FARMER
EXTENSION
SERVICES KIT
(Avg. USD 3 MN
ANNUALLY)**

SCENARIO 2: UNPROPORTIONAL CONTRIBUTION

A fixed amount contributed by all VCP players regardless of the value generated for them.

VCPs	Avg. Annual contribution (US\$) ²⁾
Tunga	x Mn per VCP
Aquarech	
Jewlet	
Kamuthanga	
Total	x Mn

FARMERS

SHFs ability to afford training is limited given the low profitability of fish farming. The amount they pay can potentially be increased as they become more profitable.

GOVERNMENT

The role of the public sector in financing extension services remains crucial. There is a need to continuously explore partnerships with county governments.

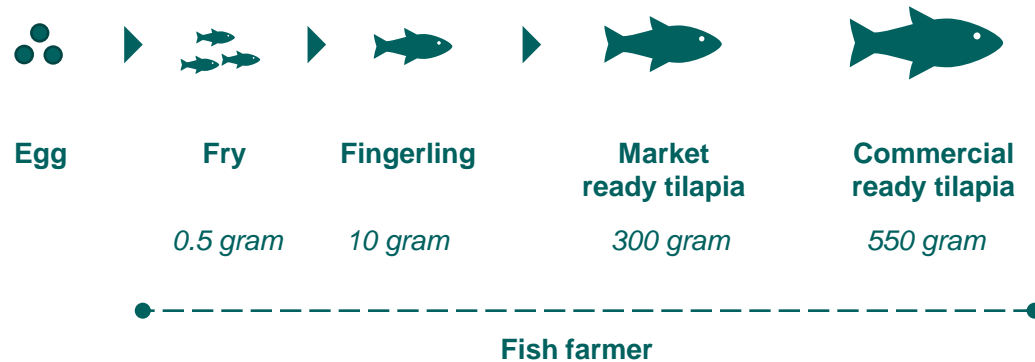
DEVELOPMENT INSTITUTIONS

Donors, NGOs, foundations and other development institutions also need to be leveraged to finance aquaculture extension, especially in the formative years.

Note: 1) Based on an assumption of 5% of value created – VCPs spent around 2-3% on extension services; 2) Assuming VCPs finance at least 25% of the cost of extension services

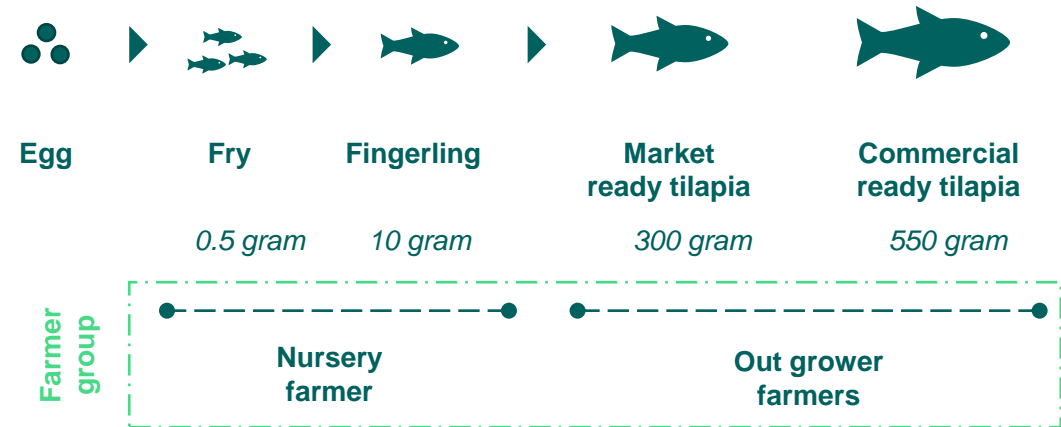
Recommendation 2.1 | Establish farmer groups that consists of specialist pond nurseries (small scale) and specialist out growers (large scale) to realize synergies from specialization.

CURRENT APPROACH



- Both pond and cage farmers grow fish from **2 gram** fingerling up to **300/550 gram** table fish.
- Current cycle length (**7-8 months**) puts pressure on cash flows with farmers investing high cost of feed into purchasing fingerlings and feed, which they only recover during harvest.
- Pressure on cash flows hinders farmers to buy good quality fingerlings and high quality feed, which causes lengthy and expensive growth cycles.
- Therefore, farmers are caught in an unproductive cycle without the ability to make a transition in becoming more productive and potentially profitable.

TO BE ESTABLISHED APPROACH



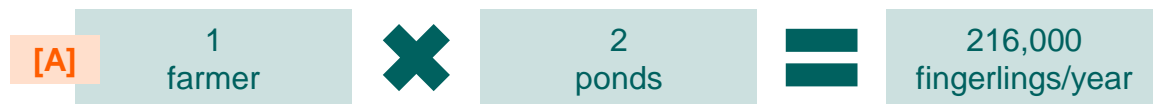
- Small scale pond farmers are advised to transition to and specialize in nursery operations (**growing fry of 0.5g to fingerling of 10g**), which enables the nursery farmers to decrease their production cycle of fingerlings from 7 to 4 months. Medium scale out grower farmers are to expand the number of production units, which enable them to benefit from economics of scale.
- One nursery can supply an average of **5 out growers** with their required number of fingerlings.
- To ensure the continuity and sound collaboration in the farmer group, clear agreements should be made around the sales price of fingerlings, which allows all stakeholders to earn a reasonable margin.



Recommendation 2.2 | Define the right balance of farmers within a farmer group based on geographical spread, farmer performance, and other significant value chain characteristics.

NURSERY TO OUTGROWER RATIO **

Pond nursery



11 farmers *
144 ponds
52,000 kg/year

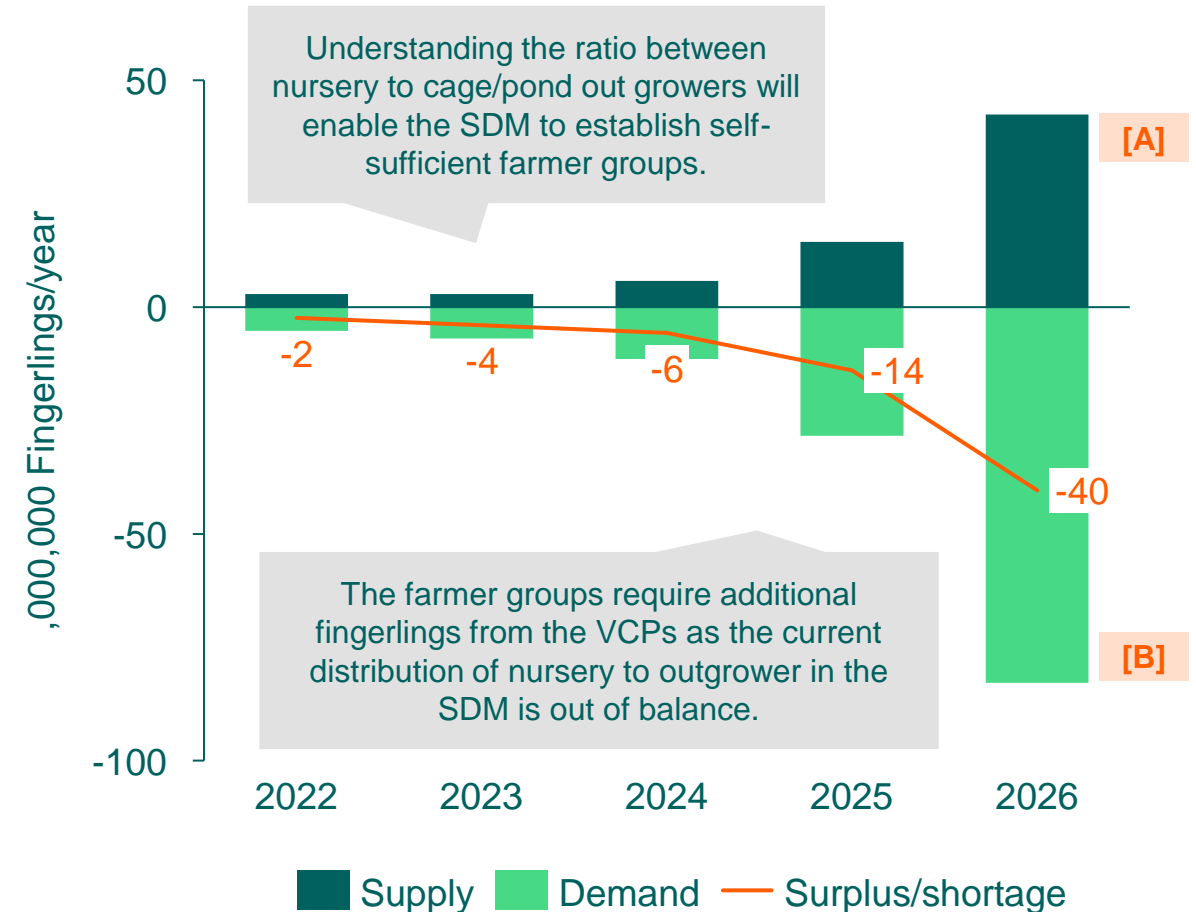
1.5 farmers *
15 cages
73,000 kg/year

Pond specific farmer group

Cage specific farmer group

NOTES: * Based on medium size farmers in third year performance ([here](#)); ** Based on the distribution of farmers between the [different segments](#), a total of 20 farmers are to transition to becoming nurseries. These 20 nurseries are insufficient to produce the required fingerlings for the 30 out growers in the SDM.

SDM SELF-SUFFICIENCY **





Recommendation 2.3 | The difference in growth cycle length, the associated finance cost, and the prevailing market price for table-size fish steer initial value distribution towards out-growers and show the importance of how to ex-post redistribute value to the nurseries.

Sensitivity on annual net-income analysis of farmer group ^{1), 2), 3)}

	Nursery farmers	Medium pond	Large pond	Small cage	Medium cage	Large cage	Total group ³⁾
5.0 KES/#	- 50,000,000	- 300,000	150,000	50,000	800,000	3,200,000	- 12,675,000
10.0 KES/#	- 5,000,000	- 400,000	- 350,000	- 500,000	- 350,000	300,000	-13,125,000
15.0 KES/#	40,000,000	- 550,000	- 750,000	- 1,050,000	- 1,550,000	- 2,600,000	- 14,175,000
20.0 KES/#	85,000,000	- 700,000	- 1,200,000	- 1,550,000	- 2,750,000	- 5,500,000	-15,050,000
25.0 KES/#	130,000,000	- 900,000	- 1,650,000	- 2,100,000	- 3,950,000	- 8,400,000	-16,625,000

NOTE: 1) The evaluation is based on the third year performance of the SDM farmers; 2) Analysis is performed on financial performance and borrowing without carrying forward possible outstanding amounts; 3) Calculation based on a farmer group of 50, with the distribution as indicated [here](#).

Recommendation 3.1 | Establish a farmer organization development cycle that formalizes the journey towards maturity and professionalization of farmer organizations.



Establish	Segment	Support	Reward
<ul style="list-style-type: none"> Determine minimum criteria for an FO to be established and for farmers to join an FO. Establish legally bounding FOs with the right combination of nurseries to out growers. Ensure members of the FO understand the business case of their FO, the responsibilities they have in the FO, and benefits they have from the FO. 	<ul style="list-style-type: none"> Perform a baseline assessment on the FOs business case and responsibilities. At the start of each performance improvement cycle (annually/per cycle), cooperatives can be segmented by assessing the level of member loyalty and level of professionalism. Based on the evaluation, FOs are plot against the FO Maturity Track which forms the starting point of the graduation path for each participating farmer organization. 	<ul style="list-style-type: none"> Each graduation step on the path to maturity comes with additional support from the SDM to the farmer organization. The type of support is focussed on preparing the farmer organization to make the next step on the maturity track towards the Mature segment. Support can range from 	<ul style="list-style-type: none"> We believe that the best way to reward for becoming a more effective business partner is financially and we propose several financial incentives for the SDM to consider. This is to be complemented by symbolic reward in the form of recognition of performance.



Recommendation 3.2 | The cycle could be designed such that segments and incentives are align to reflect the SDMs long-term goal of sustainably increasing tilapia production in Kenya.

Maturity Track	Segment evaluation ¹⁾		Segment rewarding ¹⁾
	Loyalty & Performance	Organizational professionalism	
Incubator	<ul style="list-style-type: none"> No threshold applicable. 	<ul style="list-style-type: none"> No threshold applicable. 	<ul style="list-style-type: none"> Open account and receive training on Aquaculture App. Receive support to establish legal entity; Receive training on FO principles
Member-oriented	<ul style="list-style-type: none"> Members perform according to mentor plan ³⁾ Projected volume is agreed with individual farmers <u>during the harvesting</u> Member farmers attend the organized training and information sessions by the Aquaculture Academy and register activities on the app. 	<ul style="list-style-type: none"> Farmer organizations achieve at least 6.5 from the annual <u>professionalism assessment</u>. ²⁾ 	<ul style="list-style-type: none"> Receive access to monitoring environment to see members performance. Provide off-take guarantee to FO through timely contracting based for 60% of their volume.
Growth-oriented	<ul style="list-style-type: none"> Members perform according to mentor plan ³⁾ Projected volume is agreed with individual farmers <u>at the start of the harvesting</u> Member farmers attend the organized training and information sessions by the Aquaculture Academy and register activities on the app. 	<ul style="list-style-type: none"> Farmer organizations achieve at least 7.5 from the annual <u>professionalism assessment</u>. ²⁾ 	<ul style="list-style-type: none"> Provide off-take guarantee to FO through timely contracting based for 70% of their volume. Provide training and link FOs to financial service providers to establish own finance facility.
Mature	<ul style="list-style-type: none"> Members perform according to mentor plan ³⁾ Projected volume is agreed with individual farmers <u>at the start of the growing cycle</u> Member farmers attend the organized training and information sessions by the Aquaculture Academy and register activities on the app. 	<ul style="list-style-type: none"> Farmer organizations achieve at least 8.0 from the annual <u>professionalism assessment</u>. ²⁾ 	<ul style="list-style-type: none"> Provide off-take guarantee to FO through timely contracting based for 85% of their volume.

NOTES: 1) Possible pathway of establishing a maturity track of evaluation and reward. The financial implication and success of the track could be evaluated during the TA project; 2) The score is an indication to come from a professionalism assessment, (as per framework developed by SCOPEinsight (2022) by which can be conducted by an independent organization; 3) Mentor plan consists of projected yield, quality, and delivery.

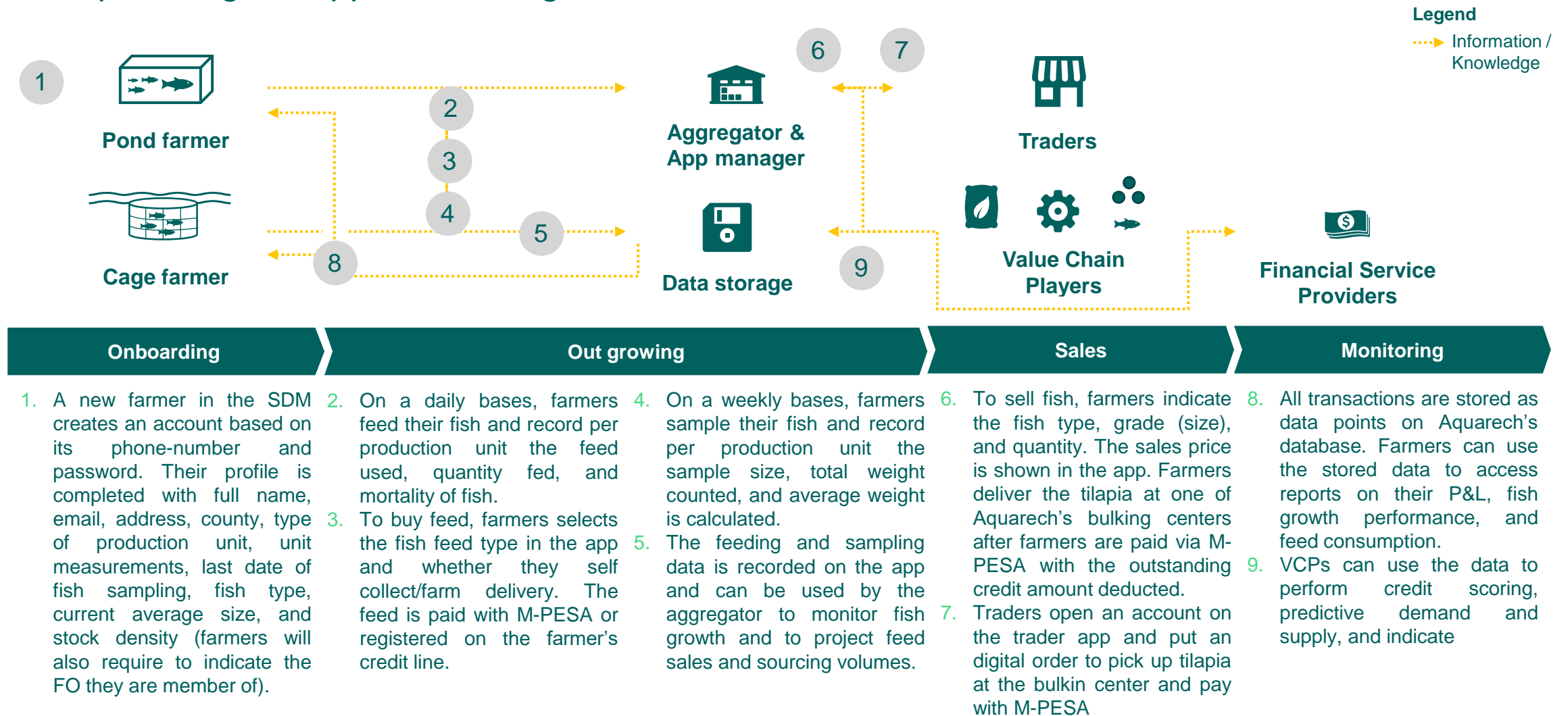


Recommendation 4.1 | Channel working capital and investments through existing value chain players (aggregators), while leveraging group risk mitigating through farmer organizations.

	PRINCIPLE	Entity providing working capital			SHF organization receiving working capital	
		Aggregator	Commercial banks	Revolving Fund	Cooperative	VSLA
Idea	To organize the financing of feed, fingerlings, and equipment a farmer on-lending infrastructure should be in place, a combination of an entity managing and providing the working capital, and a legal entity receiving and repaying the loans.	On the short-term the most feasible option is providing working capital funding to an aggregator (s). On the long-term, from a sector perspective, ideally a revolving fund is set up. This way fish farmers are more independent and farmers involved in aquaculture across the country can access these loans.	Providing loans to farmer organizations is the most secure and feasible option ¹⁾ . From a farmer's perspective, they can pool resources and manage the fish operations collectively and manage financial risks. From an SDM perspective, it enables to mitigate financial risks.			
Advantages		<ul style="list-style-type: none"> Existing entity directly involved in loan provision Relative ease of accessing capital (due to the size and credibility of the organization) 	<ul style="list-style-type: none"> Existing financing structures, readily available loan products 	<ul style="list-style-type: none"> Once set up, can provide finance in broader sector, at interest affordable rates, with tailored products Direct to fish farmer financing, independent of other businesses 	<ul style="list-style-type: none"> Formal registration provides a form of security to lenders Fully independent farmer organization, increased buy-in and bargaining power 	<ul style="list-style-type: none"> Low interest rates due to absence of formal lenders Low default rates due to social cohesion and peer pressure
Barriers		<ul style="list-style-type: none"> Accessing capital is expensive due to high interest rates High exposure due to high amounts of outstanding capital 	<ul style="list-style-type: none"> Do not lend to these SHFs or VSLAs (high-risk, small scale) Very high interest rates No fit for purpose loan products 	<ul style="list-style-type: none"> Long-term process to design and implement Requires significant funds from large scale impact investors in aquaculture for de-risking of portfolio 	<ul style="list-style-type: none"> Long-term process and costly to set up High probability to fail due to lack of organizational and governance capacity 	<ul style="list-style-type: none"> Higher risk of loan defaults due to no formal registration To little liquidity to facilitate the required working capital for fish farmers.

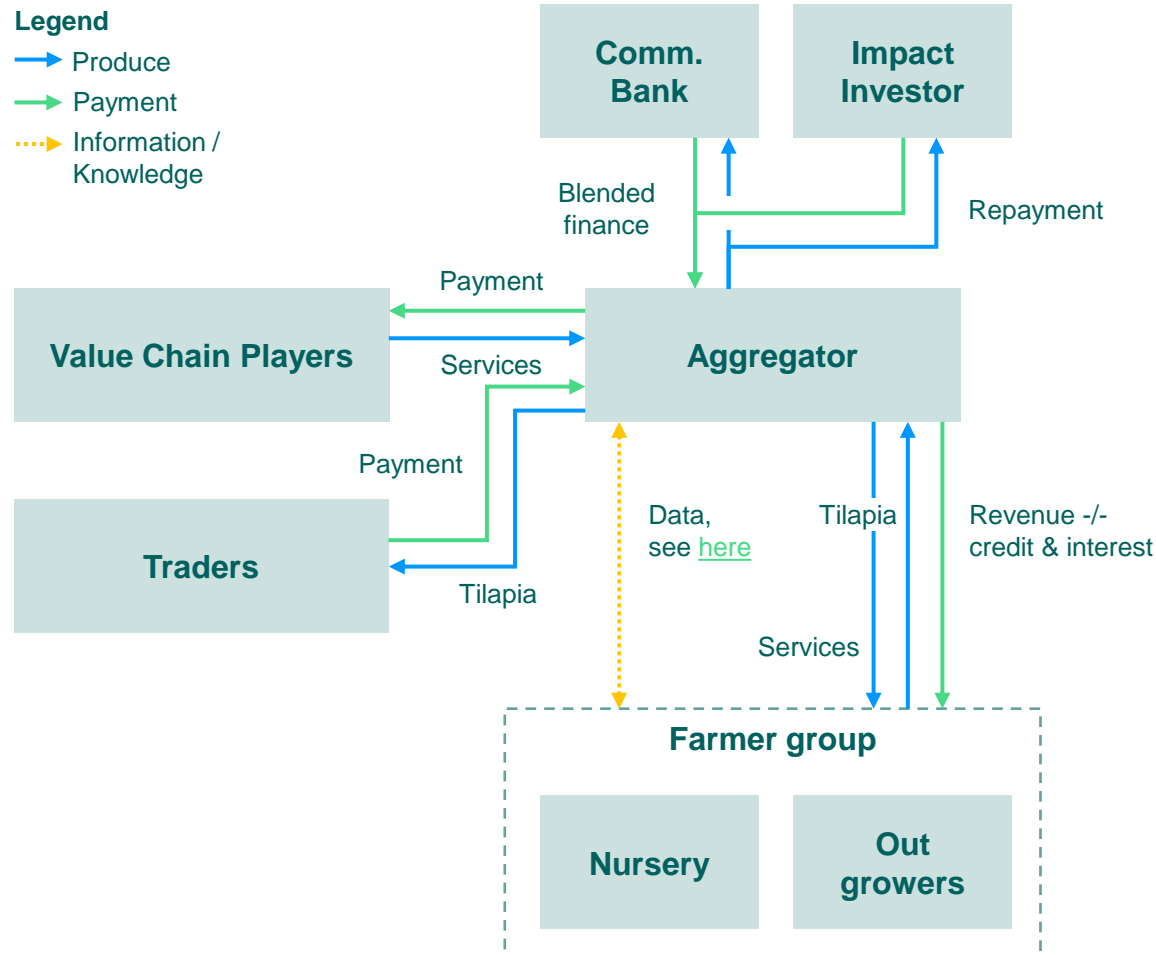
NOTES: 1) FOs become the secure and feasible option if matured to a desired stage, see [maturity track for an indication](#).

Recommendation 4.2 | Create access to finance through the Aquarech app to leverage the existing digital/physical infrastructure, while utilizing their gate-keeper position to mitigate risks, and optimizing the app for creating access to finance.*



NOTES: 1) The implementation of the recommendation should be subject to an audit of the Aquarech App's stability, capacity and sustainability

Recommendation 4.3 | Leveraging data, group synergy and risk mitigation, and an existing physical infrastructure enables this SDM to quickly scale its operations if sufficient finance is acquired.



SERVICE DESCRIPTION

Blended finance

1. A consortium of a commercial bank and an impact investor provide blended finance to the aggregator for working capital and investments at the required time and for the required amount.

Working capital

1. The aggregator purchases services in bulk, stores these at their bulking facilities, and sells them to the individual farmers on credit (or direct M-PESA).
2. Farmer group, consisting of an onboarded nursery and out growers, offer group collateral, and repay in case a farmer goes default on their working capital credit and/or investment credit.
3. Farmers sell their outgrown tilapia to the Aggregator, who sells the tilapia to traders. Transportation is done by the farmers and traders.
4. The aggregator deducts the outstanding credit and interest from the revenue to be paid to the farmer and pays the farmer through M-PESA.

Investment capital

1. For new ponds/cages, the farmer is assessed, required amount calculated, unit purchased and paid by the aggregator, and directly delivered/built at the farmer.
2. The annuity (repayment + interest) is deducted from the revenue and paid to the finance providers and the remainder is paid to the farmer.

Recommendation 5.1 | By participating in the SDM, farmers become increasingly bankable potentially overcoming the barriers to finance their transformation.

Relationship		Security		Social Impact	
Parameter	Evaluation	Parameter	Evaluation	Parameter	Evaluation
<ul style="list-style-type: none"> Years within the SDM Years of pre-financing Performance of pre-financing Nature of partnership 	Farmers who join the SDM will increase their relationship score with participating in the SDM and by adequately off taking offer services.	<ul style="list-style-type: none"> Personal guarantee of owners Pledge of assets Representation at action 	There are limited possibilities to increase bankability from securities.	<ul style="list-style-type: none"> Number of farmers in network Direct advances, inputs, and/or technical assistance to other farmers 	Farmers are part of a farmer group in the SDM, which increases the size of their network and bankability from a social impact point of view.
Financial		Monitoring & Accounting			
Parameter	Evaluation	Parameter	Evaluation		
<ul style="list-style-type: none"> Certification Financial statements/documentation Profitability Debt/Equity Working capital Fixed assets 	Farmers in the SDM will increase their bankability from a financial point of view by recording their transactions on the Aquarech App, receiving working capital, and investing in additional production units.	<ul style="list-style-type: none"> Stored and signed financial documents Participation in training Accounting of data in Aquarech App 		Farmers become more bankable if they participate in the training provided by Lattice and fully utilize the quality guaranteed by Aquarech App.	



Recommendation 5.2 | Tailor financial products and terms to the segment specific requirements to achieve optimum access to finance and performance of a loan portfolio.

Finance needs			Finance terms																
To finance		Not to finance	Working capital																
<div>Labor: 5-11% of the cost per cycle, where trained personal is required, but not provided within the SDM.</div> <div>Fingerlings/Fries: 12-30% of cost, good quality fingerlings/fries increase the survival rate and can be provided in the SDM.</div> <div>Feed: 56-82% of cost per cycle, high quality feed decreases the FCR (cost per kg of fish grown) and increases the yield per cycle, while available in the SDM.</div> <div>Equipment: sensors and other equipment is required to reduce mortality and inform good aquacultural practises to increase yield per cycle and is available in the SDM.</div> <div>Other cost ¹⁾ : other cost are small operating cost, which do not influence effectiveness or efficiency.</div>			Repayment periodicity																
		Average cost distribution		Align issuing and repayment with the different cashflow movements per segment : <ul style="list-style-type: none">Nursery farmers can decrease the duration of a growth cycle from 4 to 3 months, while increasing the number of cycles from 2 to 4 per year (tenure of 3-4 months).Out-grower farmers can achieve a cycle of 7-6 months, and perform up to 1.5-2.0 cycles per year (tenure of 6 months).															
		<table border="1"><thead><tr><th>Category</th><th>Labor</th><th>Feed</th><th>Fingerling</th><th>Equipment</th></tr></thead><tbody><tr><td>Pond</td><td>11%</td><td>56%</td><td>30%</td><td>3%</td></tr><tr><td>Cage</td><td>1%</td><td>82%</td><td>12%</td><td>5%</td></tr></tbody></table>		Category	Labor	Feed	Fingerling	Equipment	Pond	11%	56%	30%	3%	Cage	1%	82%	12%	5%	Interest %
Category	Labor	Feed	Fingerling	Equipment															
Pond	11%	56%	30%	3%															
Cage	1%	82%	12%	5%															
		Investment capital		Apart from cage-farming, margins are too low and not sufficient to cover commercial interest rates (20%). <ul style="list-style-type: none">Risk of default is small due to short cycles and high demand for fingerlings.Interest decrease to be evaluated to unlock aqua-culture potential and to ensure farmers don't become debt trapped.															
<div>Pond investments: pond farming materializes small margins and breaks-even with an increased number of ponds for medium/large out-growers farmers. Hence, farmers are advised to invest in expansion of # ponds.</div> <div>Cage investments: small and medium size farms are advised to increase the numbers of production units to unlock scale advantage and utilize fixed cost better.</div>		<p>60,000 KES/pond</p> <p>265,000 KES/cage</p>		Securities <ul style="list-style-type: none">Cages can potentially function as collateral as their economical lifespan over 20 years.Farmer groups de-risk as first level of scrutiny of allowing only farmers to become member who are known to be god farmers in the community.Farmer groups can possibly de-risk through group default sharing guarantees.															

NOTES: 1) Other cost are small equipment and cage licenses. 2) Pond of 300 M2 and Cage of 216 M3

Recommendation 6 | Adopt a gender sensitive and inclusive approach in the project implementation in order to further drive social inclusion across the value chain.

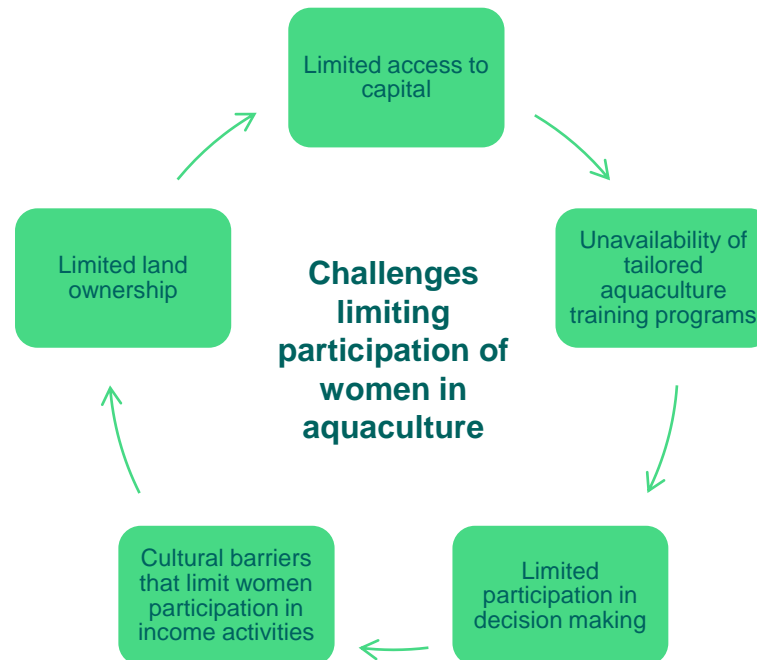
GENDER ASSESSMENT

Value chain level: Due to the capital-intensive nature of fish production, only a few women are involved in both seed and fish production. Women remain critical in the marketing and trading of fish .

Farm level: 42% of the selected fish farmers in the project are women. 81% of the farmers employ 0-1 women employees despite 77% of the farmers indicating that they have a gender policy.

Value chain partners (VCP) level: Most of the VCPs do not have a documented gender policy/strategy. While in some gender balance in employment has been achieved, this has in most cases been unintentional. Service provision is also not tailored based on gender needs.

Implementer's level: Lattice Consulting is currently drafting a gender strategy to ensure gender is mainstreamed in all internal and external activities. Gender outcomes have however not been defined at the project level.



POSSIBLE MEASURES TO BE TAKEN

Best practices in achieving gender transformation

- Gender equity considerations are integral in the design and roll out of services. This includes explicitly assessing women's needs and involving both genders in the process.
- Building the right enabling environment is critical for gender inclusion. Key enablers include; social networks, access to credit, supportive familial relationships etc.
- Gender transformation can be enhanced through gender responsive and rights-based policies, closing gender data gaps and amplifying women's leadership.

Actionable interventions

- Inclusive consultation: Incorporate both men and women farmers in the design process of the interventions to ensure the different needs are considered.
- Data collection and analysis: Assess gender disaggregated data collected to identify trends and incorporate in service design.
- Leadership: Intentionally advocate for women to serve as leaders in the (sub) groups and to take activate roles in recruitment and training of farmers.
- Access to credit: Leverage farm level data collected to facilitate access to finance for women farmers. Credit can be provided directly to service providers to ensure independence.
- Trainings: Ensure trainings consider women farmers' needs and preferences in view of the types of trainings, times and location.

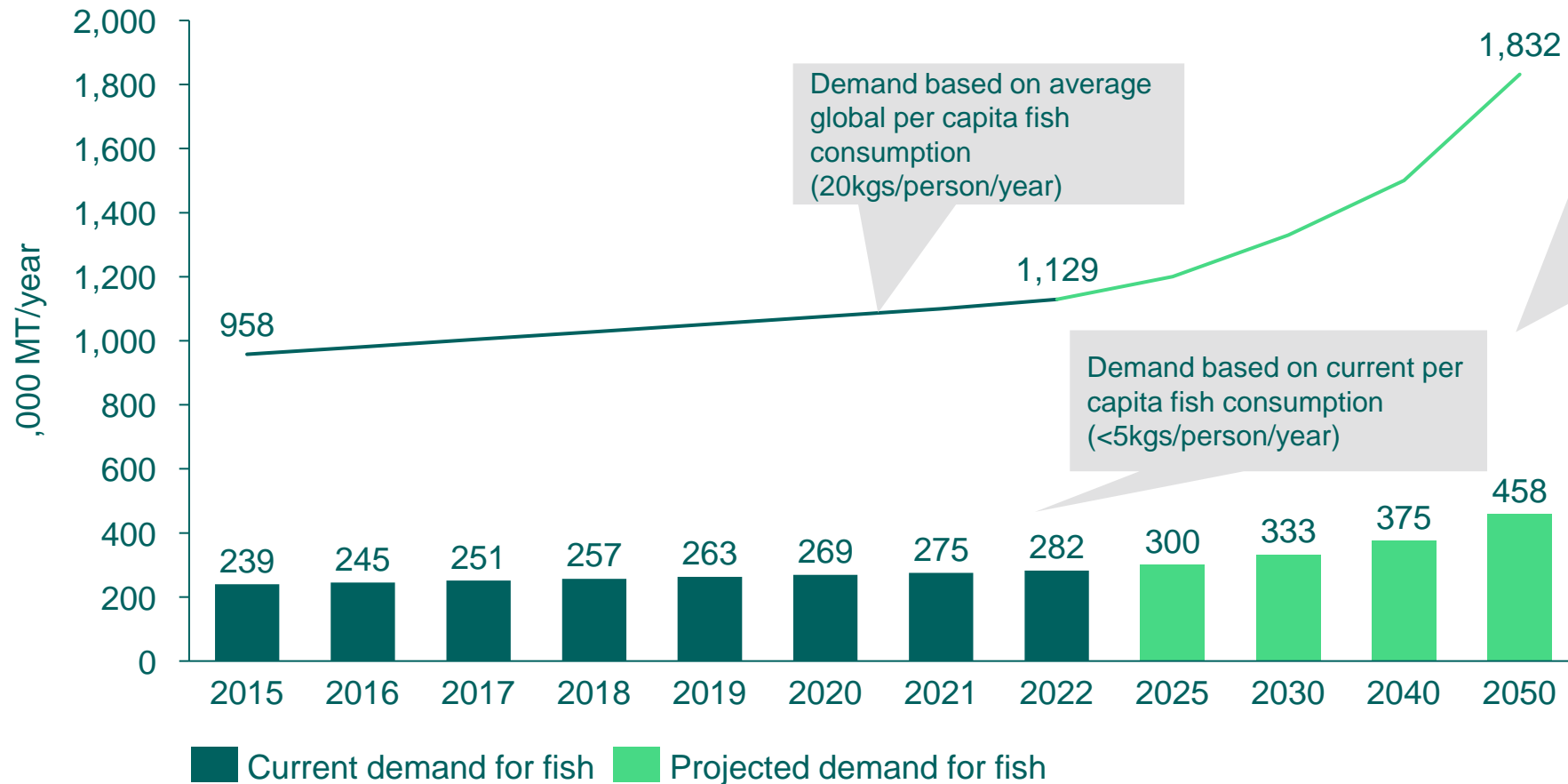


3

**State of
the sector**

Market demand | Market demand for fish in Kenya is increasing rapidly as a result of a growing population and rising incomes.

Quantity (,000 MT) of demand in Kenya from 2015 – 2050 * / **

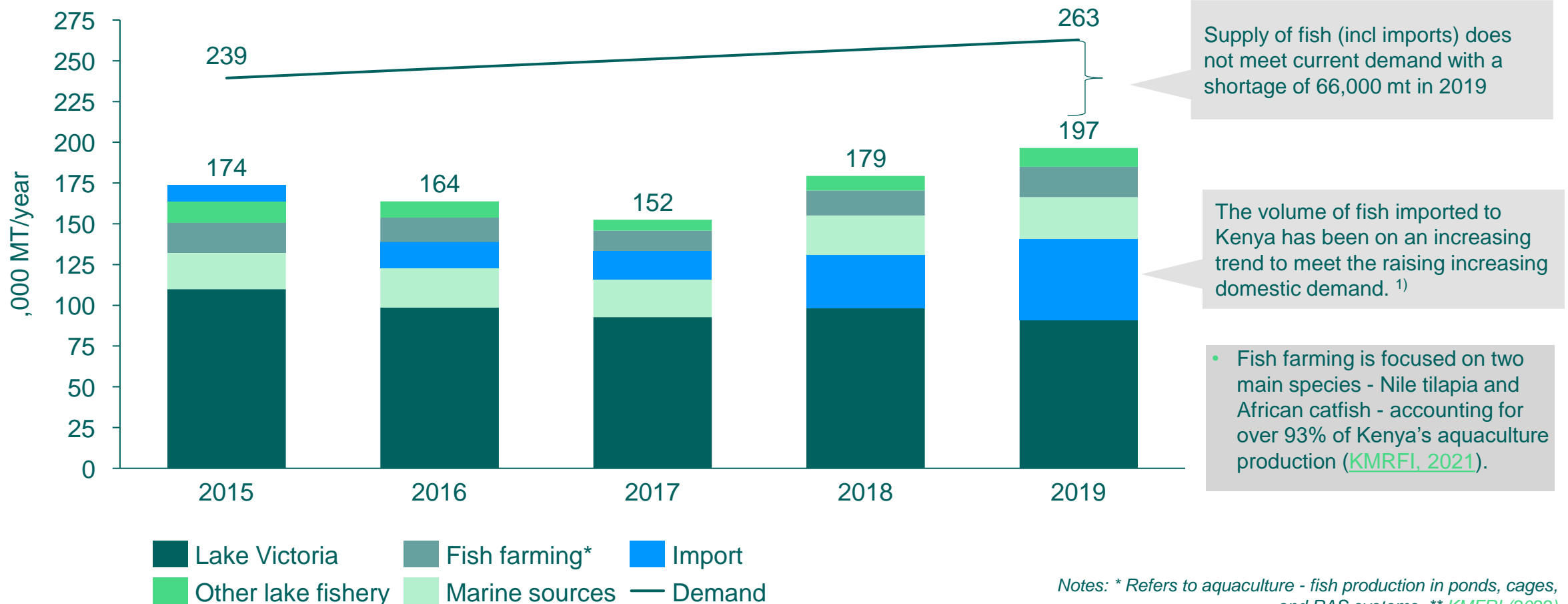


- The Kenyan population is expected to grow by almost 60% to up to 91.6 million by 2050. ** This will increase the overall demand for fish at current consumption rates by 62%.
- By 2050, demand for tilapia in the country is projected to range between 0.46MT (at current consumption rate) and 1.8MT (at global rates).
- Kenya lags peer countries Tanzania (8.5kgs), and Uganda (10kgs) in per capita fish consumption.
- The government through initiatives such as “Kuza, Kula na Kuuza campaign” has been promoting the production and consumption of fish in the country.

Notes: * [KMRFI, 2021](#); ** [Statista, 2022](#)

Market supply | Local production remains uncompetitive with the growing market demand increasingly being met by imported fish

Quantity (in ,000 metric tonnes) of fish production * and imports in Kenya from 2015 to 2019 **



Geographical suitability | A small part of Kenya is highly suitable for growing fish, depending on the type of production system, with the majority of the production done through cages.

Kenya Aquaculture suitability, 2018 ¹⁾

The Western, Central, and Eastern parts of Kenya are the most suitable for fish growing. Suitability depends on water availability/temperature, climatic conditions, soil type, topography, land use, access to inputs, and markets.*

Farmers in the West, where cage farming is predominant, generally have a shorter breeding period for tilapia due to higher temperatures, which stimulates fish growth. In Central and Eastern farmers predominantly grow tilapia in ponds.



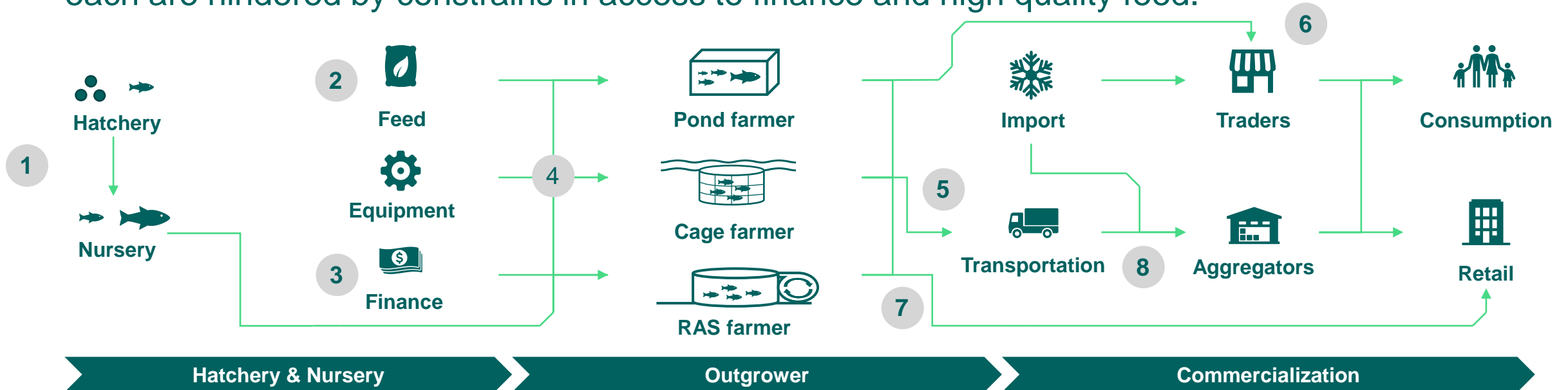
The suitable regions are, however, at risk of climate change. The area in the West is threatened by frequent heavy rainfall, which increases the risk of flooding of Lake Victoria, while the Central/Eastern area is under threat of drought, which makes pond farmers rely more heavily on natural water points. This increases competition with conventional agriculture.
** ***

Legend
 High suitability
 Medium suitability

Sources: * [Opiyo \(2018\)](#); ** [NASA \(2020\)](#); *** Country visit



Value chain description | The tilapia value chain consists of a limited number of players, who each are hindered by constraints in access to finance and high quality feed.



1. There are a limited number of professional hatcheries and nurseries in Kenya, which hinders farmers from getting good quality (size, sex, and type) fingerlings. Hence, farmers perform the whole cycle from fry to fish themselves.
2. High quality feed (protein level, type, size) is scarce and expensive, which drives farmers to use low quality feed for growing their fish. Low quality feed hinders the growth of fish (increases Feed Conversion Rate (FCR)) and extends the length of the growing cycle.

3. Finance providers have limited focus onto providing finance to aquaculture and are not able to reach the medium scale fish farmer, which hinders farmers from purchasing feed and production units on credit, which is required to dampen being cash constrained and increasing profitability.
4. Fish are grown in three types of systems: ponds, cages, and RAS systems. Ponds and RAS systems are used in areas away from Lake Victoria, where cages are used.
5. Transport for fries, fingerlings, and tilapia is expensive due to the high sensitivity of fry/fingerlings and perishability of tilapia.

6. Traders and farm gate sales are the primary sales channel for most pond/cage farmers, ranging from 200-300 gram/fish, partly due to a market preference for whole fish and most of the consumers not being able to afford bigger fish.
7. Currently, RAS farmers are the minority in the fish industry, however, can better commercialize fish for a higher price and size to retailers, which are channels un-utilized by cage and pond farmers.
8. Although the vast majority of tilapia is purchased almost immediately after harvest, there remains a gap in formally connecting production and demand by aggregators, who could play a pivotal role in the service provision to further develop the value chain.



Enabling environment (1 of 2) | Access to affordable credit has limited use of quality inputs and technologies for tilapia farming.

Opportunity

Neutral

Risk

Definition	Situation	Implications on SDM
TECHNOLOGY	<ul style="list-style-type: none"> ▪ Mobile technology: Mobile phone penetration in the country stood at 120% (all subscribers) in 2020 while mobile money stands at 74%. 	<ul style="list-style-type: none"> ▪ Mobile technology can be used for paying farmers in order to build their digital profiles that can be used to leverage access to credit.
ENVIRONMENT	<ul style="list-style-type: none"> ▪ Climate change: About 40%¹ of the potential growth of the sector is lost due to (in)direct impacts of climate change. Water levels in the western region around Lake Victoria have been increasing resulting in frequent floods as well as lake upwelling. While drought in the Eastern and Central region increases competition for water. ▪ Industrial waste: Lake Victoria's water quality is also at risk due to intensive factories dumping their waste in the lake. 	<ul style="list-style-type: none"> ▪ Need to potentially invest in increasing/reinforcing boundaries around ponds that are close to the lake. ▪ Incorporate trainings on adaptation measures to equip farmers to handle climate change.
LABOR	<ul style="list-style-type: none"> ▪ Availability: Tilapia growing requires labor everyday throughout the production cycle to manage the feeding and monitor the production environment. The high (youth) unemployment rate enables farmer to more easily find affordable labour for pond and cage systems. Higher skilled labor is however, required to operate RAS systems, which is not always available. 	<ul style="list-style-type: none"> • Training should go beyond the farmers to also include their employees to ensure they are properly equipped to feed and monitor the fish.
INPUTS	<ul style="list-style-type: none"> ▪ Feed: Major challenges in importation and distribution of feed to SHFs ultimately leading to high prices. Local feed production capacity is undeveloped to suit the increasing demand; ▪ Fingerlings: With few hatcheries and nurseries set up near the farmers, they face challenges accessing quality and affordable fries and fingerlings. Further given transport challenges, farmers are forced to grow smaller fingerlings which increases the production cycle. ▪ Equipment: Most farmers do not use the required equipment to monitor water temperature, oxygen and PH levels. This, hinders farmers from effectively feeding, monitoring and managing the growing cycle of the fish. 	<ul style="list-style-type: none"> ▪ Provide support in setting up nurseries (for farmers with fewer production units) nearer to the grow out farms. This will enable farmers to specialize in either outgrowing or nurseries ensuring a consistent flow of fingerlings near the farmers. ▪ Need to work with feed providers to address challenges hindering local production of quality and affordable feed. ▪ It will be critical for the SDM to enable farmers access the equipment needed for monitoring the fish as well as training them to interpret the data.
FINANCING	<ul style="list-style-type: none"> ▪ Credit: Few finance providers have specific products for the sector. Conventional products and agribusiness loans available do not meet the needs of the fish farmers. There is a high need for financing both working capital (feed, fingerlings) and capital investment. 	<ul style="list-style-type: none"> ▪ Need to onboard a non-conventional financial service provider (s) willing to customise products for the farmers, leveraging production data on the aquarech app. Can explore working with high risk impact investors such as Farmfit Fund.

¹; Status and Outlook for Climate Resilient Aquaculture in Kenya; 2. [Communications Authority of Kenya, 2022](#)



Enabling environment (2 of 2) | Kenyan grown tilapia is highly competitive (premium quality) but is increasingly facing competition from cheaply priced imports.

Opportunity

Neutral

Risk

Definition	Situation	Implications on SDM
LAND TENURE	<ul style="list-style-type: none"> • Ownership: Cultural norms still underpin ownership of land with men observed to own land more than women across most of the country. <5% of title deeds are owned by women.¹ 	<ul style="list-style-type: none"> ▪ To increase participation of women as farmers in the SDM, there is a need to get buy in from the men, particularly when constructing production units and when facilitating access to credit.
TRADING SYSTEMS	<ul style="list-style-type: none"> ▪ Consumer preference: Consumers in Kenya prefer Kenyan fish over imported fish. In the urban areas, fish is mainly sold in Kgs while in rural and informal set up its sold per piece. ▪ Markets: The majority of fish is sold at farm-gate to traders or directly to consumers. Traders perform basic value addition and and sell processed fish to consumers. Other premium markets include restaurants and supermarkets which are inaccessible to smallholder farmers. 	<ul style="list-style-type: none"> ▪ The SDM has potential to facilitate access to higher value markets for the farmers.
PRICING, AND COMPETITION	<ul style="list-style-type: none"> ▪ Competition: There is a scarcity of fish, which reduces competition amongst producers, but increases competition between buyers. There is also growing competition from cheap imports. ▪ Pricing: Imports from China which have increased in recent years, have affected the local prices for fish. The cost for a kg of Chinese fish ranges between Ksh 150-300 compared to Kenyan fish Ksh 350-400. Imports have however, been affected by the Covid pandemic. 	<ul style="list-style-type: none"> ▪ Competition from cheap imported fish affects the locally produced impact the business case for fish production. The SDM thus needs to focus on higher value markets that are willing to pay higher prices for quality fish.
INFRA-STRUCTURE	<ul style="list-style-type: none"> ▪ Production infrastructure: Heavy capital investment is required to set up the production infrastructure (ponds, cages). ▪ Cold storage: Tilapia is highly perishable and thus needs cold storage for preservation. 	<ul style="list-style-type: none"> ▪ Farmers would need support in accessing capital to increase/upgrade their production units. ▪ Ensure proper coordination between the off-taker and the farmers to ensure cold chain is maintained during transportation.
INSTITUTIONAL STABILITY	<ul style="list-style-type: none"> ▪ Policies: Fragmented legal and regulatory frameworks remain a challenge hindering growth of the sector. There is also inadequate enforcement of existing regulations. ▪ Beach Management Units: Cage farmers are required to become member of a BMUs, who licenses and oversees the management of the beaches. 	<ul style="list-style-type: none"> ▪ Ensure effective alignment and onboarding of BMU who are willing to empower cage farmers;
SOCIAL NORMS	<ul style="list-style-type: none"> ▪ Sexual harassment: Women largely participate in the trading of fish. They face a lot of harassment when purchasing fish from the male farmers. Although declining, sex for fish trade is still common in Western Kenya. ▪ Gender equality: While women are instrumental in various parts of the value chain, their ownership of resources and their decision making is limited⁵. 	<ul style="list-style-type: none"> ▪ Intentionally addressing the challenges facing women will be critical to ensure their full participation in the SDM.

¹;Federation of Women Lawyers Kenya;



4

The Service Delivery Model





Objectives | The project aims to drive productivity and commercial viability of tilapia fish farming in Kenya by bringing together critical value chain players.

CORE OBJECTIVE

Scale up the productivity of small to large fish farms and enhance market linkages through an integrated ecosystem approach

SUB OBJECTIVES

Increase fish productivity and reduce the cost of production

Provide access to guaranteed and predictable market

Improve access to finance for smallholder farmers

Monitoring and evaluation

TARGETS

Reduce production cycle length (by 2 months)

Decrease overall cost of production by 15%

Absorb 80% of the tilapia produced by the smallholder farmers

Facilitate access to finance for 30% of the farmers

Decrease feed conversion ratio (>1.8 to <1.6)

Increase overall productivity by 67%

INPUTS

Quality fingerlings

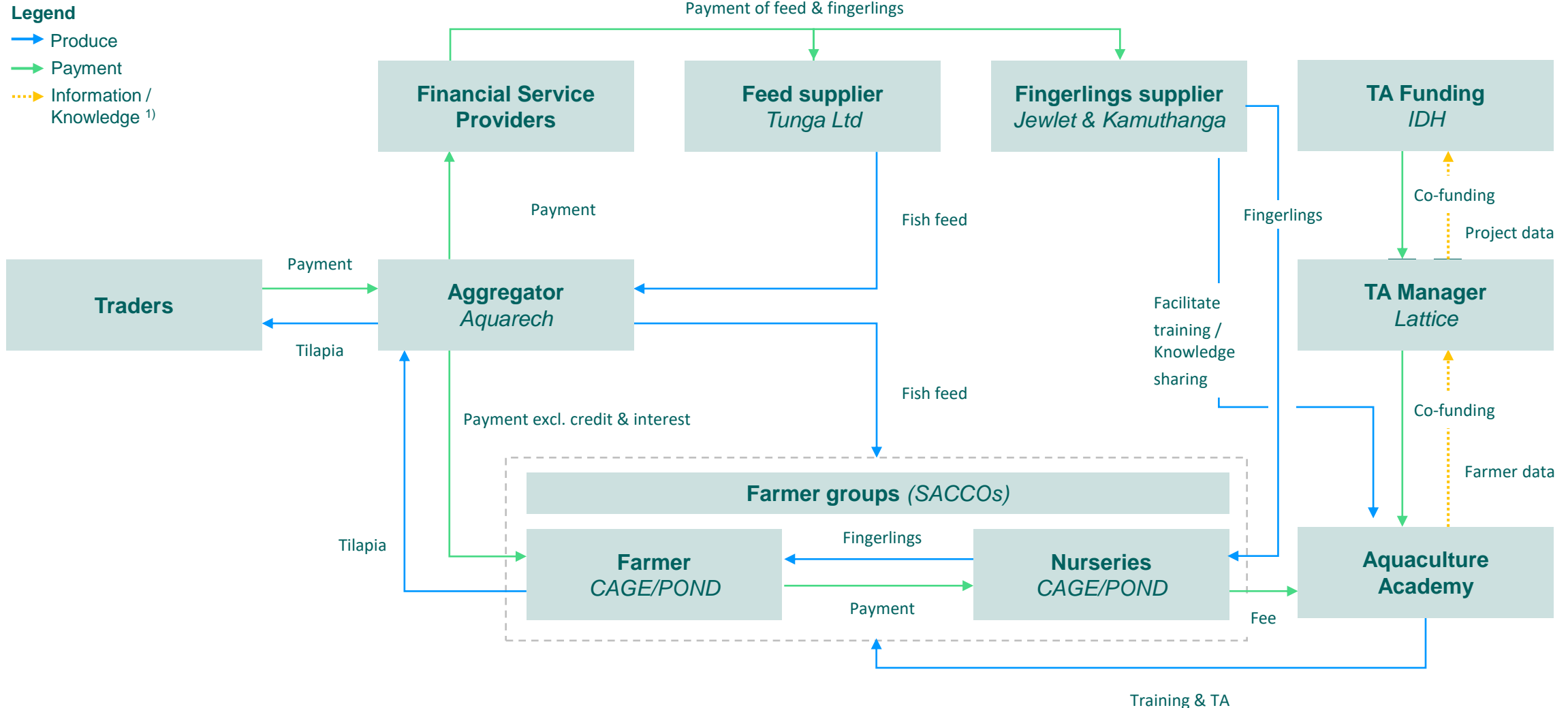
Quality feed

Credit

Training & mentorship

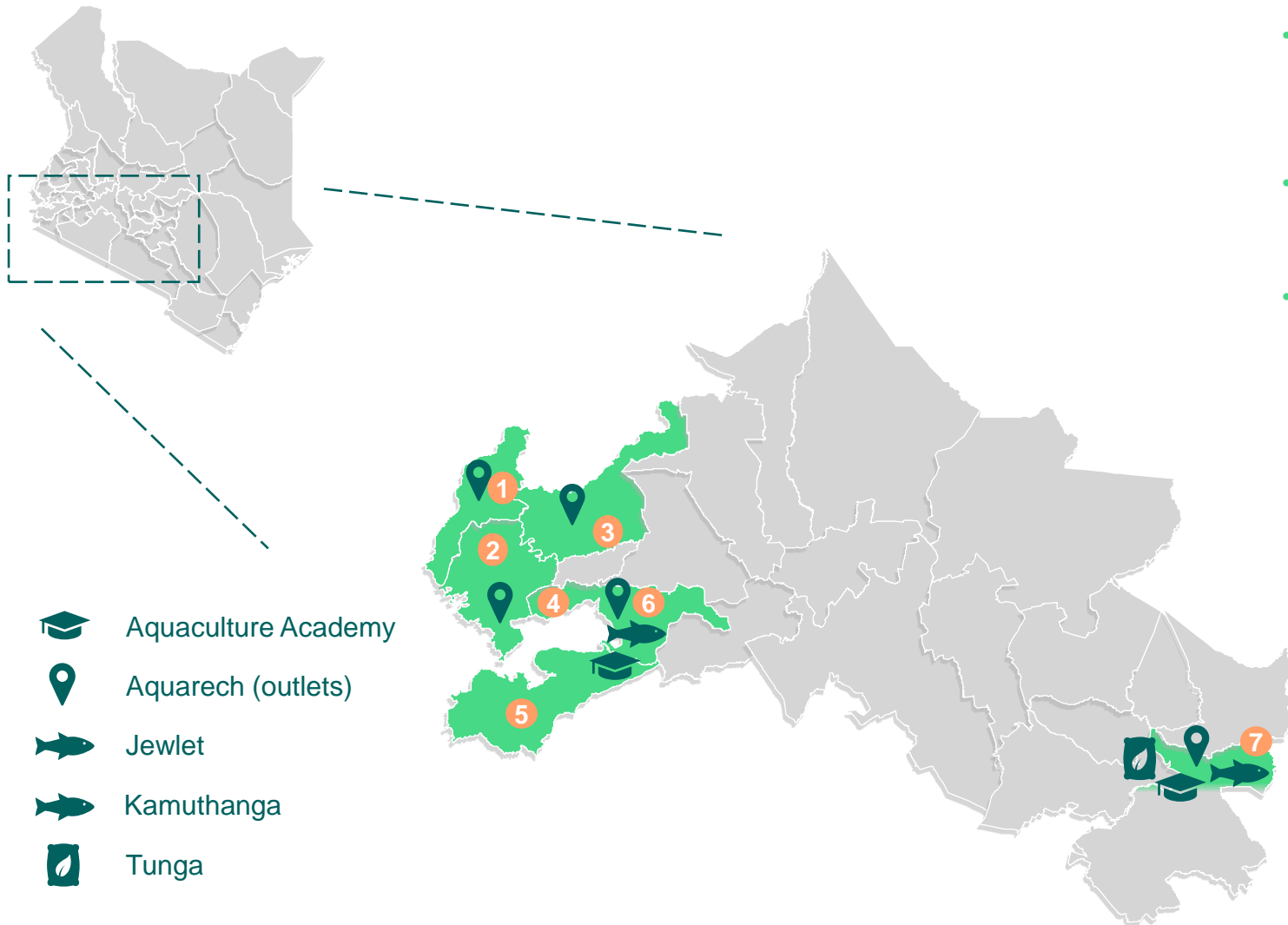
+ Digitization of service delivery through Aquarech App

SDM overview | In the partly developed SDM, the selected players will together provide a holistic service offering to address most of the challenges facing smallholder farmers.



NOTES: 1) For detailed overview of data, information, and digital money flows, [see here](#)

Location | The project will be implemented in two regions – Western and Eastern – the main fish growing regions in the country.







- The Aquaculture Academy currently has two locations - at the facilities of Jewlet in Western Kenya and Kamuthanga in Eastern Kenya. It intends to open a new location soon in Uganda.
- Aquarech has its headquarters in Kisumu, with operations in four other counties of Kakamega, Busia, Siaya, and Kirinyaga;
- Tunga has its factory in Nairobi with distribution outlets in all main areas where fish is intensively grown.

- Location (counties) of farmer base
- | | |
|------------|------------|
| 1 Busia | 5 Homabay |
| 2 Siaya | 6 Kisumu |
| 3 Kakamega | 7 Machakos |
| 4 Vihiga | |







Stakeholders (1/2) | The project design presents clear revenue model and value proposition for most actors involved which is critical for success. This however, needs to be refined for the AA.

Actor	Legal status	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (Within this SDM)
 Lattice Aqua Ltd	Limited company	<ul style="list-style-type: none"> Overall project management Value chain players coordination (Financial) project administration and reporting 	<ul style="list-style-type: none"> Co-funding of project management cost Consulting fee 	<ul style="list-style-type: none"> Increase experience of conducting business with aquaculture farmers Bring into practice the results of the research
 Aquaculture Academy (AA)	Limited company	<ul style="list-style-type: none"> Provide experienced technical trainers Provide training on good aquaculture practices and business-related topics Avail its campuses for use whenever required 	<ul style="list-style-type: none"> Co-funding of aquaculture capacity building Training fee (currently low as its paid by the farmers) 	<ul style="list-style-type: none"> Contribute to aquaculture development in Kenya Bring into practice the results of the research
 Kamuthanga Ltd	Limited company	<ul style="list-style-type: none"> Provision of high-quality fries & fingerlings Facilitate training at Aquaculture Academy campuses 	<ul style="list-style-type: none"> Margin on fry & fingerling sales 	<ul style="list-style-type: none"> Increase and secure off take of fries and fingerlings Contribute to the alleviation of poverty in rural communities
 Jewlet Ltd	Limited company	<ul style="list-style-type: none"> Provision of high-quality fries & fingerlings Provision of required equipment Facilitate training at Aquaculture Academy campuses 	<ul style="list-style-type: none"> Margin on fry & fingerling sales 	<ul style="list-style-type: none"> Increase and secure off take of fries and fingerlings Contribute to the alleviation of poverty in rural communities

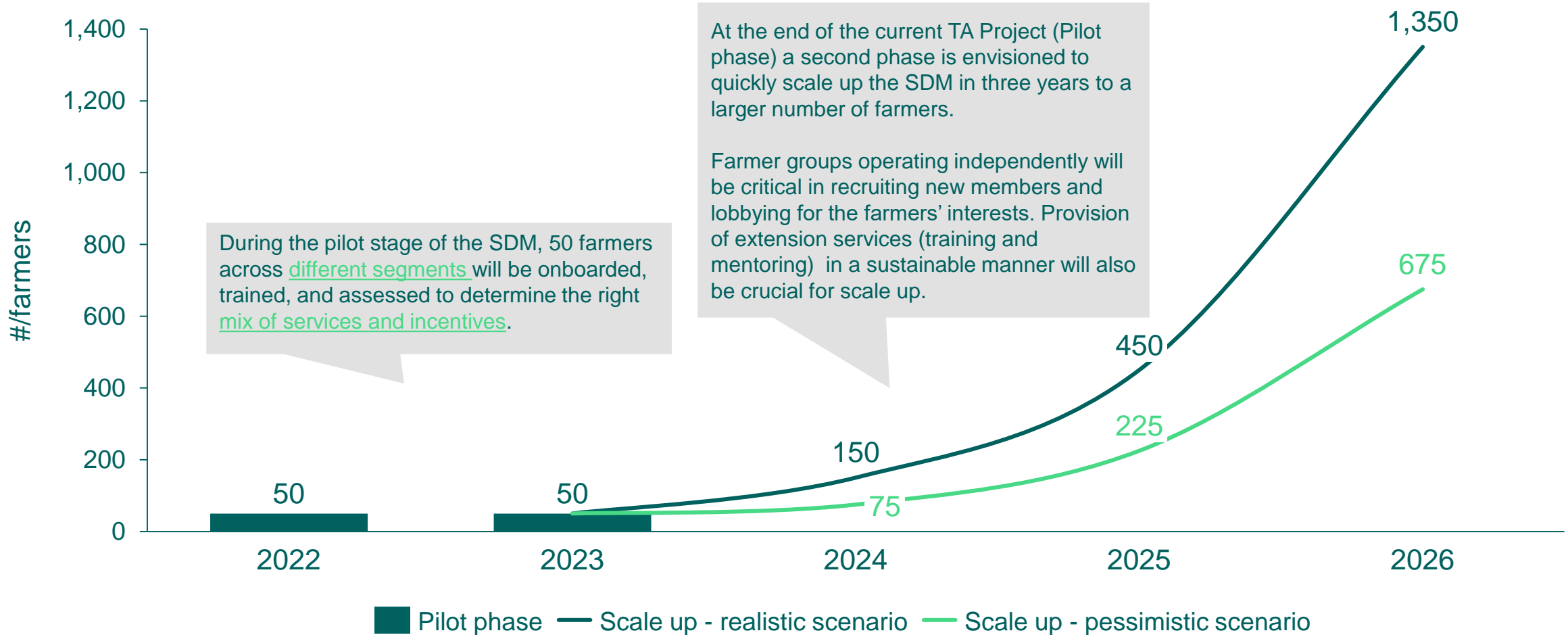


Stakeholders (2/2) | The project design presents clear revenue model and value proposition for all the actors involved which is critical for success. This however, needs to be refined for the AA.

Actor	Legal status	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (Within this SDM)
 Aquarech	Limited company	<ul style="list-style-type: none"> Provide reliable market linkages through the Aquarech App Leverage on its app to provide viable data on farmer locations, production, sales and prices for SHFs in targeted regions 	<ul style="list-style-type: none"> Margin on tilapia sales Margin on feed sales 	<ul style="list-style-type: none"> Increase and secure supply of tilapia Contribute to the alleviation of poverty in rural communities
 Tunga	Limited company	<ul style="list-style-type: none"> Provision of high-quality fish feed Facilitate training at AA campuses 	<ul style="list-style-type: none"> Margin on feed sales 	<ul style="list-style-type: none"> Increase and secure off take of fish feed Contribute to the alleviation of poverty in rural communities
 Financial Service Providers	TBD	<ul style="list-style-type: none"> Provide access to finance at reasonable rates and terms 	<ul style="list-style-type: none"> Payment of interest 	<ul style="list-style-type: none"> Attract new agri-customers Increase experience of conducting business with aquaculture farmers Increase farmers access to banks services and products
 IDH	Foundation	<ul style="list-style-type: none"> Accelerate and scale sustainable trade by building impact-oriented coalitions Develop business solutions to poverty by linking people to information, capital, and markets 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Increase experience of conducting business with aquaculture farmers and farmer groups Bring into practice the results of research

Scale | The project will initially onboard and serve 50 farmers as part of the pilot phase, which will be followed by a scale-up phase to onboard between 675 and 1,350 farmers in the next 3 years. Independently run farmer groups are envisioned to drive the scale up.

Number of farmers to operate between 2022 – 2026











Organizational capacity | The VCPs will need to work together; leveraging each others strengths, experiences and capabilities to effectively deliver the services to the farmers.

Element	Aquarech	Tunga	Kamuthanga	Jewlet	Aquaculture Academy	FSPs*
Farmer organisation and management						
GAP training and knowledge transfer	**	**	**	**		
Financial literacy training						
Feed marketing and distribution						
Fingerlings transportation (cold chain)						
Fish transportation (cold chain)						
Credit provision (disbursement and collection)						
Data collection, monitoring and evaluation						
Digitization of supply chain activities						
<div> <div>Adequate experience/capacity</div> <div>Limited experience/capacity</div> <div>No experience/capacity</div> <div>Critical gaps</div> </div>						

* Proposed FSPs for this project are Juhudi Kilimo and Faulu Bank: ** While these VCPs have experience in GAP training, they are only able to provide these to the extend that its profitable to their business as that's not their core focus. **Note:** This was a high level assessment of the capacity based on the area of specialisation of the VCP.



Farmer relations | The SDM will continue to implement and evaluate its farmer relations strategy, with learnings from the pilot phase, to achieve the desired target of the scale up phase.

 Outreach	 Selection	 Contracting
<ul style="list-style-type: none"> There is no active farmer outreach in the pilot stage of the SDM for which <u>50 farmers were pro-actively selected</u>. Successful farmers from the pilot phase will become lead farmers, who will promote and onboard new farmers during the scale-up phase of the SDM. During the pilot stage, the SDM will develop an outreach and onboarding strategy to guide the realization of the ambitious <u>scale up target</u>. 	<ul style="list-style-type: none"> For the pilot phase, 50 farmers are selected based on their geographical location, <u>production capacity, business motivation, and position in the community</u>. Aligning with the SDM's impact ambitions, female and youth farmers are prioritized. For the scale up phase, after evaluating the selection criteria with learnings from the pilot phase, the SDM will continue to assess farmers on pre-defined criteria before they can join the SDM. 	<ul style="list-style-type: none"> Farmers have signed a Letter of Intent to become part of the SDM, which in return gives them an off-take guarantee of <u>80% of their marketable surplus</u>. The SDM aims to establish a SACCO where each farmer will be a member to and will adhere to set rules. During the scale-up phase, based on the extent of the success of the pilot, the SDM might evaluate designing forward contracts.
 Segmentation	 Graduation	 Data collection
<ul style="list-style-type: none"> Farmers are <u>segmented based on the type (cage/pond), size, and scale of their production capacity</u> to align with pre-defined <u>development strategies</u> for each segment. 	<ul style="list-style-type: none"> The SDM has no formalized graduation strategy per farmer segment, although <u>access to financial services might follow a graduation approach</u>. Farmers from the pilot phase can become lead farmers for which services and incentives are to be determined. 	<ul style="list-style-type: none"> Data collection is an integrated part of the SDM. <u>Aquarech collects financial and non-financial data through their application</u>, and Lattice monitors and collects data during mentoring visits of the farmers. Collected data is analysed and informs the design of interventions, services, and success of the value chain development.






Services (1/2) | Through the SDM, partners provide critical services to solve the most pressing challenges for the farmers.

Category	Service	Impact	Implementation	Revenue model	Status
Training & information	Aquaculture training	Increase good management practices to utilize impact of access to other services.	<ul style="list-style-type: none"> Aquaculture Academy Lattice 	Participation fee	
	Data collection and literacy training	Increase understanding of available data to inform decisions on feed(ing) choice	<ul style="list-style-type: none"> Aquaculture Academy Aquarech 	Participation fee	
	Financial literacy training	Increase understanding of farm economics and the business case of tilapia farming to increase understanding of repayment of loans and rational behind investments	<ul style="list-style-type: none"> Aquaculture Academy FSPs 	Participation fee	
Inputs	High quality feed	Decrease feed conversion rate (FCR) to decrease feed cost	<ul style="list-style-type: none"> Tunga 	Margin on feed sales	
	High quality fries / fingerlings	Decrease of mortality and increase of annual production	<ul style="list-style-type: none"> Jewlet Kamuthanga 	Margin on fries and fingerlings	
Financial services	Working capital	Ensure sufficient working capital to access high quality feed and fries/fingerlings	<ul style="list-style-type: none"> FSPs 	Interest on outstanding loan balance	
	Long-term finance	Ensure sufficient capital to expand farms	<ul style="list-style-type: none"> FSPs 	Interest on outstanding loan balance	

Ongoing
 Under development



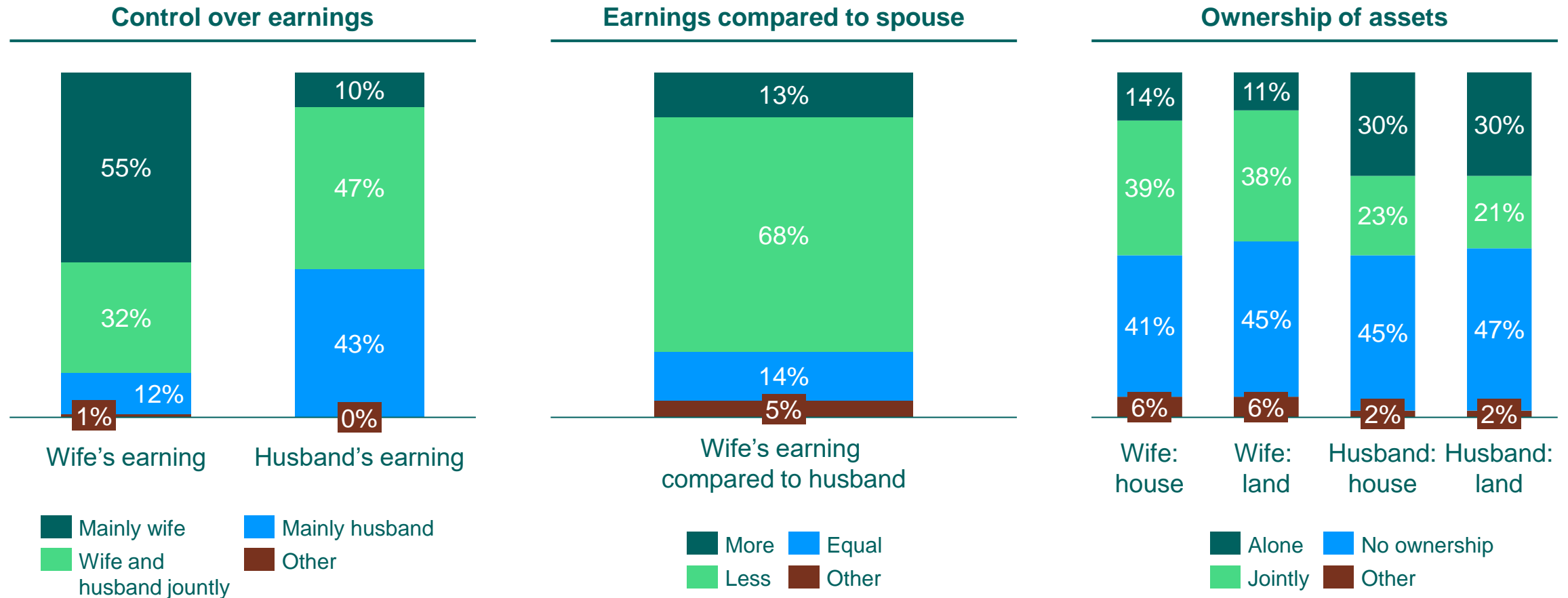
Services (2/2) | Through the SDM, partners provide critical services to solve the most pressing challenges for the farmers.

Category	Service	Impact	Implementation	Revenue model	Status
Equipment & labor	Monitoring equipment	Equipment will enable better feeding and overall to provide data to inform feed and management decisions and utilize impact of other services	Jewlet and Kamuthanga	Margin on equipment sales	
Post-harvest services	Aggregation	Secure off take of increased tilapia produce for a market fair prevailing price	Aquarech	Margin on tilapia sales	
Market access	Traceability	Create data driven insights into fish growth, farmer performance, sourcing area, and service uptake to safeguard quality of tilapia and use for credit-scoring	Aquarech, FSPs, and other value chain players	Margin on tilapia sales	

 Ongoing
  Under development



Gender balance at HH-level | Although having high control over their own earnings, women are hindered to perform capital intensive business investments, due to relatively low incomes and a limited ownership of assets.

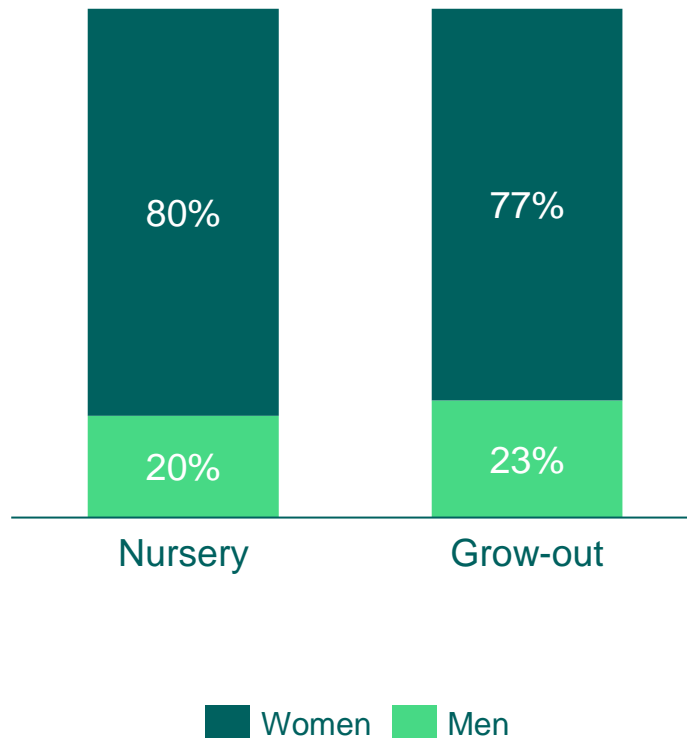


Source: [DHS Kenya \(2014\)](#)

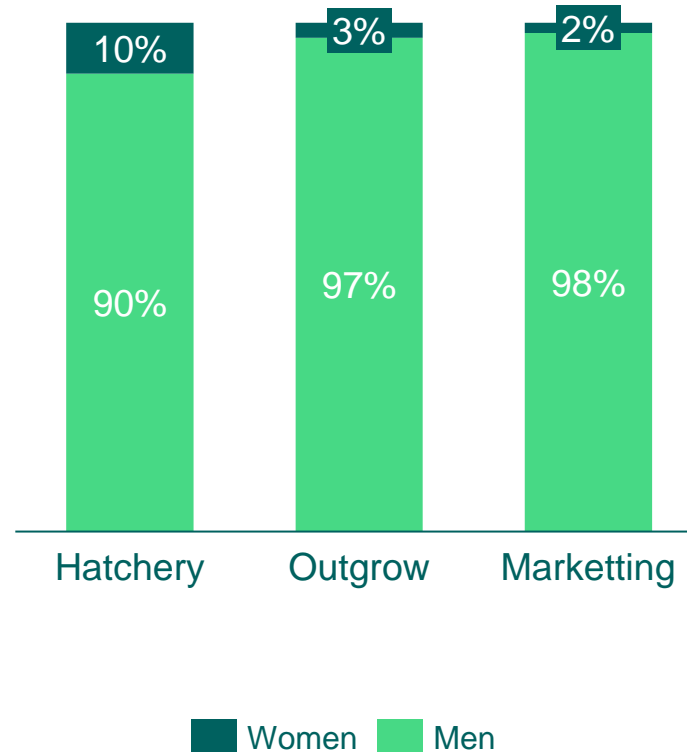


Gender balance at Farm-level | Performing the majority of production activities, while lacking ownership over assets, women require training and access to innovative forms of collateral to finance the development of their business.

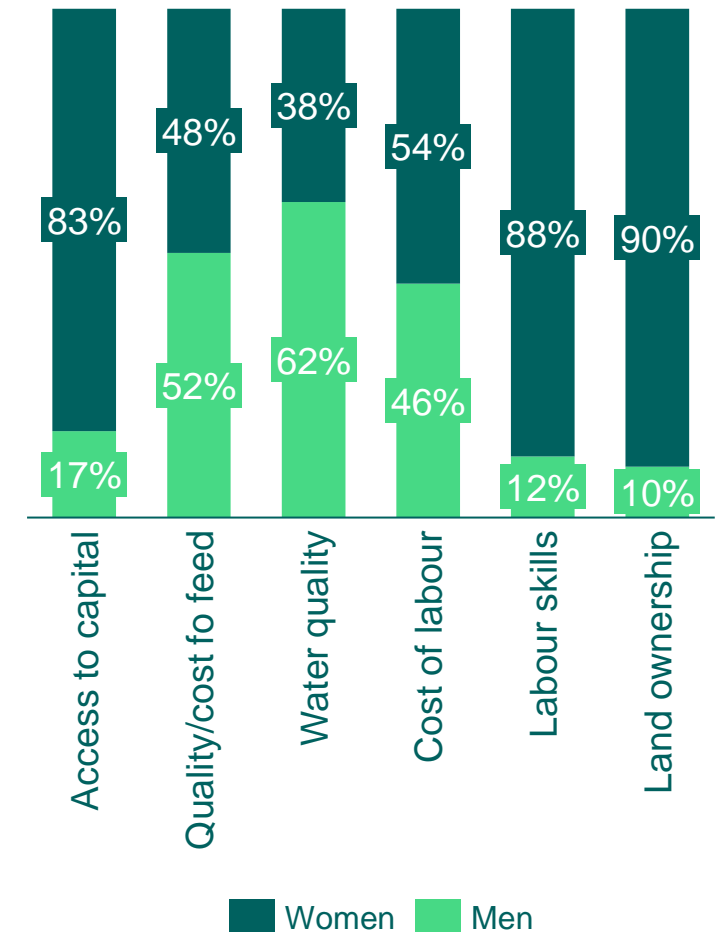
Allocation of production activities on nursery and grow-out level



Ownership of production facilities



Barriers faced to improve aquaculture operations by gender



Source: [KMFRI \(2016\)](#)



Gender intention of the SDM | The overall assessment of the SDM is gender intentional and can become transformative by formalizing a gender strategy and by increasingly making services gender sensitive.

Category	Status	Observations
Gender Strategy Is gender equality a strategic goal for the SDM which is communicated in documents?	PARTLY	The value chain players each have a clear gender intention, but the majority don't have a formal gender policy. Aquarech is currently commissioning the development of an aquaculture gender strategy, which could potentially be leveraged by the SDM in designing and implementing more gender intentional interventions and becoming gender transformative.
Data Collection Does the SDM collect data on staff or customers / farmers disaggregated by gender?	YES	All the farm level data collected is gender disaggregated – this includes data on outgrowing systems, volumes delivered, and inputs used. The SDM manager assesses the data collected, informs on the trends, and advices on how to get more women farmers involved.
Inclusive workplace Does the SDM have policies or practices to make the workplace inclusive for both women and men?	YES	The farmer/trainee selection criteria will be based on; production volumes (past, current and future targets), gender (considering women inclusion), age (considering youth inclusion) and location of operation. There are no formal policies related to activities associated with activities performed in the SDM yet.
Inclusive consultation Does the SDM speak to or consult both male and female farmers to learn about their different needs and preferences when designing a product?	YES	Through the trainers and mentors (both men and women) the SDM consults both male and female fish farmers. Consultation is usually done during the group meetings and individual visits. Through the consultation, the SDM develops the possibility to determine which training to provide for which cluster.
Inclusive tailoring If services are tailored based on customers' needs and preferences, does the SDM tailor these based on how needs may be different for men/women?	PARTLY	The SDM is eager to tailor the services based on the needs and preferences of the farmers and to current gender balance on the ground between ownership and operations. Hence, it is required for men farmers in the SDM to bring their wives to the training, as they perform the majority of operational activities. In a next stage, based on collected data, further tailoring of services will be done.
Independence and control over resources Does the SDM provide services that allow women to have more independence and control over resources or move into roles in which they can gain more value?	PARTLY	The SDM increases transparency on sales prices and will enable onboarded farmers to specialize their business. The transparency in the value chain enables women to increase their bargaining position. Moreover, the SDM intends to make access to finance gender sensitive, which can increase the Independence and control over resources.



5

Business Cases

Financial performance | The SDM is projected to create up to 21 mln USD/year over the next five years. The value generated can be redistributed to enhance the sustainability of the Aquaculture Academy.

Gross margins per value chain players (5-year average)

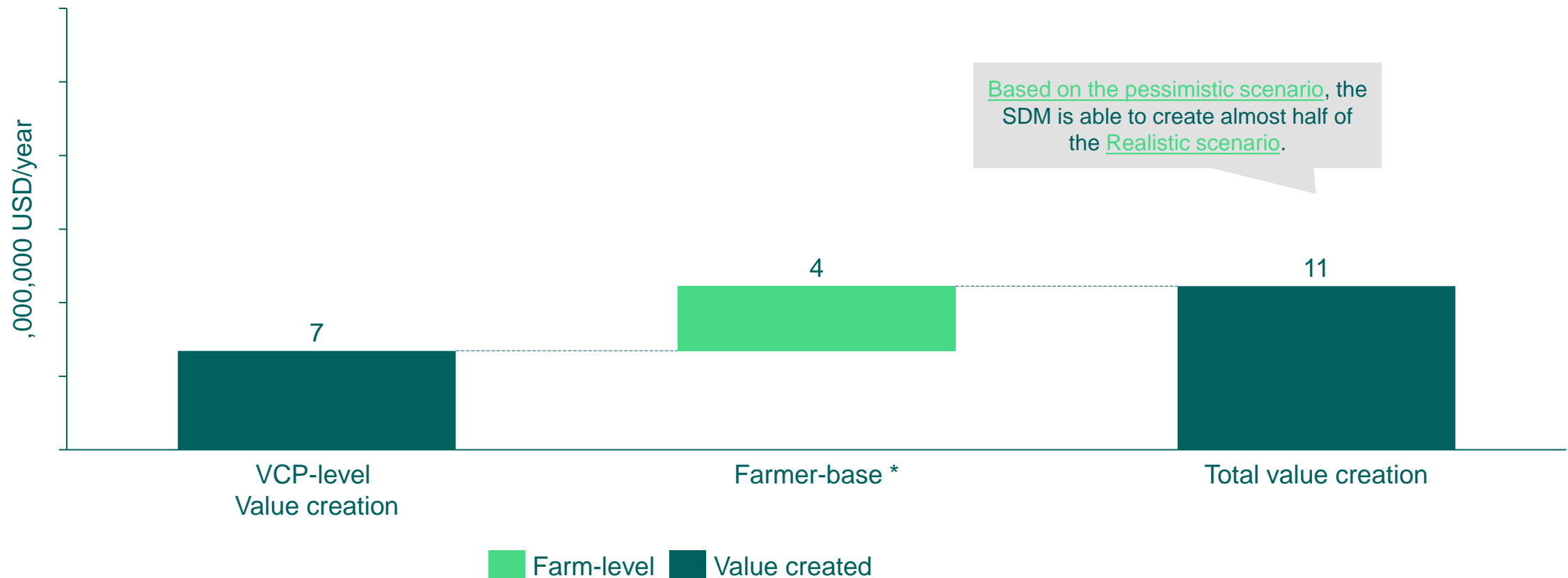
Realistic

NOTES: * Farmer-base is computed as the difference between Baseline and SDM farmer annual income from all farmer segments.

Financial performance | The SDM is projected to potentially create up to 11 mln USD/year over the next five years when projecting the pessimistic scale-up scenario.

Gross margins per value chain players (5-year average)

Pessimistic



NOTES: * Farmer-base is computed as the difference between Baseline and SDM farmer annual income from all farmer segments.



5.1

Aggregator
Aquarech

Introduction | Aquarech is a fish off-taker that leverages technology to provide end-to-end solutions for smallholder fish farmers.



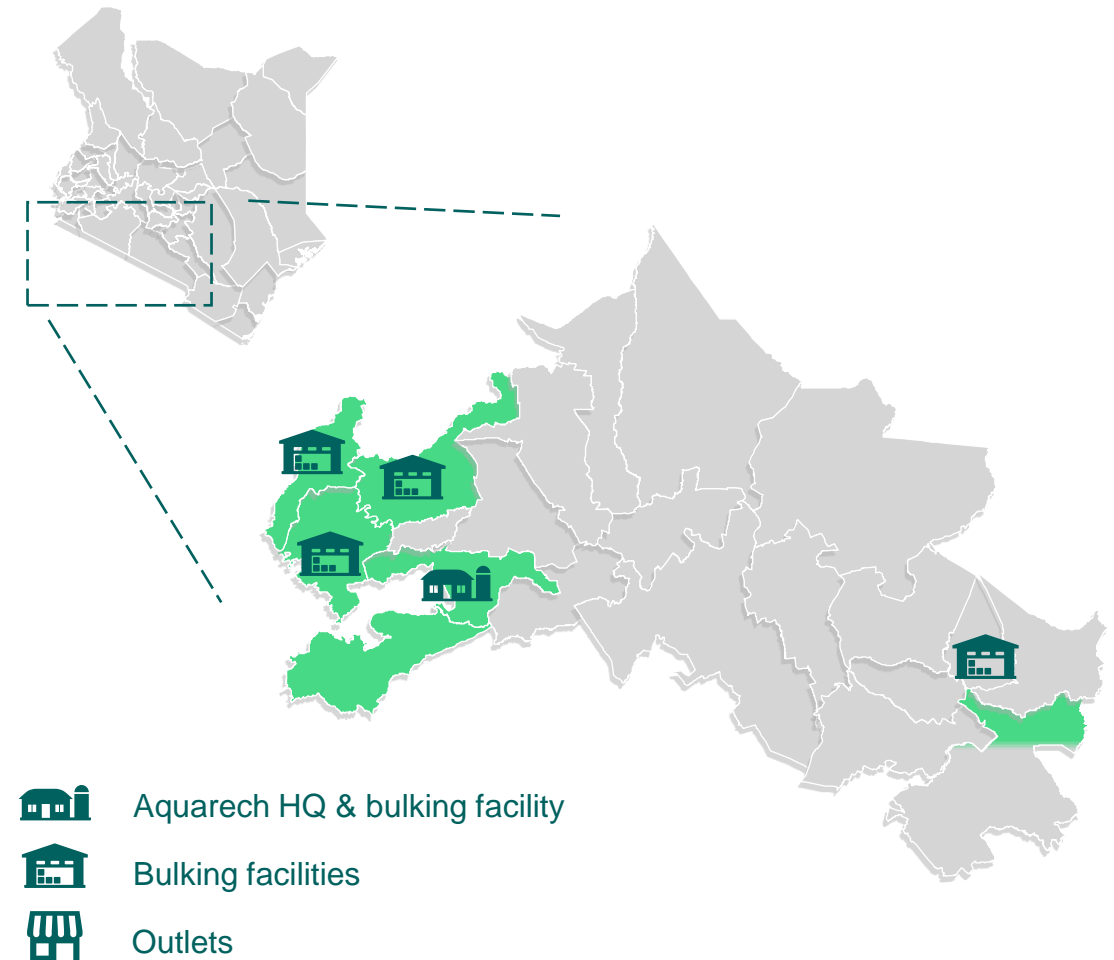
Company

Introduction

- Aquarech is a fish aggregation company established in 2019 in Kisumu, Kenya.
- Aquarech is building Africa's first fish farming platform where farmers, fish feed manufacturers, and fish buyers can trade and build trusted relationships.
- Through the platform, fish farmers can buy top-quality feed, sell fish, and learn about best fish farming practices to improve their incomes.
- Fish feed manufacturers can sell feed and service rural farmers with last-mile delivery options and consumers can order fresh authentic Kenyan tilapia.
- The company estimates its outreach to be about 2,000 farmers, 60% of whom are cage farmers.












Geographical location of operations





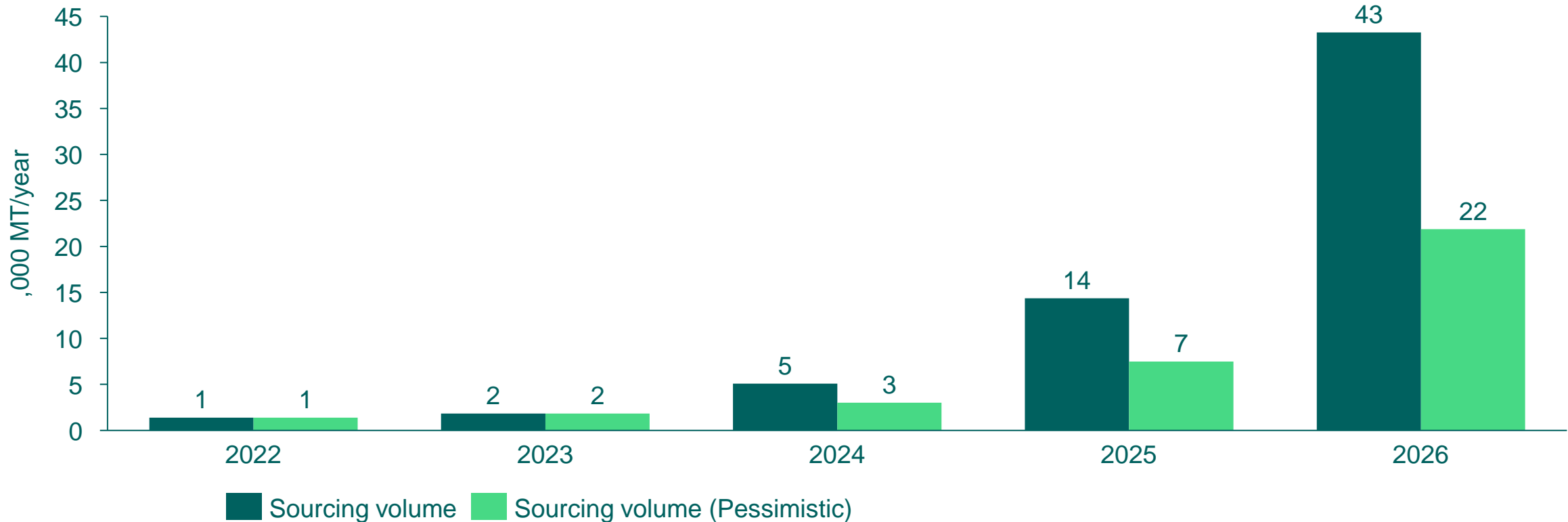
Business canvas | The business model of Aquarech is premised on providing a digital platform to farmers and traders, facilitating access to market, high quality inputs and credit.

Key partners 	Key activities  <ul style="list-style-type: none">• Aggregating and selling market size fish• Facilitating access to high quality fish feed• Training farmers on good aquaculture practices• Providing access to finance with 90-day tenure	Value propositions  <ul style="list-style-type: none">• Increase accessibility to quality tilapia and transparency on prices• Provide farmers and traders a digital platform for data management• Provision of fit-for purpose service package allowing farmers to invest and supply quality produce	Customer relations  <ul style="list-style-type: none">• Transparency to farmers on feed sales prices and tilapia purchase prices• Realization of off take guarantee of 80% marketable surplus• Full filling agreements with 5 county governments to operationalize bulking facilities• Develop access to finance facility with segment specific finance terms	Customer segments  <p><i>Farmer services</i></p> <ul style="list-style-type: none">• Small and medium size pond and cage fish farmers <p><i>Processed tilapia</i></p> <ul style="list-style-type: none">• Franchisees/outlets• Fish traders
Key resources  <ul style="list-style-type: none">• Business development, processing, finance, and training staff• Working capital• Bulking facilities• Sales outlets• Infrastructure• Electricity• Agreements with county government and BMUs ¹⁾• Application & data	Key channels  <p><i>Sales</i></p> <ul style="list-style-type: none">• Franchisees/outlets• Bulking facility <p><i>Farmers</i></p> <ul style="list-style-type: none">• Aquarech App• Extension officers	Cost structure  <ul style="list-style-type: none">• Cost of goods sold (fish/feed)• Infrastructure CAPEX• Staff costs• Finance costs• General and administrative expenses• Marketing and farmer acquisition costs		Revenue streams  <ul style="list-style-type: none">• Margin on fish sales• Margin on fish feed sales• (possible) Margin on credit provision

NOTES: 1) Beach Management Units (BMUs)

Sourcing outlook | Sourcing volumes from the project farmers are estimated to surpass the current processing capacity of Aquarech which necessitates investment in additional capacity.

Sourcing volume of market size tilapia between 2022 and 2026 (,000 MT/year)

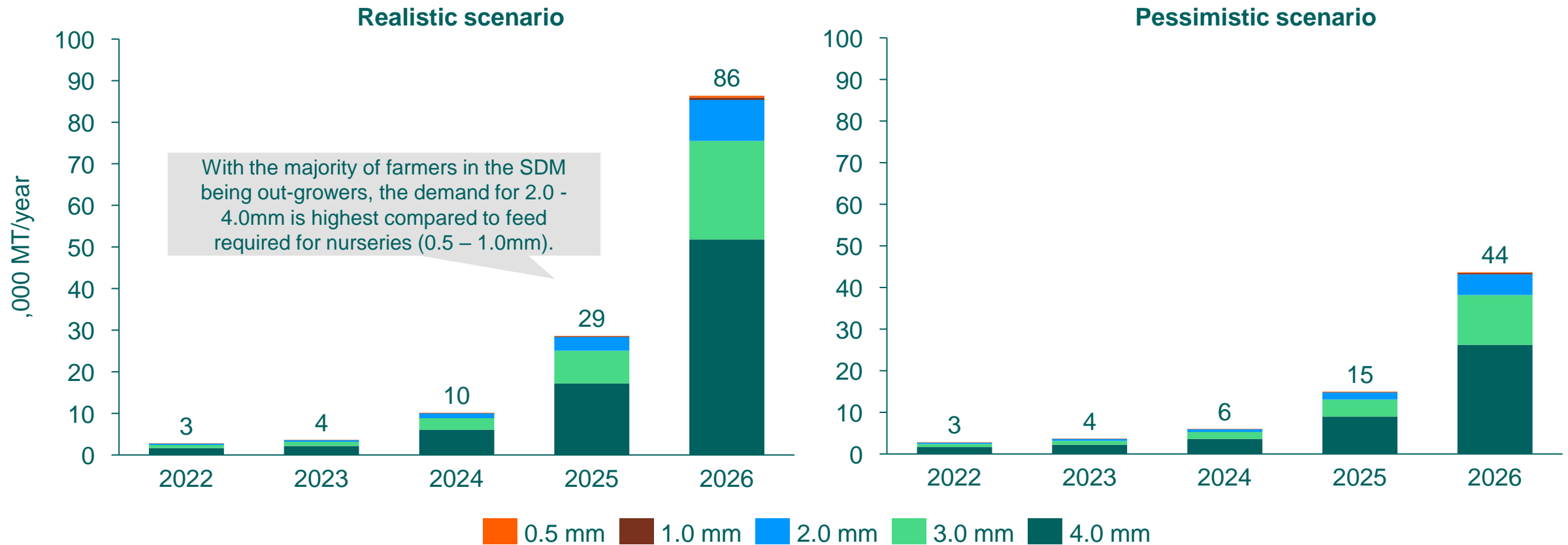


See detailed assumptions [\[here\]](#)




Feed sales outlook | The highest demand is for out-grower feed (2.0 mm – 4.0 mm) accounting for 99% of total demand, which Aquarech is able to procure from other VCPs in the SDM coalition.

Feed demand per type between 2022 and 2026 (,000 MT/year) ¹⁾



See detailed assumptions [\[here\]](#)

NOTES: 1) Feed demand from farmers within the SDM only.



5.2

Feed
Tunga



Introduction | Tunga Nutrition was established in 2021 to solve the persistent challenge of quality and affordable fish feed facing farmers in Kenya and the broader East Africa.



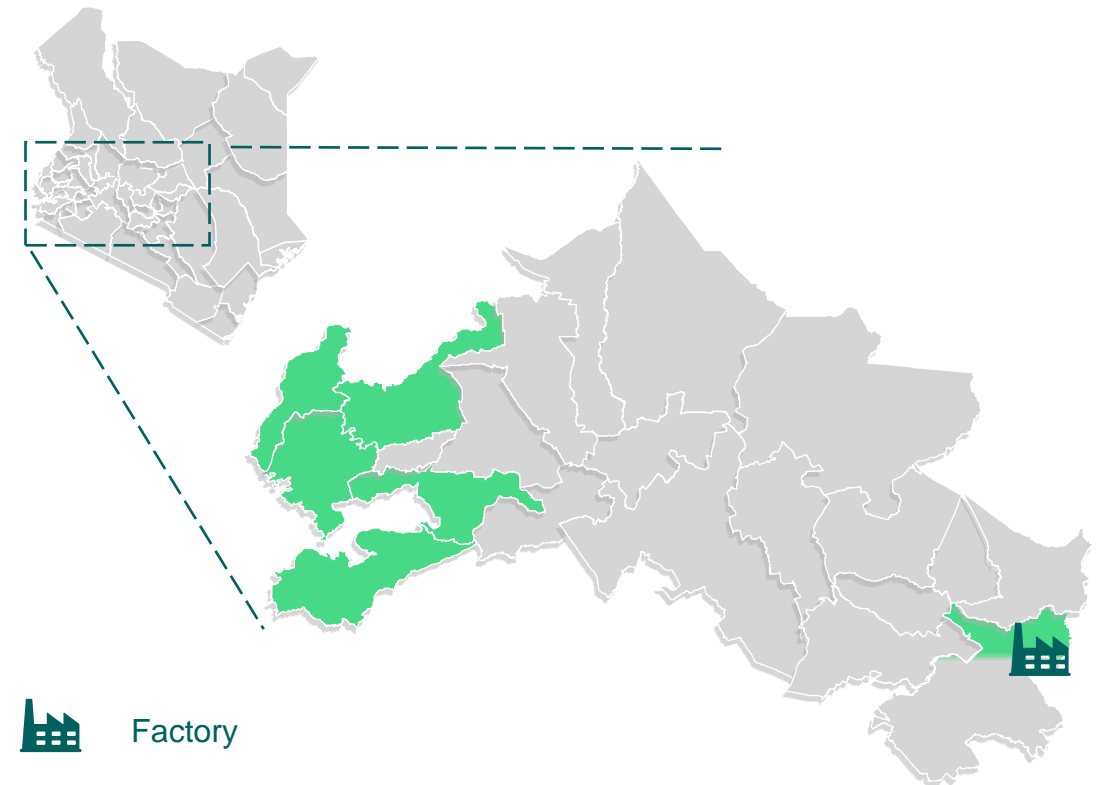
Company

Introduction

- Tunga was established in 2021 as a joint venture between Unga Farm Care (EA) Ltd and Nutreco International BV's Aqua division, Skretting, to utilize the individual competencies of the companies to meet the growing demand for fish feed in the wider East African region¹.
- The company shares the vision of its parent companies, 'Nutrition for life' and 'Feeding the Future' respectively².
- The company has a production plant located in Nairobi with over 35 distribution outlets spread out in the region.
- The company is involved in the manufacturing, importation marketing, and distribution of fish feed.



Geographical location of operations












Factory

Sources: 1) [Nutreco, 2022](#) 2) [Skretting, 2022](#)



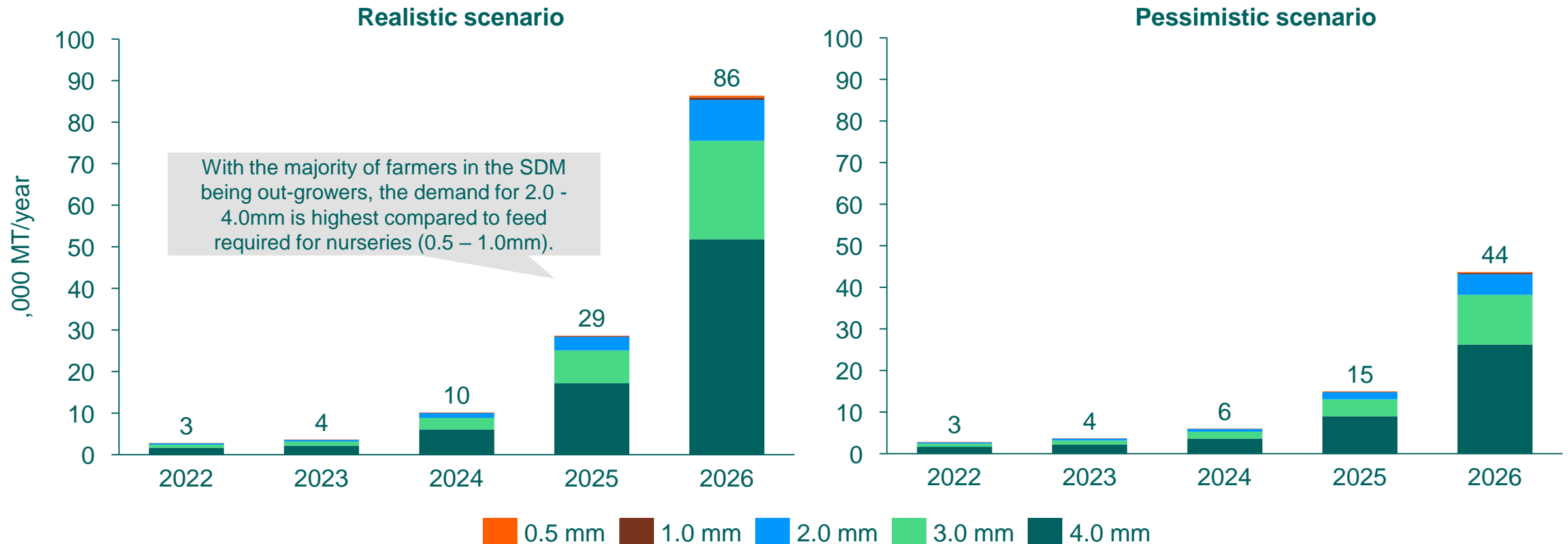
Business canvas | Tunga is a joint venture between Unga Farm Care (EA) Ltd and Skretting that makes fish feed available locally through manufacturing and importation.

Key partners 	Key activities  <ul style="list-style-type: none">• Feed research• Ingredient importation• Feed manufacturing• Feed importation• Feed sales	Value propositions  <ul style="list-style-type: none">• Apply knowledge of ingredients and the nutritional needs of fish to develop innovations that achieve optimum nutritional value, sustainable production and economic performance.• Create access to high quality fish feed from national soil to decrease dependency on imported feed and increase control over quality.	Customer relations  <ul style="list-style-type: none">• Long term and close customer relationships and actions on feed back on feed quality• Constant development of feed and training on optimum use of feed.	Customer segments  <ul style="list-style-type: none">• Large scale farmers (direct sales at factory gate)• Agro dealers and aggregators (indirect sales to small/medium scale farmers)
	Key resources  <ul style="list-style-type: none">• Manufacturing plant/staff• Warehouse• Working capital• Protein supply• Animal feed intelligence		Key channels  <ul style="list-style-type: none">• Distribution outlets• Direct sales to farmers• Sales through dealers such as Aquarech	
Cost structure  <ul style="list-style-type: none">• Cost of imported feed• Ingredients cost• Research and development cost• Infrastructure CAPEX• Staff costs• Finance costs• General and administrative expenses• Marketing and farmer acquisition costs			Revenue streams  <ul style="list-style-type: none">• Margin on fish feed sales	



Feed demand outlook | The highest demand is in out-grower feed (2.0 mm – 4.0 mm) accounting for 99%¹⁾ of total demand. With the upgraded production capacity, Tunga can meet the demand until 2025.

Feed demand per type between 2022 and 2026 (,000 MT/year) ¹⁾



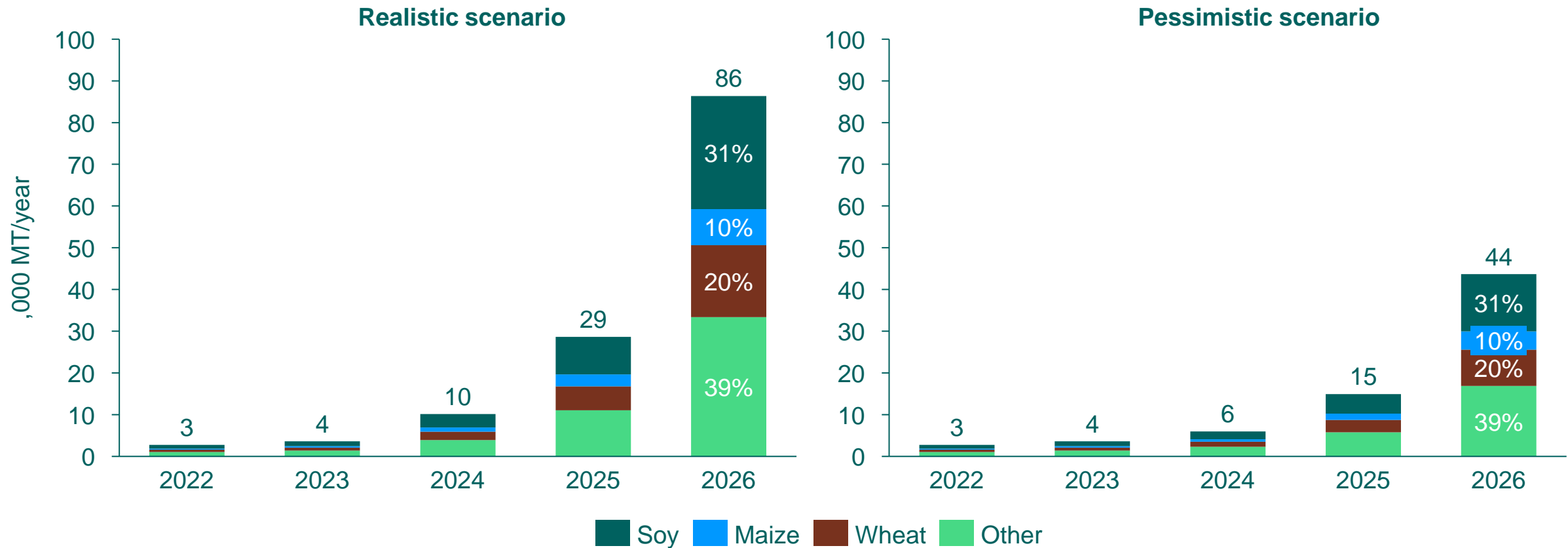
See detailed assumptions [\[here\]](#)

NOTES: 1) Feed demand from farmers within the SDM only.



Feed ingredients outlook | Accounting for 31% of raw materials used, the volume of soy is expected to grow, which, in light of a tight soy market, highlights the importance of developing the soy value chain in order to develop the tilapia value chain.

Feed ingredients requirement analysis between 2022 and 2026 (,000 MT/year)



See detailed assumptions [\[here\]](#)



5.3

Fingerlings/ Equipment *Jewlet*



Introduction | With an estimated annual production of 6 million fingerlings, Jewlet Fish Farms is among the leading producer of fingerlings in Kenya.



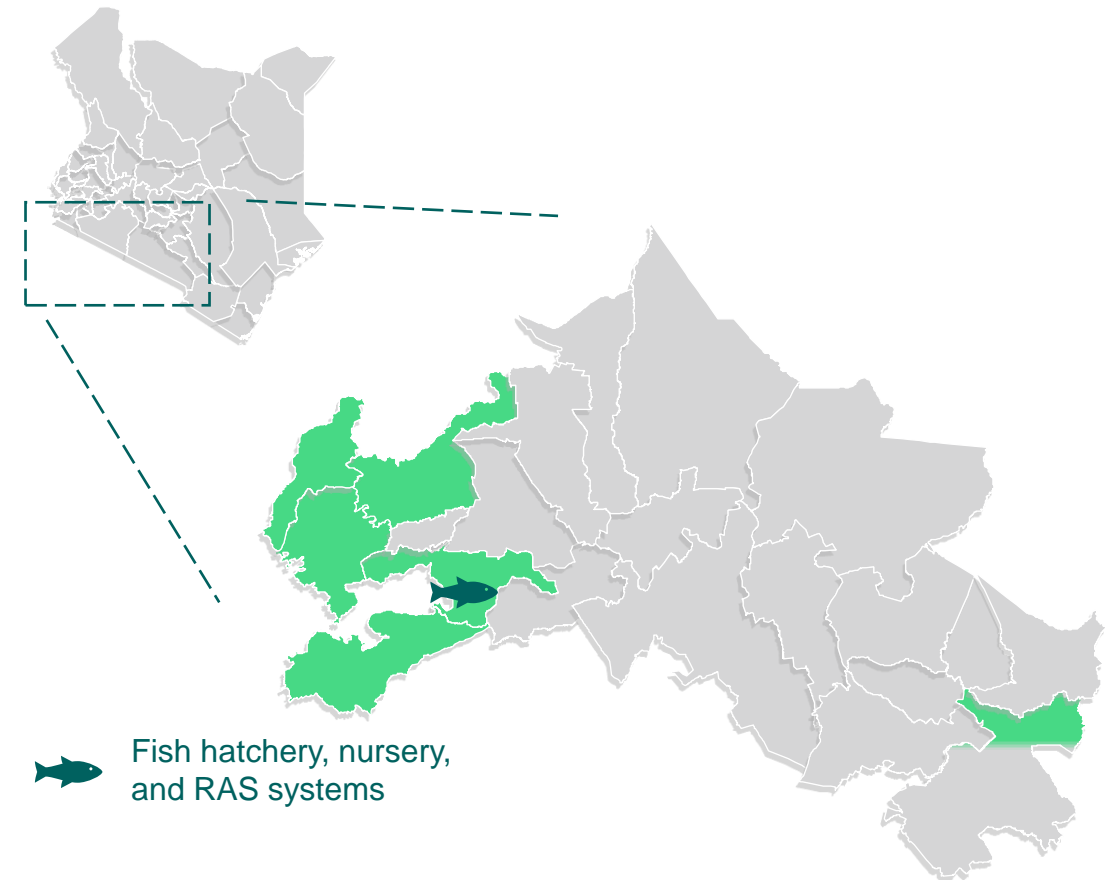
Company

History

- Jewlet was established in 2010 with the vision of becoming a leading freshwater aquaculture farm in the East African region.
- The farm is involved in the production of fingerlings and market-size tilapia fish using RAS, ponds, and cages.
- The average fingerling production in the facility is currently at 500,000 fingerlings per month.
- The company has heavily invested in research and technology and currently uses Genetically Improved Farmed Tilapia (GIFT) in the production of fingerlings¹.



Geographical location of operations












Fish hatchery, nursery, and RAS systems

Sources: 1) [Jewlet \(2022\)](#)



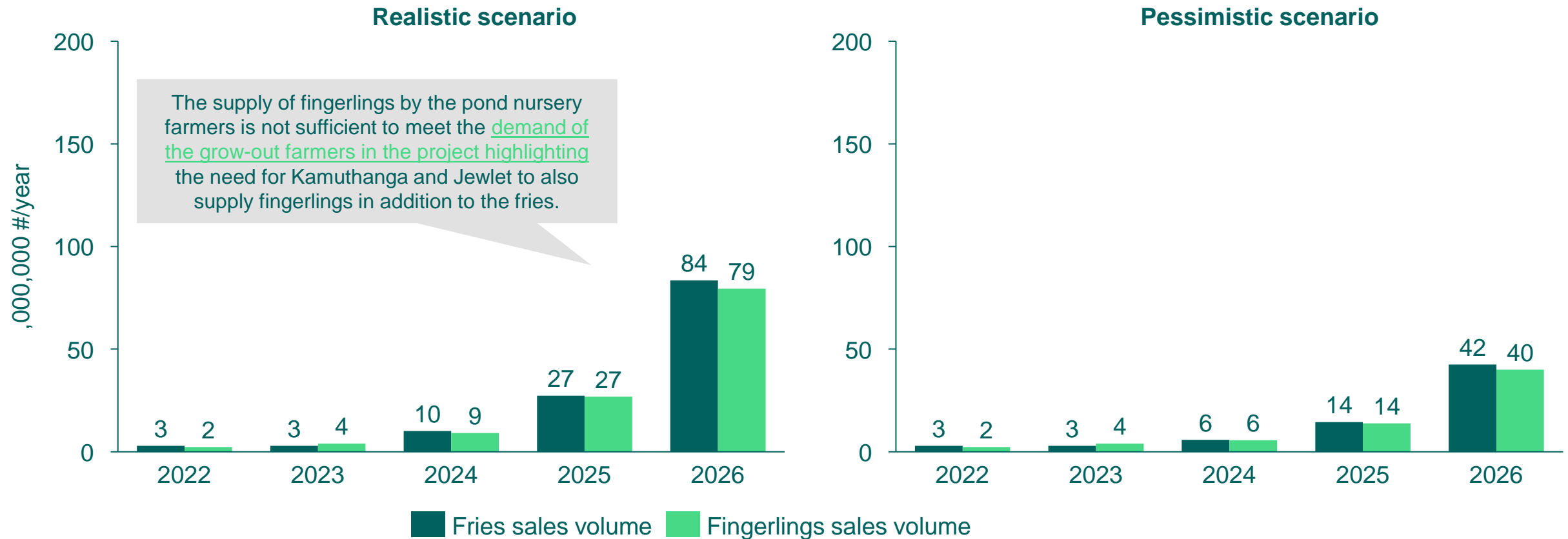
Business canvas | Jewlet has a diversified portfolio, providing fingerlings and fish feed to farmers while growing fish for the end consumers.

Key partners 	Key activities  <ul style="list-style-type: none">• Fish hatchery• Fish nursery• Tilapia and catfish out-growing• Fish farmer capacity building• Tilapia feed manufacturing	Value propositions  <ul style="list-style-type: none">• Provide quality fingerlings at affordable prices.• Offer market sized fish to meet the growing demand of the consumer• Produce and sell high quality fish feed for own fish production and affiliated fish farmers	Customer relations  <ul style="list-style-type: none">• Long term and close customer relationships and actions on feed back on feed quality• Training and capacity development of fish farmers that are nearby the facility	Customer segments  <p><i>Farmer services</i></p> <ul style="list-style-type: none">• Small and medium size pond and cage fish farmers <p><i>Market-size tilapia</i></p> <ul style="list-style-type: none">• Franchisees/outlets• Fish traders• Hotel & leisure
	Key resources  <ul style="list-style-type: none">• RAS systems (hatchery)• Ponds (nursery/grow-out)• Brand• Working capital• Infrastructure• Electricity		Key channels  <ul style="list-style-type: none">• Direct Sales to Farmers• Other Hatcheries	
Cost structure  <ul style="list-style-type: none">• Infrastructure CAPEX• Utilities of electricity, water, and fuel (generators)• Qualified staff• Cost of fish feed ingredients• Cost of imported fish feed• Finance cost• General and administrative expenses			Revenue streams  <ul style="list-style-type: none">• Margin on fry/fingerling sales• Margin on market size fish sales• Margi non fish feed sales	

Sources: 1) Jewlet questionnaire 2) Field visit notes

Sales volume outlook | Jewlet has the capacity to meet the fry demand during the project period, but with the scale-up of the project, demand will likely outstrip the existing capacity of both the production of fries and fingerlings.

Projected fingerling and fry sales between 2022 and 2026 (,000,000 #/year)



See detailed assumptions [\[here\]](#)



5.4

Fingerlings

Kamuthanga

Introduction | Kamuthanga is an EcoMark Africa certified farm that leverages Recirculating Aquaculture System in the production of fingerlings and market-size fish.



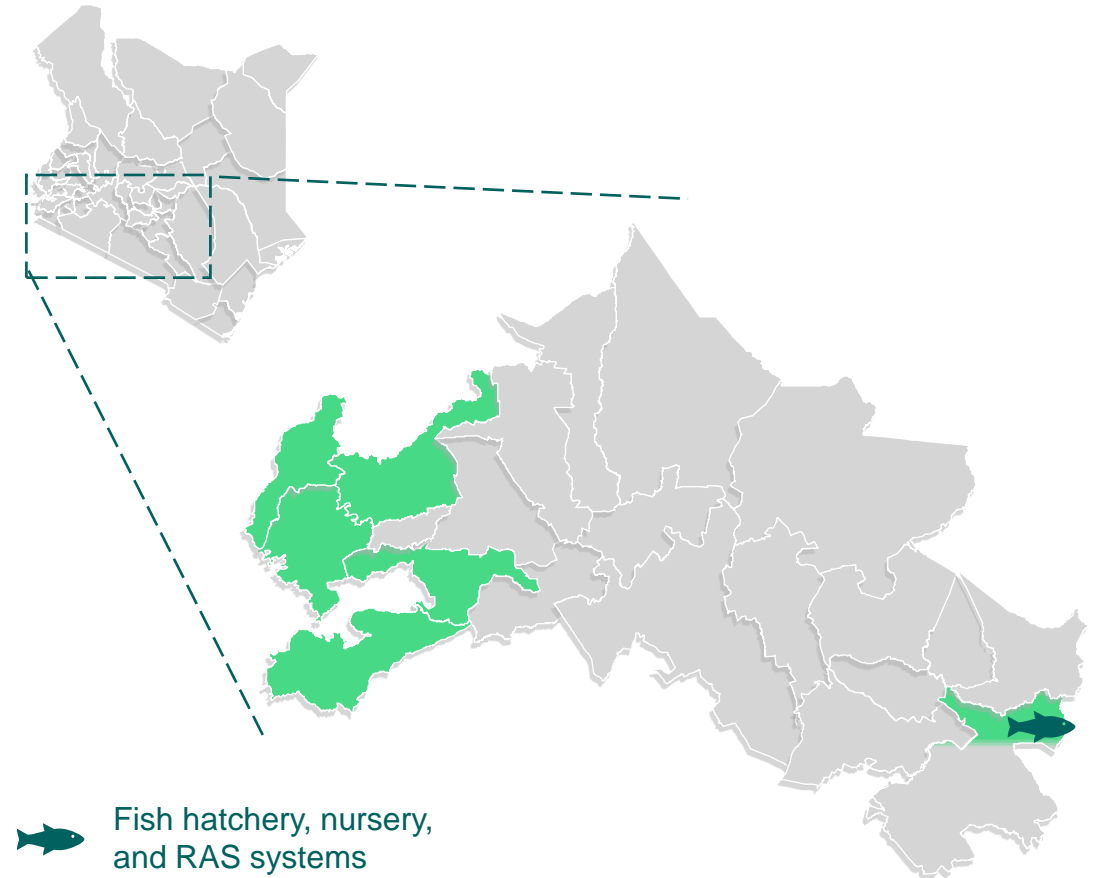
Company

History

- Kamuthanga Fish farm was established in 2014 with the vision to become a sustainable fish farm. The farm is based in Machakos County, located in the eastern part of Kenya.
- The farm has managed to incorporate social and environmental considerations in its production process.
- FoodTech Africa consortium was instrumental in developing the farm and supporting it to achieve the EcoMark Africa label.
- The farm produces approximately 100MT of fish and 3 million fingerlings in a year.












Geographical location of operations





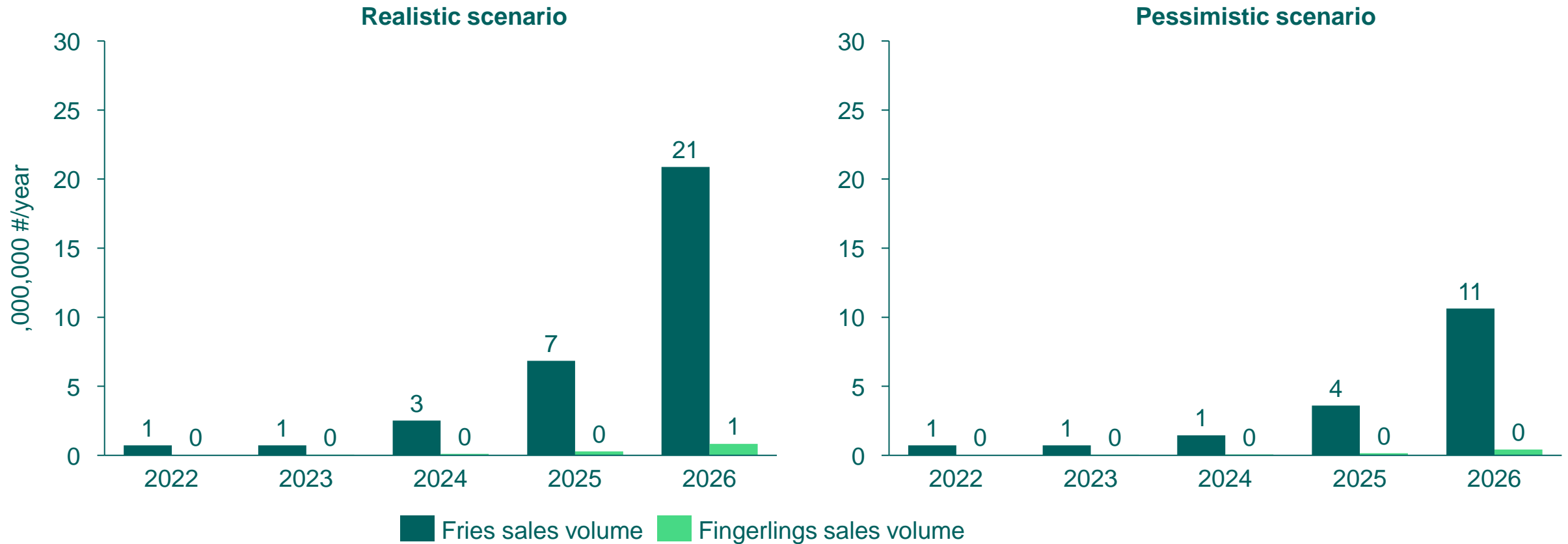
Business canvas | The business model of the farm is pegged on earning margins from the sale of fingerlings and market-size fish at premium prices.

Key partners 	Key activities  <ul style="list-style-type: none"> Fish hatchery Fish nursery Tilapia and catfish out-growing Fish farmer capacity building Tilapia sales (own restaurant) 	Value propositions  <ul style="list-style-type: none"> Sustainable and innovative production of fries, fingerlings, and market-size fish with the use of RAS. High quality tilapia suitable for hotel restaurants, which Kamuthanga can sell for a premium price. 	Customer relations  <ul style="list-style-type: none"> Long term and close customer relationships and actions on feed back on feed quality Training and capacity development of fish farmers that are nearby the facility 	Customer segments  <p><i>Farmer services</i></p> <ul style="list-style-type: none"> Small and medium size pond fish farmers <p><i>Market-size tilapia</i></p> <ul style="list-style-type: none"> Franchisees/outlets Fish traders Hotel & leisure
Key resources  <ul style="list-style-type: none"> RAS systems Brand (EcoMark Africa Certified) Working capital Sales outlets Infrastructure Electricity 			Key channels  <ul style="list-style-type: none"> Direct sales at factory gate Outlets 	
Cost structure  <ul style="list-style-type: none"> Infrastructure CAPEX Utilities of electricity, water, and fuel (generators) Qualified staff 	<ul style="list-style-type: none"> Cost of fish feed Finance cost General and administrative expenses 	Revenue streams  <ul style="list-style-type: none"> Margin on fish sales (for premium price) Margin on fry/fingerling sales Tilapia sales through own restaurants 		



Sales volume outlook | Kamuthanga will double up as a fingerling provider in the eastern region of Kenya, while they have the capacity to meet the demand for fingerlings within the pilot phase, a fingerling shortfall is projected at scale-up.

Fries and fingerlings volume between 2022 and 2026 (,000,000 #/year)

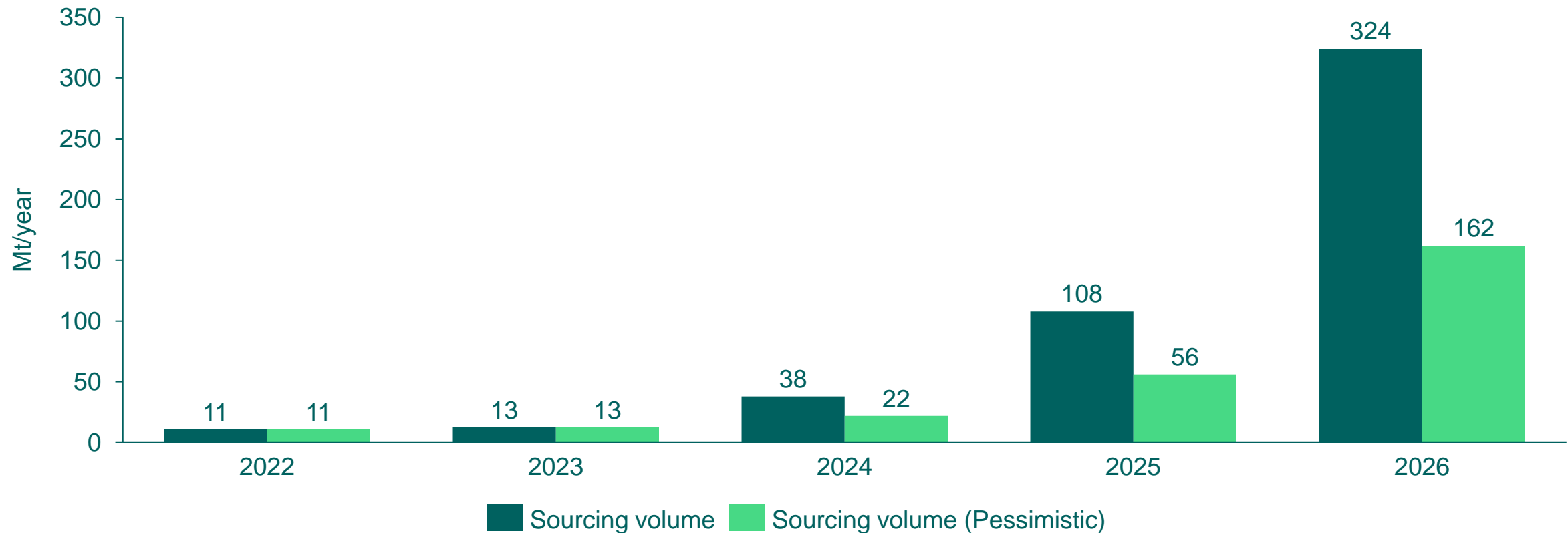


See detailed assumptions [\[here\]](#)



Sales volume outlook | Kamuthanga is positioned to source and sell up to 324 MT/year in 5 years as a result of an effective onboarding of farmers and the adoption of services by the fish farmers within the SDM.

Fish sourcing volume between 2022 and 2026 (MT/year)



See detailed assumptions [\[here\]](#)



5.5

**Knowledge
institute**
*Aquaculture
Academy*



Introduction | The academy is a needed solution to the extensive challenge of lack of knowledge and capacity among aquaculture farmers.



Company

History

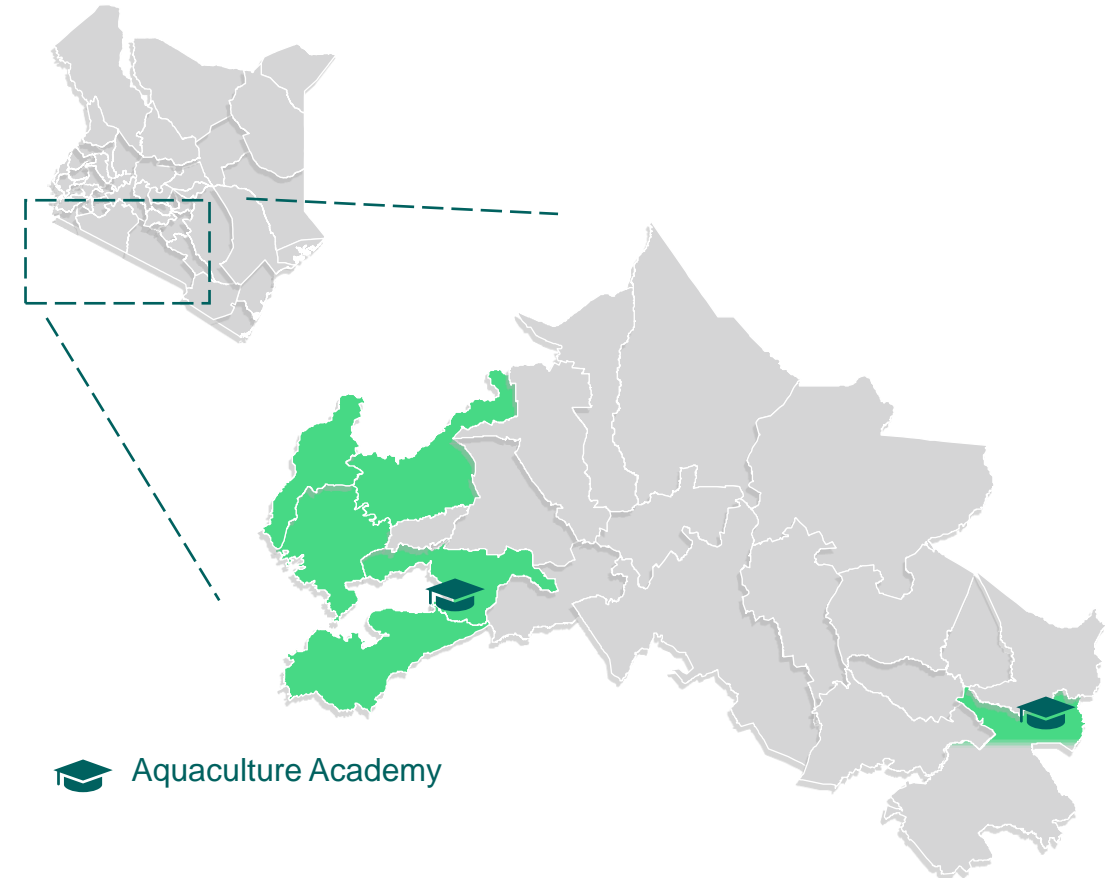
- Established in 2021 with the goal to meet the knowledge gap in the aquaculture value chain.
- The academy was founded by the FoodTech Africa consortium who are leveraging on their experience working in the aquaculture sector in East Africa.
- The academy currently has two locations at Kamuthanga Fish Farm located in Machakos county and Jewlet Fish farms in Homabay County.
- The academy is structured to provide both theoretical and practical training to fish farmers, with a target to reach about 1,000 farmers every year.

Objectives

- To train and build 'aquapreneurs' able to run a sustainable and profitable business, inspire others to become fish farmers and spur economic prosperity throughout the sector












Geographical location of operations



Aquaculture Academy



Business canvas | Farmers are charged a small fee as a show of commitment to the program. The fee is however not sufficient to cover the program costs, as such the academy has to rely on external support to fund its programs.

Key partners  <ul style="list-style-type: none"> Donors/funders SDM partners 	Key activities  <ul style="list-style-type: none"> Capacity building - vocational practical training Enable access to market/employment opportunities Enable access to inputs for practical sessions Provide data collection materials Enable access to finance 	Value propositions  <ul style="list-style-type: none"> Building Aquapreneurs in East Africa through vocational training for the aquaculture sector Offering aquaculture expertise through strategic key partnerships and the Academy 	Customer relations  <ul style="list-style-type: none"> Training and mentoring on different topics at the AA-campuses Feedback from training Developing a database of trainees and having to follow ups for additional training Alumni Network Thought leadership articles on social media or newspapers Employer partners Roadshows/exhibitions/conferences Documentary Brochures 	Key channels  <ul style="list-style-type: none"> Aquaculture Academy website Partnerships with Universities and other institutions offering aquaculture courses County governments Referrals from input suppliers, AA partners and other farmers Media platforms eg radio, newspapers Farmer groups and cooperative societies Aquaculture influencers Social media
Key resources  <ul style="list-style-type: none"> Infrastructure facilities at Jewlet in Homabay and Kamuthanga in Machakos IT Qualified staff Training curriculum and training materials 	Cost structure  <ul style="list-style-type: none"> Trainers costs Training materials for theory (presentation materials, booklets, tuition materials) & practical (data collection materials, feed, fingerlings) Administration staff costs Overheads eg rent & utilities, motor vehicle maintenance 		Revenue streams  <ul style="list-style-type: none"> Fees paid by students Donor Support 	Customer segments  <ul style="list-style-type: none"> Institutions of higher learning Students interested in aquaculture



5.6

**Financial
Service
Provider**

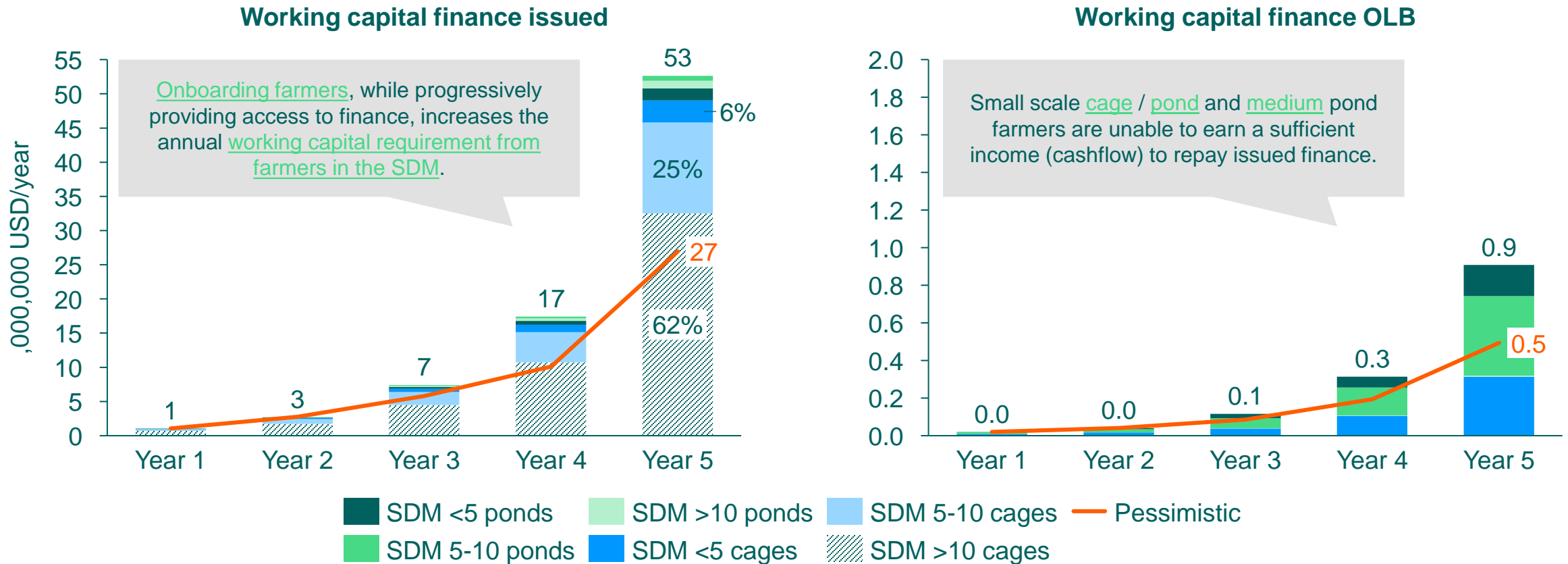




Working capital requirements | Understanding the bankability of each farmer segment, while progressively providing access to finance, provides a business case for financial service providers.

Annual finance requirement and OLB of smallholders in the SDM (,000,000 USD/year)

Working capital

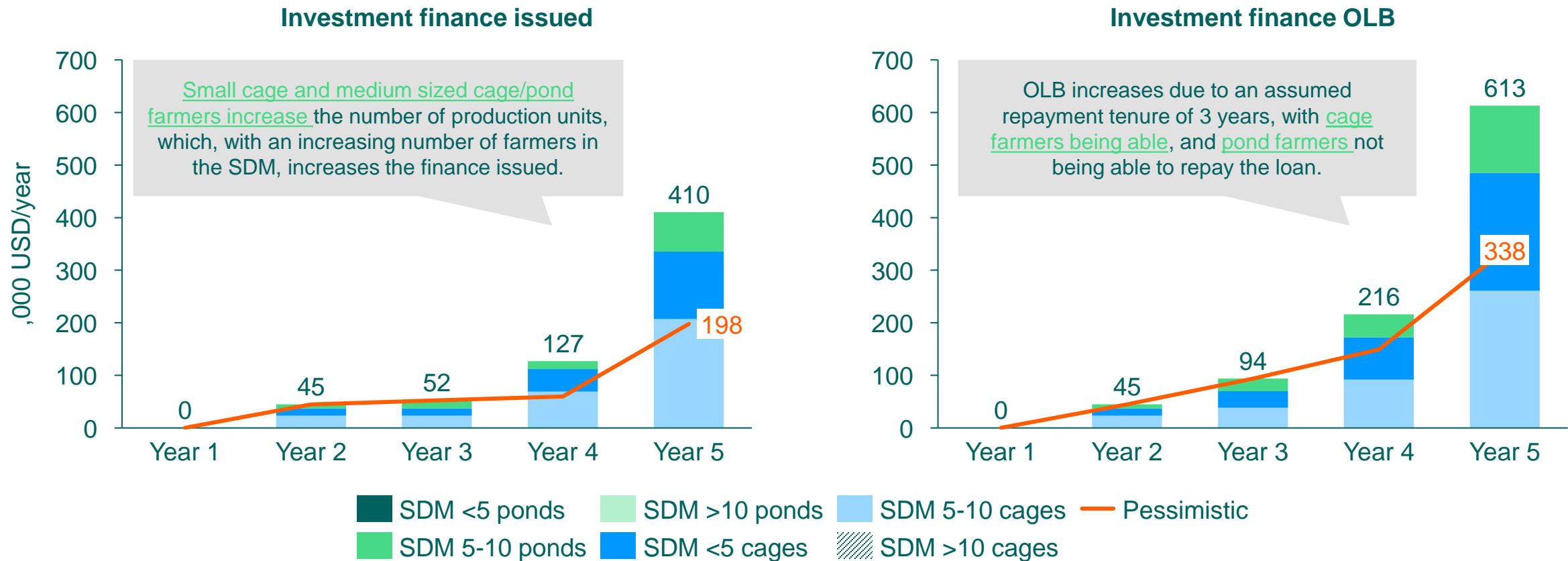


See detailed assumptions [\[here\]](#)

Investment capital requirements | Understanding the bankability of each farmer segment, while progressively providing access to finance, provides a business case for financial service providers.

Annual finance requirement and OLB of smallholders in the SDM (,000 USD/year)

Investment



1) See detailed assumptions [\[here\]](#)

2) There is assumed to be no write-off of loan positions for this analysis.







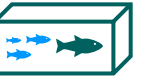
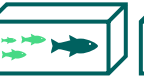
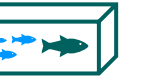
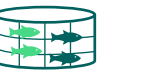




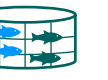


6

Impact Case











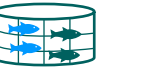






Farmer segments | The SDM is serving a wide range of farmer segments that differ in type and number of production units, production cycles per year, and size of the fish.

Characteristics	Pond farming						Cage farming					
	Small scale		Medium scale		Large scale		Small scale		Medium scale		Large scale	
	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM
 Fry (0.5 gr)  Fingerling 10gr  Tilapia 300-450 gr												
Type of production	Pond / Tilapia	Pond / Fingerling	Pond / Tilapia	Pond / Tilapia	Pond / Tilapia	Pond / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia
Number of units #/cages or ponds	Y1: 2 Y5: 2	Y1: 2 Y5: 2	Y1: 7 Y5: 7	Y1: 7 Y5: 13	Y1: 38 Y5: 38	Y1: 38 Y5: 38	Y1: 2 Y5: 2	Y1: 2 Y5: 6	Y1: 7 Y5: 7	Y1: 7 Y5: 11	Y1: 22 Y5: 22	Y1: 22 Y5: 22
Cycles per year #/year	Y1: 1 Y5: 1	Y1: 2 Y5: 4	Y1: 1 Y5: 1	Y1: 1 Y5: 1.5	Y1: 1 Y5: 1	Y1: 1 Y5: 1.5	Y1: 1 Y5: 1	Y1: 1.2 Y5: 2	Y1: 1 Y5: 1	Y1: 1.2 Y5: 2	Y1: 1 Y5: 1	Y1: 1.2 Y5: 2
Marketable surplus # or kg/cycle/unit	175 KG	36,000 #	175 KG	360 KG	175 KG	360 KG	2,900 KG	4,700 KG	2,900 KG	4,700 KG	2,900 KG	4,700 KG
Farm-gate price KES/kg or #	295 KES/kg	10 KES/#	300 KES/kg	330 KES/kg	300 KES/kg	330 KES/kg	300 KES/kg	330 KES/kg	300 KES/kg	330 KES/kg	300 KES/kg	330 KES/kg
Services (overview)												
Training & Information												
Inputs												
Finance see details												
Labor & Equipment												
Post harvest service												
Market access												



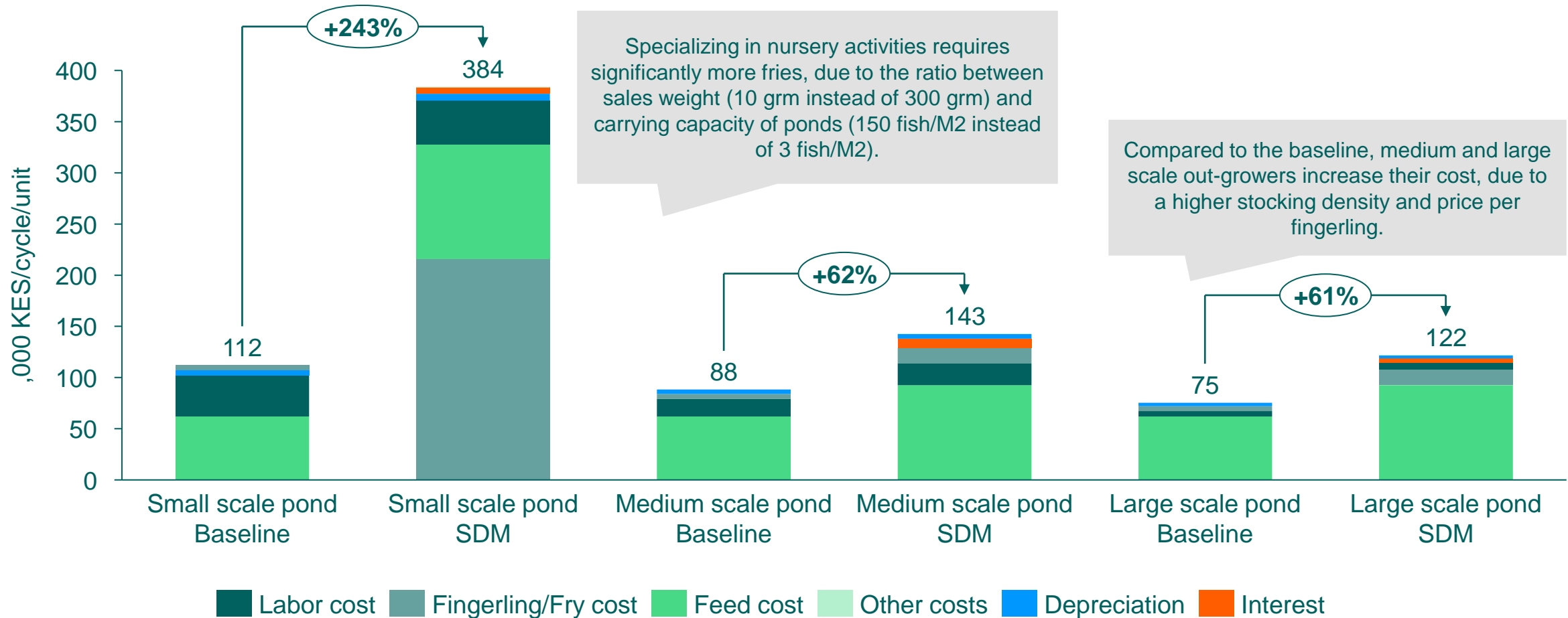
Farmer segments | Overview of VCP related KPIs

Characteristics	Pond farming						Cage farming					
	Small scale		Medium scale		Large scale		Small scale		Medium scale		Large scale	
	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM	Baseline	SDM
 Fry (0.5 gr)  Fingerling 10gr  Tilapia 300-450 gr												
Type of production	Pond / Tilapia	Pond / Fingerling	Pond / Tilapia	Pond / Tilapia	Pond / Tilapia	Pond / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia	Cage / Tilapia
Fry demand #/year	Y1: 0 Y5: 0	Y1: 180k Y5: 360k	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0	Y1: 0 Y5: 0
Fingerling demand #/year	Y1: 2k Y5: 2k	Y1: 0 Y5: 0	Y1: 6k Y5: 6k	Y1: 11k Y5: 29k	Y1: 34k Y5: 34k	Y1: 57k Y5: 86k	Y1: 22k Y5: 22k	Y1: 34k Y5: 168k	Y1: 76k Y5: 76k	Y1: 118k Y5: 309k	Y1: 238k Y5: 238k	Y1: 371k Y5: 618k
Marketable surplus # or kg/year	kg/year Y1: 300 Y5: 300	#/year Y1: 144k Y5: 288k	kg/year Y1: 1.2k Y5: 1.2k	kg/year Y1: 2.5k Y5: 7.0k	kg/year Y1: 6.6k Y5: 6.6k	kg/year Y1: 14k Y5: 21k	kg/year Y1: 5.8k Y5: 5.8k	kg/year Y1: 11k Y5: 57k	kg/year Y1: 20k Y5: 20k	kg/year Y1: 40k Y5: 105k	kg/year Y1: 64k Y5: 64k	kg/year Y1: 125k Y5: 209k
Feed demand Mt/year	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5	Y1 Y5
0.5	N/a	0.8 1.5	N/a		N/a		N/a		N/a		N/a	
1.0		0.9 1.9										
2.0				0.6 1.9		3.6 5.5		2.0 10.		7.0 19.		22. 37.
3.0				1.6 4.5		8.8 13.		4.9 24.		17. 44.		53. 89.
4.5				1.6 4.5		8.8 13.		10. 55.		38. 100		120 201
Working capital Mln. KES/year	N/a	Y1: 0.5 Y5: 1.5	N/a	Y1: 0.5 Y5: 1.5	N/a	Y1: 1.0 Y5: 4.0	N/a	Y1: 1.0 Y5: 12.0	N/a	Y1: 3.0 Y5: 22.0	N/a	Y1: 8.0 Y5: 44.0

Cost of production | Transitioning to becoming a nursery significantly increases the initial investment of purchasing the required number of fingerlings, while out-growers increase their cost due to interest, high quality feed, and labour.

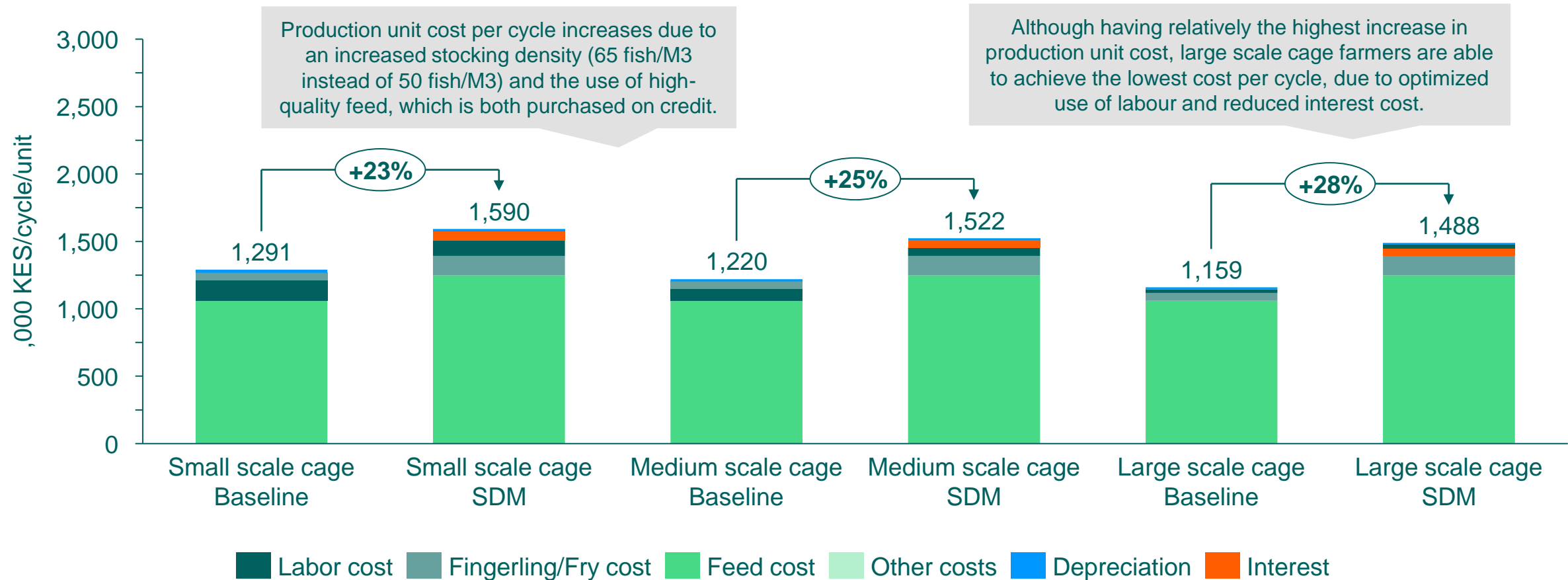
Cost of production per cycle in ponds (5-year average)

POND



Cost of production | Increasing the number of production units of cage out-growers enables them to achieve scale benefits from optimized use of labour and reduced interest cost.

Cost of production per cycle in cage (5-year average)

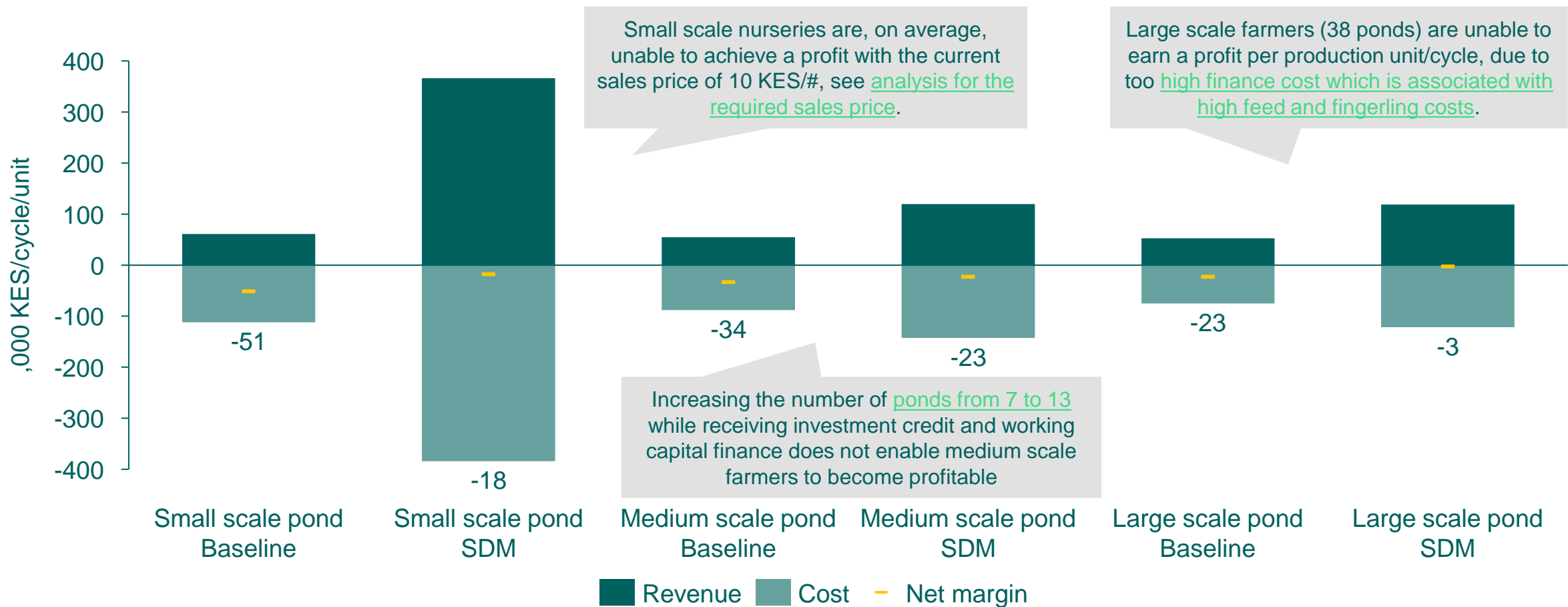
CAGE




Margin analysis | Under current conditions and with current development strategies, small and medium scale farmers are unable to become profitable, while large scale farmers are able to establish a sustainable business case.

Margin analysis per cycle in pond (5-year average)

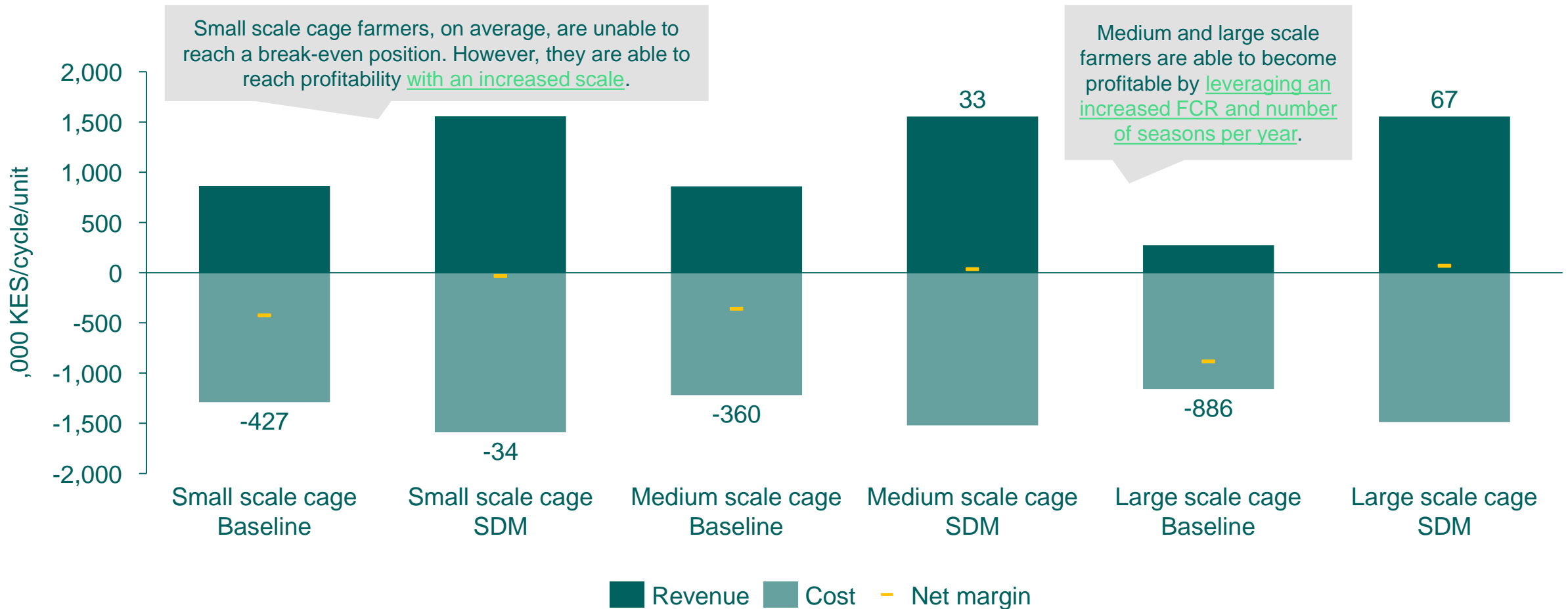
POND



Margin analysis | Expanding the number of production units and applying good aquacultural practises enables cage farmers in the SDM to establish a sustainable business case.

Margin analysis per cycle in cage (5-year average)

CAGE



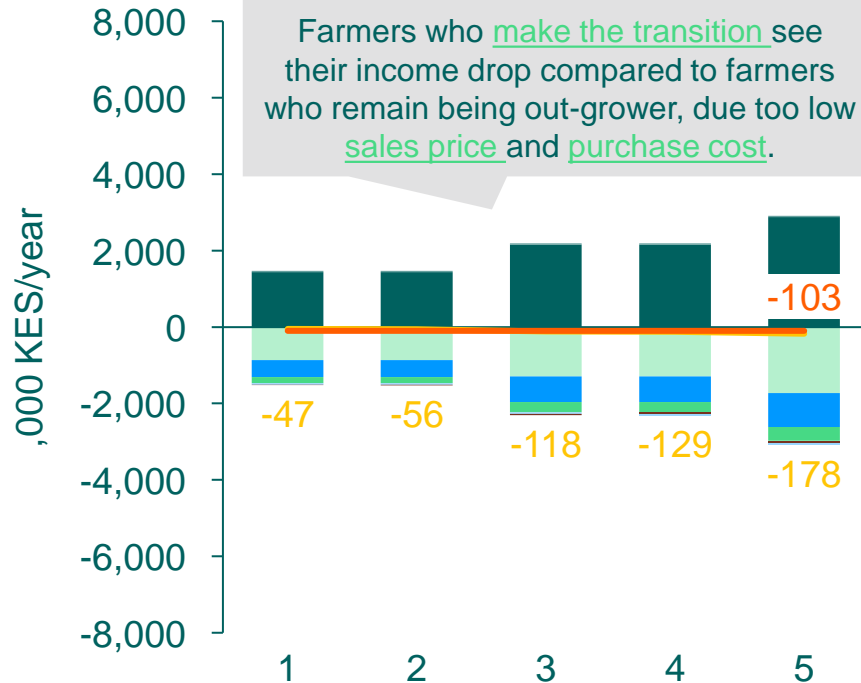
Annual income analysis | Unable to reach the critical number of production units, out-grower farmers are unable to become profitable and risk becoming debt trapped, while small scale farmers face the same risk due to too low sales prices of fingerlings.

Profit and loss for a five year period for pond farmers (,000 KES/year)

POND

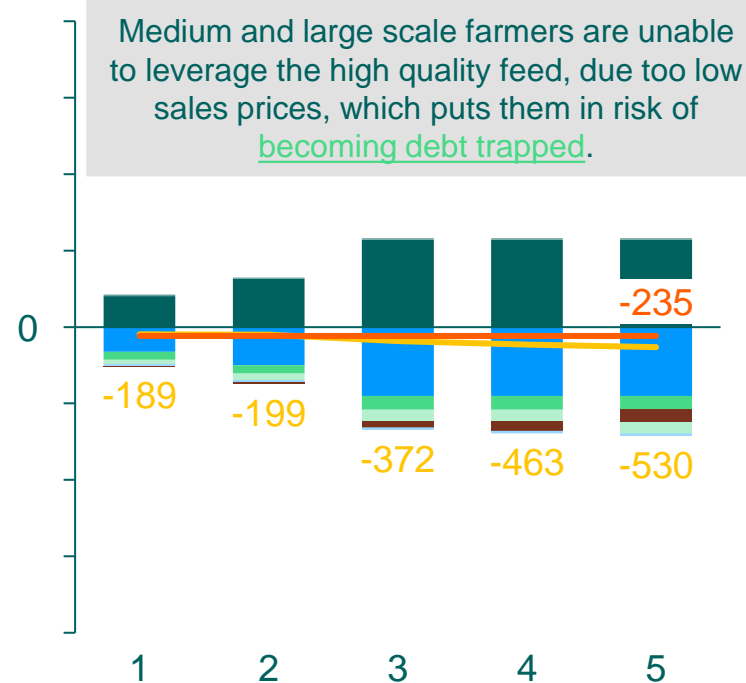
Small scale

Farmers who make the transition see their income drop compared to farmers who remain being out-grower, due too low sales price and purchase cost.

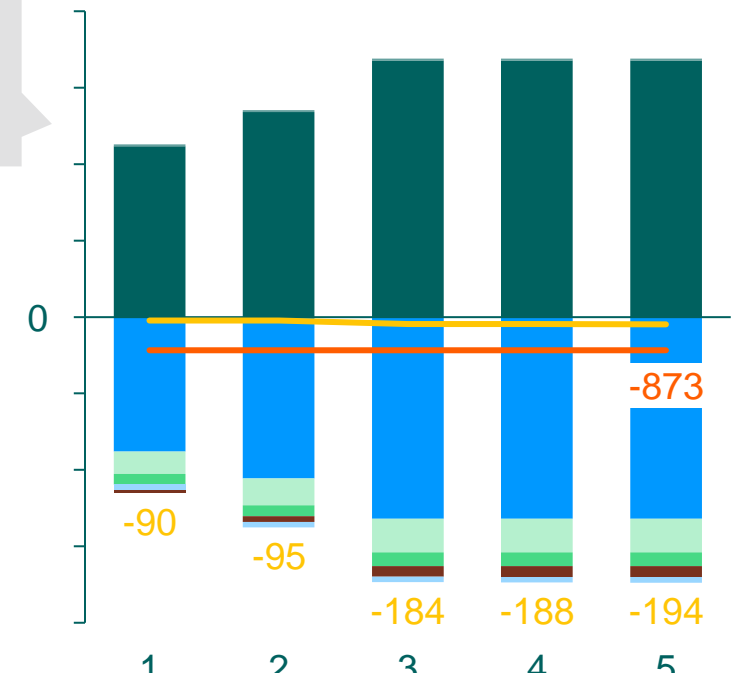


Medium scale

Medium and large scale farmers are unable to leverage the high quality feed, due too low sales prices, which puts them in risk of becoming debt trapped.



Large scale



Revenue (dark green), Labor cost (green), Feed cost (blue), Finance cost (brown), Other revenue (grey), Fry/Fingerling cost (light green), Depreciation & other cost (light blue), Baseline net income (orange line), SDM net income (yellow line)



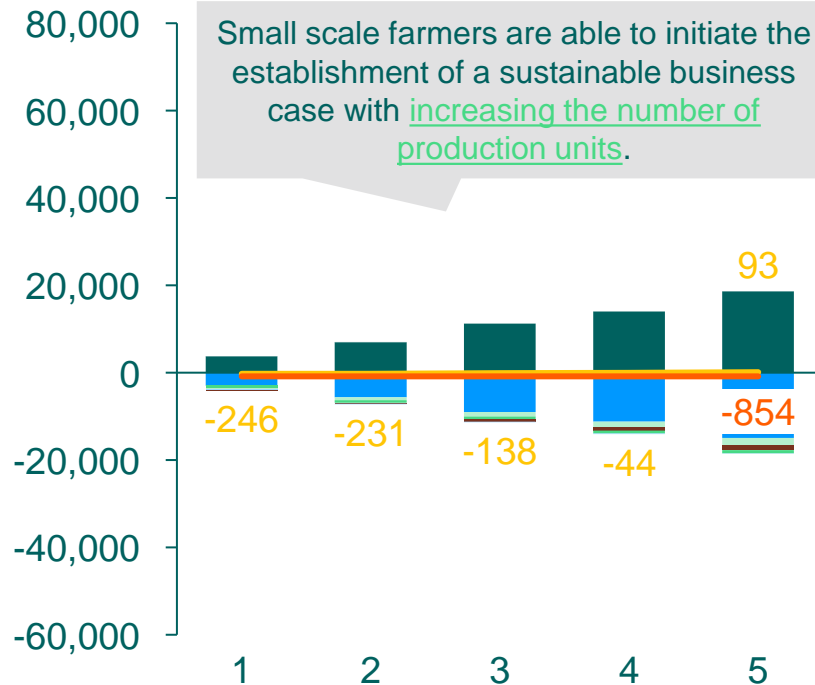
Annual income analysis | Under current assumed finance terms, small and medium scale cage farmers are able to expand the number of production units and implement good aquacultural practises to achieve a sustainable business case.

Profit and loss for a five year period for cage farmers (,000 KES/year)

CAGE

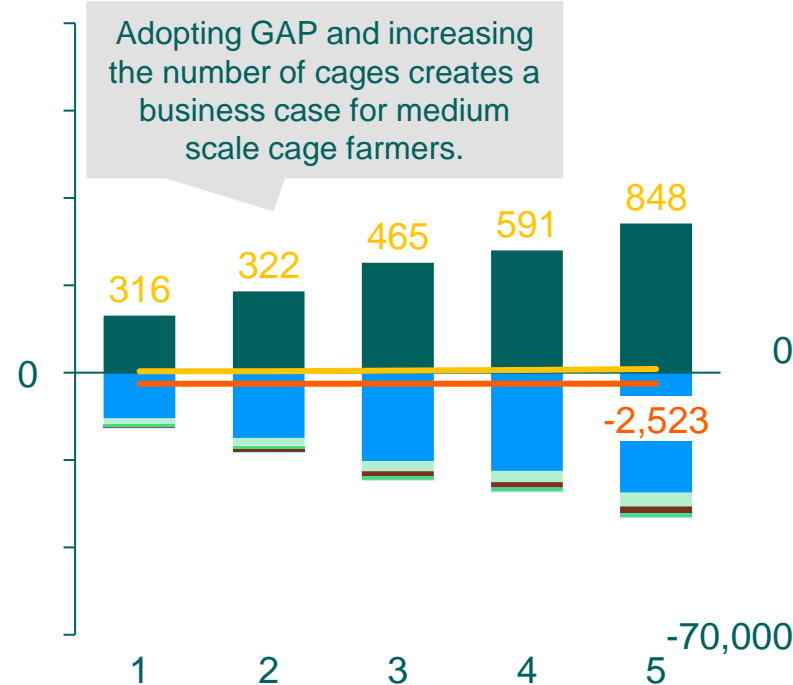
Small scale

Small scale farmers are able to initiate the establishment of a sustainable business case with increasing the number of production units.

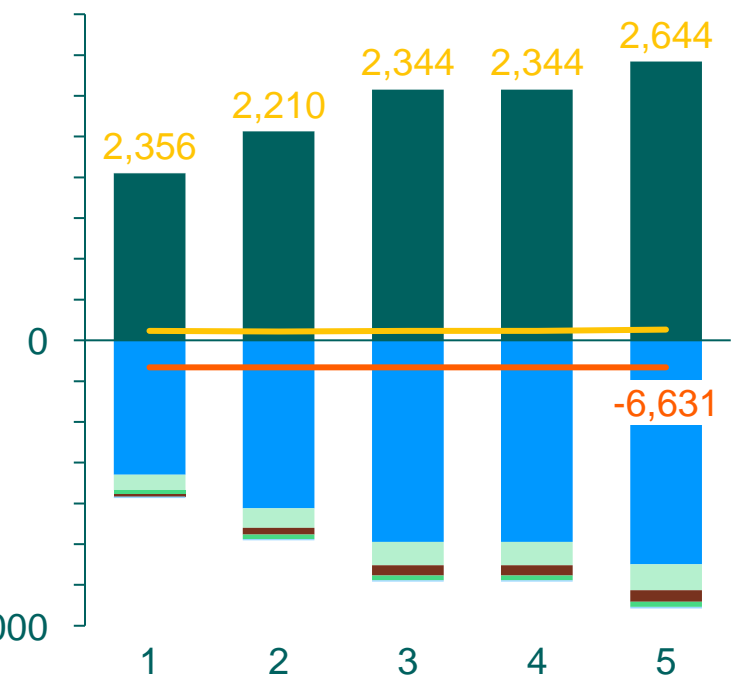


Medium scale

Adopting GAP and increasing the number of cages creates a business case for medium scale cage farmers.



Large scale



Revenue (dark green), Labor cost (green), Feed cost (blue), Finance cost (brown), Other revenue (grey), Fry/Fingerling cost (light green), Depreciation & other cost (light blue), Baseline net income (orange line), SDM net income (yellow line)



Price sensitivity analysis | Nursery farmers can only establish a business case by charging an increased sales price (12.5 KES/fingerling for a living income), as benefits from scale are insufficient to cover increased feed prices.

Sensitivity analysis on net income* for nursery farmers (3rd Year performance assumptions)

POND

# production units	2	2	2	2	3	3
cycles/year	2.0	2.5	3.0	4.0	3.0	4.0
# laborers/year	2	3	3	3	3	3
# fingerlings/year	144,000	180,000	216,000	288,000	324,000	432,000
KES/year						
7.5	-530,000	-620,000	-655,000	-990,000	-1,055,000	-1,245,000
10.0	-170,000	-170,000	-115,000	-270,000	-245,000	-160,000
12.5	190,000	280,000	425,000	450,000	565,000	920,000
15.0	550,000	730,000	965,000	1,170,000	1,375,000	2,000,000
17.5	910,000	1,180,000	1,505,000	1,890,000	2,185,000	3,080,000
20.0	1,270,000	1,630,000	2,045,000	2,610,000	2,995,000	4,160,000

Sales price (KES/#)



Current projections



Poverty line



Living income

NOTES: * Net income is calculated exclusive of interest charged on capital investments and the effect of possible debt carry-forward from previous years.



Price sensitivity analysis | Pond out-grower profitability is highly dependent on sales price and scale, with current prices being unsustainable, and farmers requiring at least up to 30 production units (ponds) to earn a living income if prices increase to 400 KES/kg (+24%).

Sensitivity analysis on net income* for pond out-grower farmers (3rd Year performance assumptions)

POND

# production units	10	15	20	30	40	50	
cycles/year	1.5	1.5	1.5	1.5	1.5	1.5	
# laborers/year	2	3	3	3	4	5	
kg tilapia/year	5,400	8,000	10,800	16,100	21,500	26,900	
Sales price (KES/kg)	KES/year						
	150	-1,180,000	-1,730,000	-2,190,000	-3,105,000	-4,115,000	-5,120,000
	250	-645,000	-925,000	-1,115,000	-1,495,000	-1,965,000	-2,435,000
	325	-240,000	-320,000	-305,000	-285,000	-350,000	-420,000
	400	165,000	285,000	500,000	925,000	1,260,000	1,600,000
	475	570,000	890,000	1,305,000	2,135,000	2,875,000	3,615,000
	550	970,000	1,495,000	2,110,000	3,345,000	4,485,000	5,630,000



Poverty line



Living income

NOTES: * Net income is calculated exclusive of interest charged on capital investments and the effect of possible debt carry-forward from previous years.



Price sensitivity analysis | Cage farmers can strengthen their business case and resilience by selling tilapia at a premium price and by expanding the number of cages they operate to leverage the current production shortage of tilapia.

Sensitivity analysis on net income* for cage out-grower farmers (3rd Year performance assumptions)

CAGE

		5	10	15	20	30	40
# production units		5	10	15	20	30	40
cycles/year		1.8	1.8	1.8	1.8	1.8	1.8
# laborers/year		3	3	3	4	4	4
kg tilapia/year		42,600	85,200	127,900	170,500	255,800	341,000
KES/year							
Sales price (KES/kg)	150	-7,450,000	-14,480,000	-21,270,000	-28,305,000	-41,880,000	-55,460,000
	250	-3,190,000	-5,955,000	-8,485,000	-11,255,000	-16,305,000	-21,360,000
	325	140,000	695,000	1,490,000	2,045,000	3,645,000	5,240,000
	400	3,205,000	6,830,000	10,700,000	14,325,000	22,060,000	29,795,000
	475	6,405,000	13,225,000	20,290,000	27,110,000	41,240,000	55,370,000
	550	9,600,000	19,620,000	29,880,000	39,900,000	60,425,000	80,945,000



Poverty line

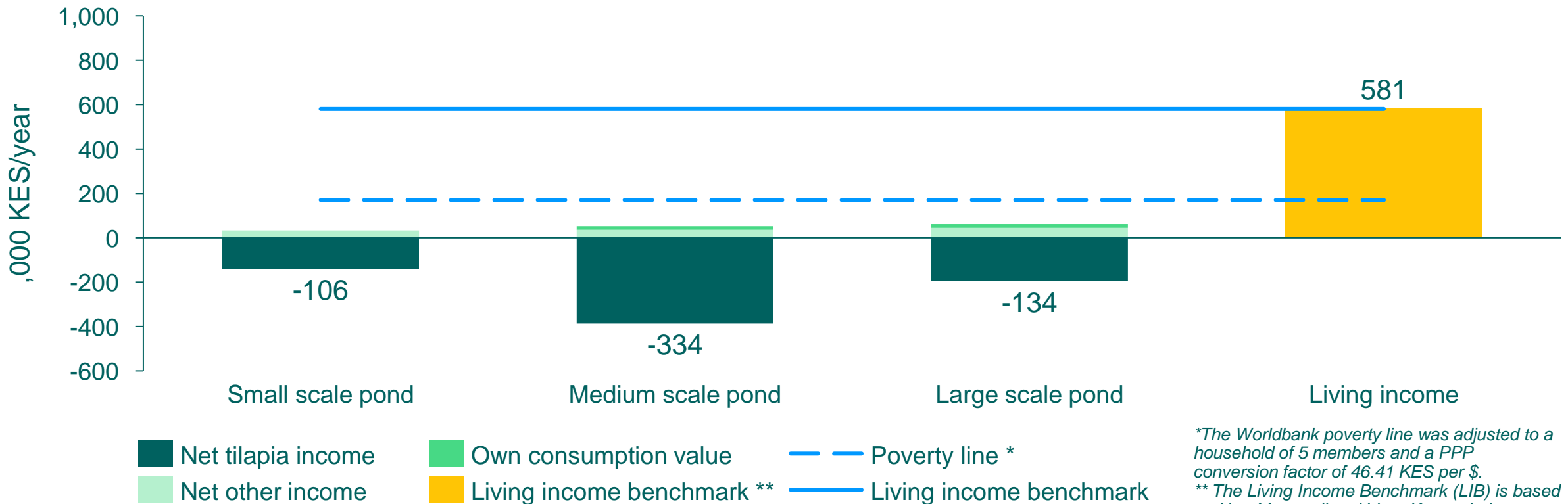


Living income

NOTES: * Net income is calculated exclusive of interest charged on capital investments and the effect of possible debt carry-forward from previous years.

Living income analysis | No pond farmer is able to earn an income above the poverty line, although they adopt GAP and use high quality feed, which communicates no sustainable business case can be reached through pond out-growing.

Annual living income analysis of pond farming (5-year average)

POND


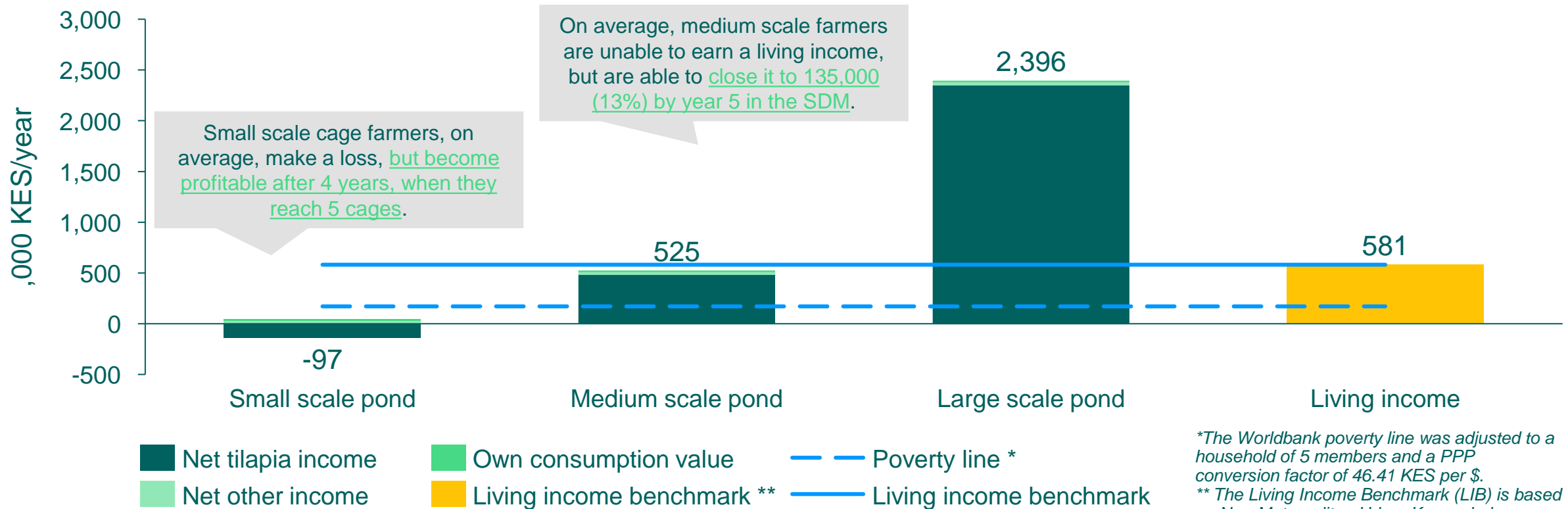
*The Worldbank poverty line was adjusted to a household of 5 members and a PPP conversion factor of 46.41 KES per \$.

** The Living Income Benchmark (LIB) is based on Non-Metropolitan Urban Kenya, Lake Naivasha, see report here [Global Living Wage Coalition \(2022\)](#).

Living income analysis | Only large scale farmers, on average, are able to earn a living income, with the number of production units (scale) being the most important driver behind closing the living income gap.

Annual living income analysis of cage farming (5-year average)

CAGE



*The Worldbank poverty line was adjusted to a household of 5 members and a PPP conversion factor of 46.41 KES per \$.

** The Living Income Benchmark (LIB) is based on Non-Metropolitan Urban Kenya, Lake Naivasha, see report here [Global Living Wage Coalition \(2022\)](#).



Income driver analysis | Decreasing margins in the value chain at the feed provider (cost) and aggregator (sales price) level, while optimizing productivity at the farm level, provides a pathway to develop a sustainable business case for pond farming.

POND	Driver analysis (3 rd Year performance)		Small scale ^{1) / 2)}	Medium scale ^{1) / 2)}	Large scale ^{1) / 2)}	
Definition	Required and feasible change	Current income (KES/year)	-/- 120,000	-/- 370,000	-/- 185,000	
Production units	<ul style="list-style-type: none">Under current assumptions, pond farmers are operating with <u>negative margins per unit</u>, hence, there is no way to increase income by increasing the number of production units.		-	-	-	
Productivity	<ul style="list-style-type: none">Productivity increase can only be reached through shorting the growing stage (increased FCR) and increasing the number of cycles per year, as optimum <u>stocking densities are already reached</u>.Under current assumptions, pond farmers are operating with <u>negative margins per cycle per unit</u>. Hence, there is no possibility to increase income through productivity		-	-	-	
Sales price	<p>A. Fingerlings are generally sold for 1 KES/gram, but small-scale nurseries could reach a <u>feasible 1.5 KES/gram</u>.</p> <p>B. Medium scale farmers require an increase to 450 KES/kg (+38%) and large-scale farmers to 340 KES/kg (+4%), with an increase to 350 KES/kg being feasible based on market trends.</p>		+ 1,085,000 ^A	+225,000 ^B	+430,000 ^B	
Cost of production	<ul style="list-style-type: none">The cost of feed and fries/fingerlings drives the cost of production. The <u>effect of fingerling cost is evaluated</u> and not added in this analysis.C. For out-grower only, feed cost can be decreased by reaching a lower FCR of 1.2 instead of 1.6 and using imported feed for 60 KES/kg instead of 145 KES/kg (based on 4 mm. fish feed).		-	+1,300,000 ^C	+ 3,585,000 ^C	
Diversified income	<ul style="list-style-type: none">Further research is required to evaluate the extent to which farmers are able to diversify their income within the limits of capital, labour, and land.		-	-	-	
Feasible	Neutral	Unfeasible	Feasible income (KES/year) ³⁾	965,000	1,455,000	4,035,000

NOTES: 1) The values presented in the graphs are the income change that can be attained within the context of the SDM (KES/year); 2) Net income is calculated exclusive of interest charged on capital investments and the effect of possible debt carry-forward from previous years; 3) Cumulative and interconnected (e.g. price increase * marketable surplus increase) effect of all feasible changes identified.



Income driver analysis | Feasible changes in income drivers create a prospered business case outlook for cage farmers in the SDM, which is to be unlocked by creating the required market linkage and value distribution in the value chain.

CAGE	Driver analysis (3 rd Year performance)		Small scale ^{1) / 2)}	Medium scale ^{1) / 2)}	Large scale ^{1) / 2)}	
Definition	Required and feasible change	Current income (KES/year)	-/- 95,000	465,000	2,345,000	
Production units	<div>A. Small and medium cage farmers are expected to be able to increase their production units with 4 units in 5 years. From year 3, this means an additional 2 units.</div> <div><div></div><div>The Large scale farmer is not expected to be able to increase the #/units.</div></div>		+ 295,000 ^A	+ 385,000 ^A	-	
Productivity	<div><div></div><div>Productivity increase can only be reached through shorting the growing stage (increased FCR) and increasing the number of cycles per year, as optimum <u>stocking densities are already reached</u>.</div></div> <div><div></div><div>Under current assumptions, cage farmers are operating at maximum capacity. Hence, there is no possibility to increase income through productivity</div></div>		-	-	-	
Sales price	<div>B. Although sales prices are competing with low prices from imported fish, domestic lake fish can potentially increase to 350 KES/kg being feasible based on market trends.</div>		+ 825,000 ^B	+ 1,755,000 ^B	+ 4,390,000 ^B	
Cost of production	<div><div></div><div>The cost of feed and fries/fingerlings drives the cost of production. The <u>effect of fingerling cost is evaluated</u> and not added in this analysis.</div></div> <div>C. For out-grower only, feed cost can be decreased by reaching a lower FCR of 1.2 instead of 1.6 and using imported feed for 60 KES/kg instead of 145 KES/kg (based on 4 mm. fish feed).</div>		+ 4,765,000 ^C	+10,620,000 ^C	+ 26,060,000 ^C	
Diversified income	<div><div></div><div>Further research is required to evaluate the extent to which farmers are able to diversify their income within the limits of capital, labour, and land.</div></div>		-	-	-	
Feasible	Neutral	Unfeasible	Feasible income (KES/year) ³⁾	8,460,000	15,815,000	32,535,000

NOTES: 1) The values presented in the graphs are the income change that can be attained within the context of the SDM (KES/year); 2) Net income is calculated exclusive of interest charged on capital investments and the effect of possible debt carry-forward from previous years; 3) Cumulative and interconnected (e.g. price increase * marketable surplus increase) effect of all feasible changes identified.

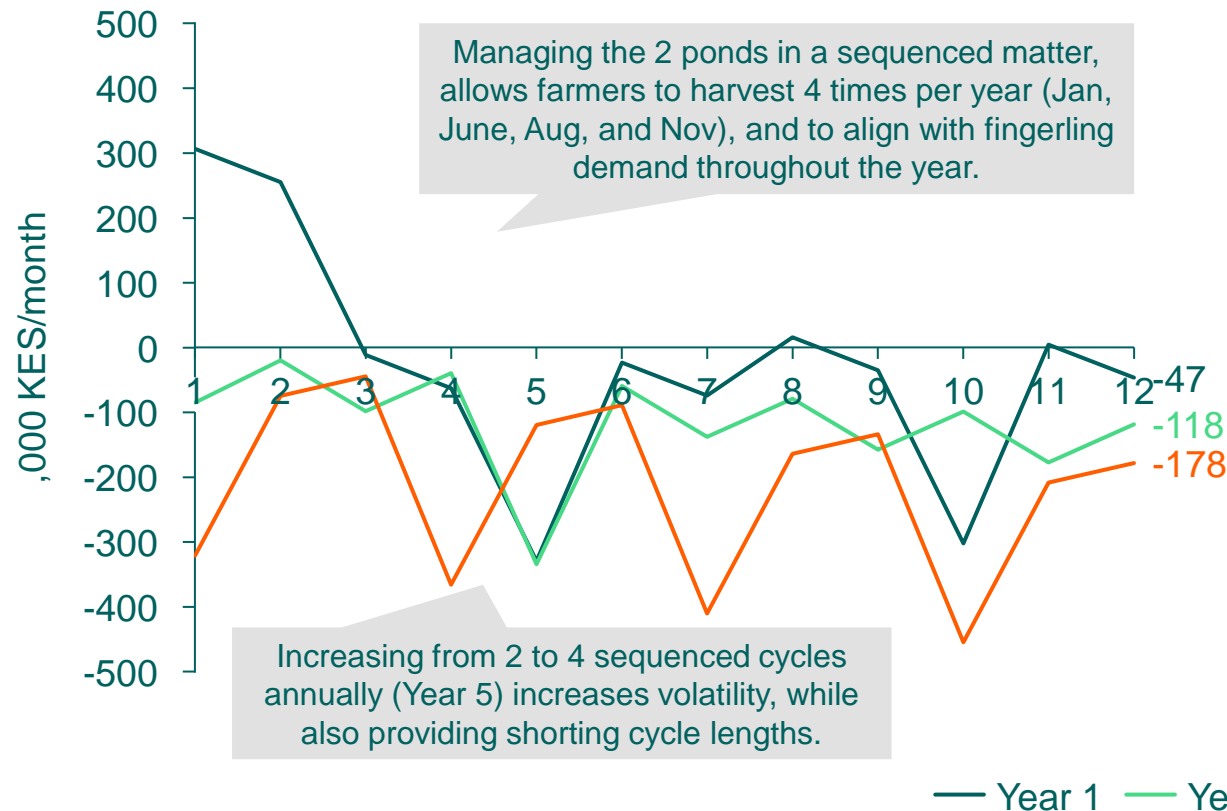


Cash flow analysis | Nursery farmers can dampen their cash-constrained positions with access to finance while shortening the cycle lengths and increasing the number of cycles per year.

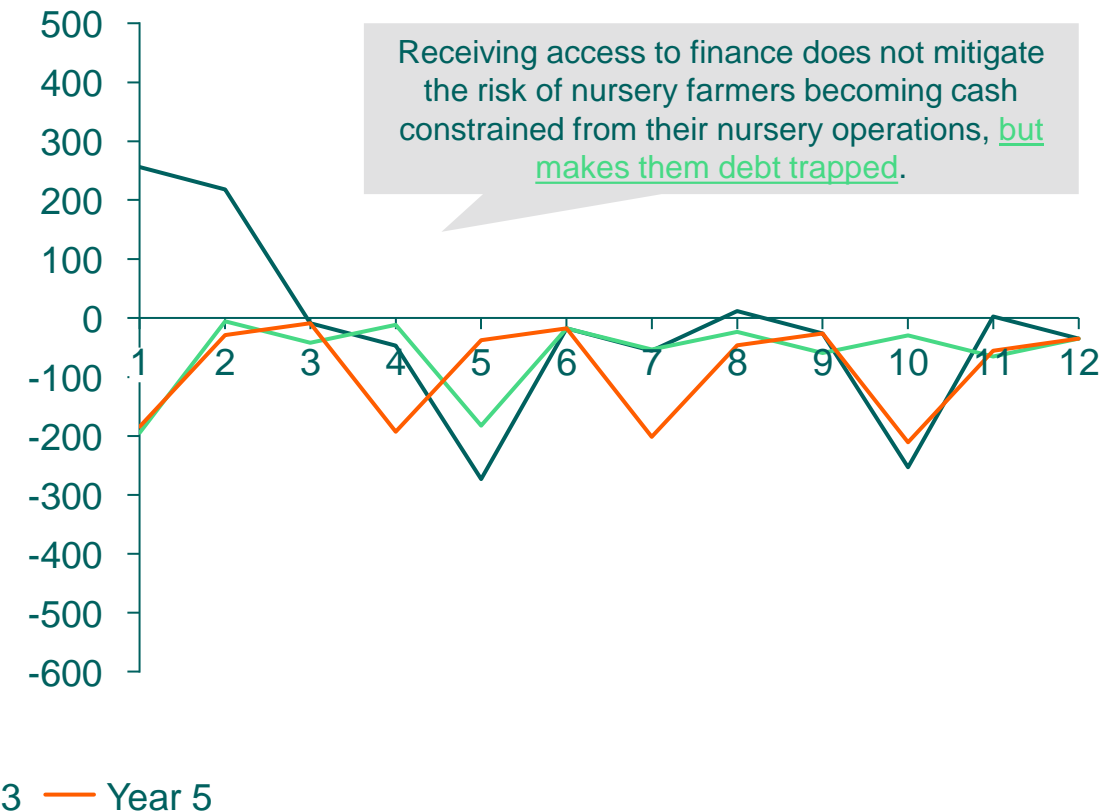
Monthly cashflow of small scale pond nursery farmers (,000 KES/month)

SMALL-POND

Without access to finance



With access to finance

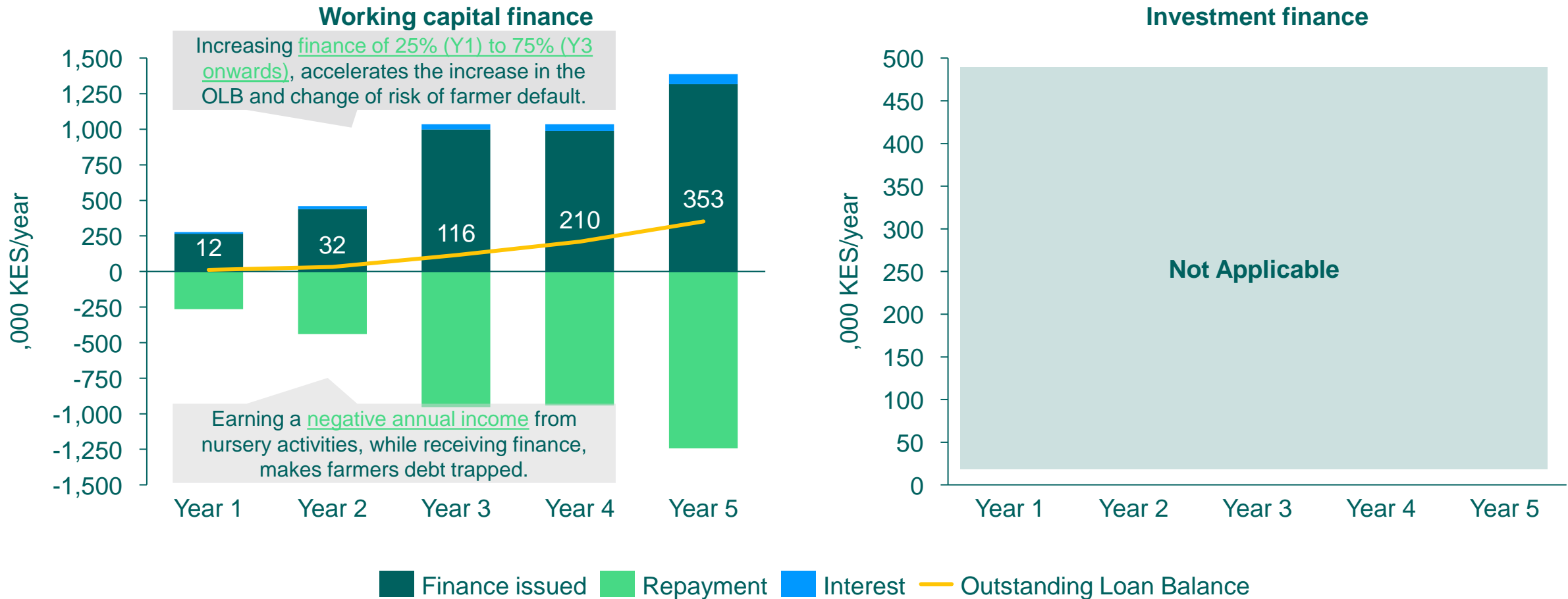




Investability | Progressively receiving access to finance, while being unable to realize a positive return on nursery activities, accelerates the magnitude of small pond fish farmers being debt trapped position and an uncompetitive investment.

Finance issued and OLB of small scale pond nursery farmer (,000 KES/year)

SMALL-POND

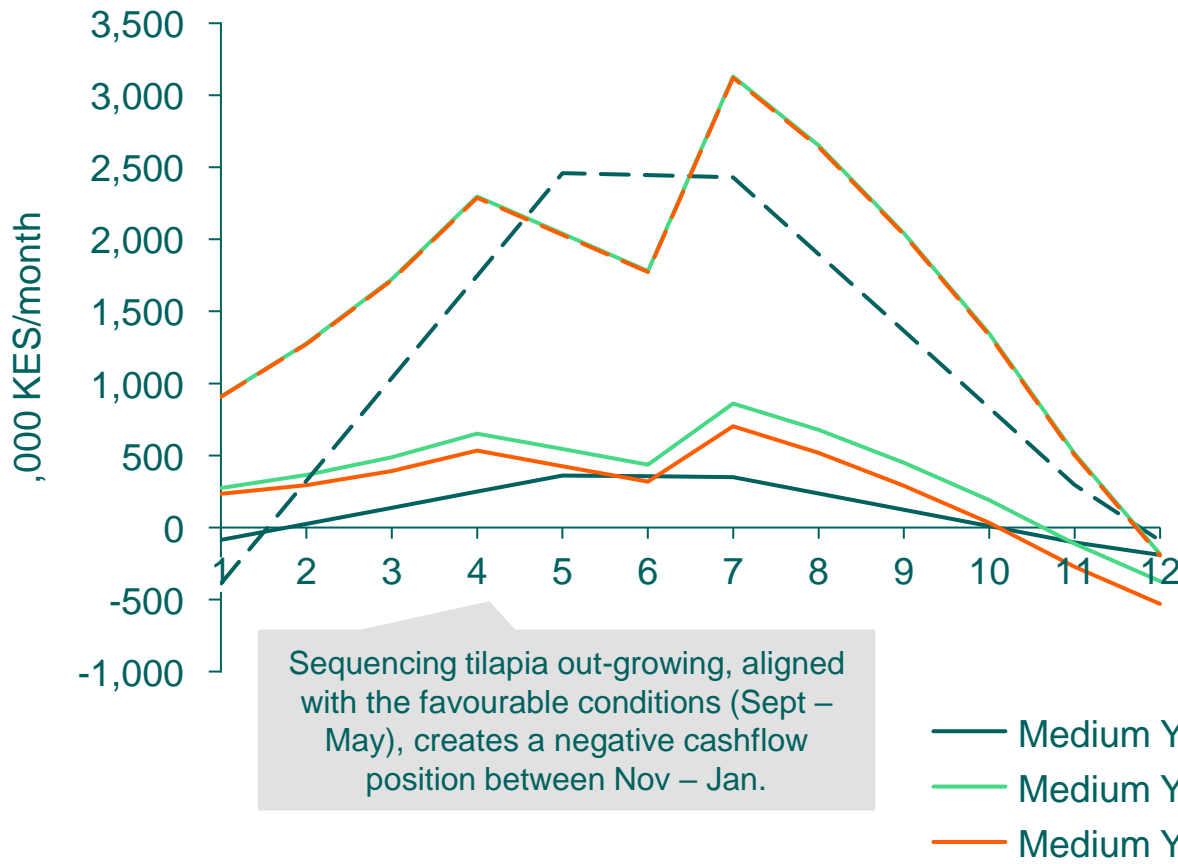


Cash flow analysis | Access to finance dampens volatility and the level of being cash-constrained but does not mitigate the risk of out growers facing a cash shortage, which might hinder them from applying GAP and purchasing high-quality feed.

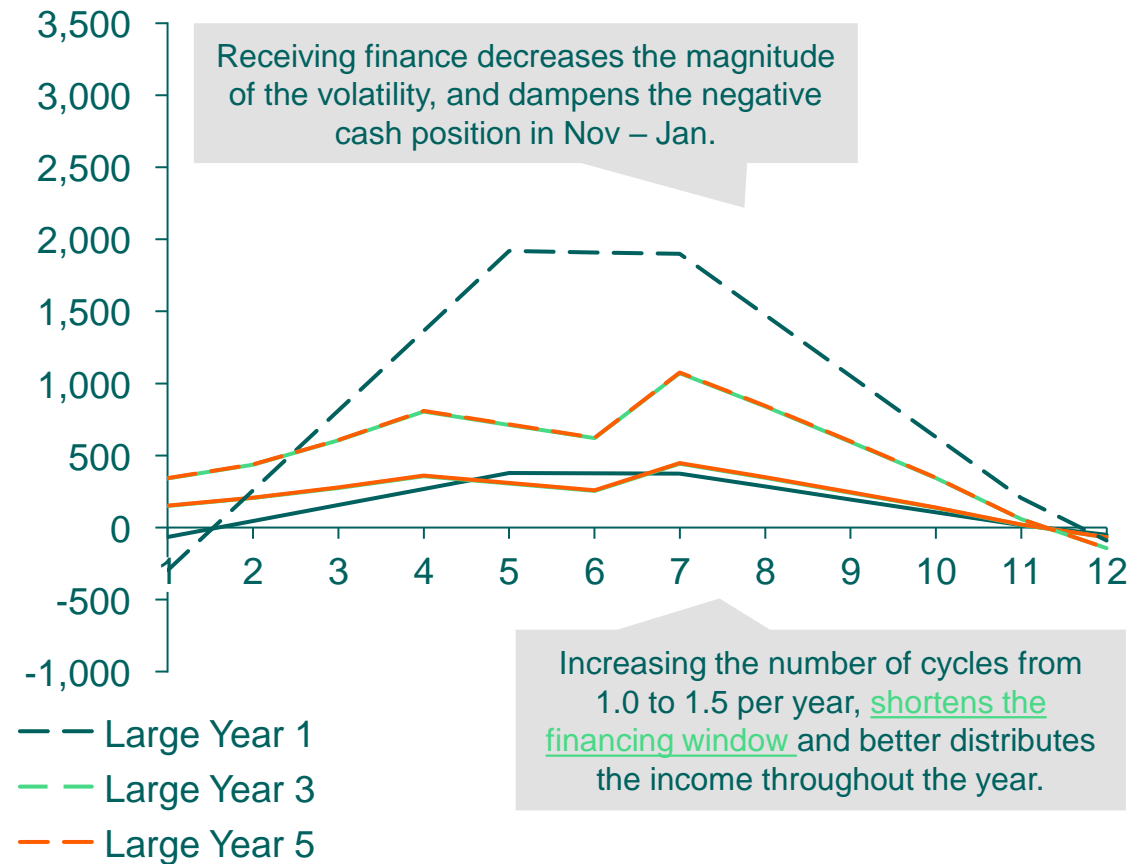
Monthly cashflow of medium scale pond out grower farmers (,000 KES/month)

MEDIUM/LARGE-POND

Without access to finance



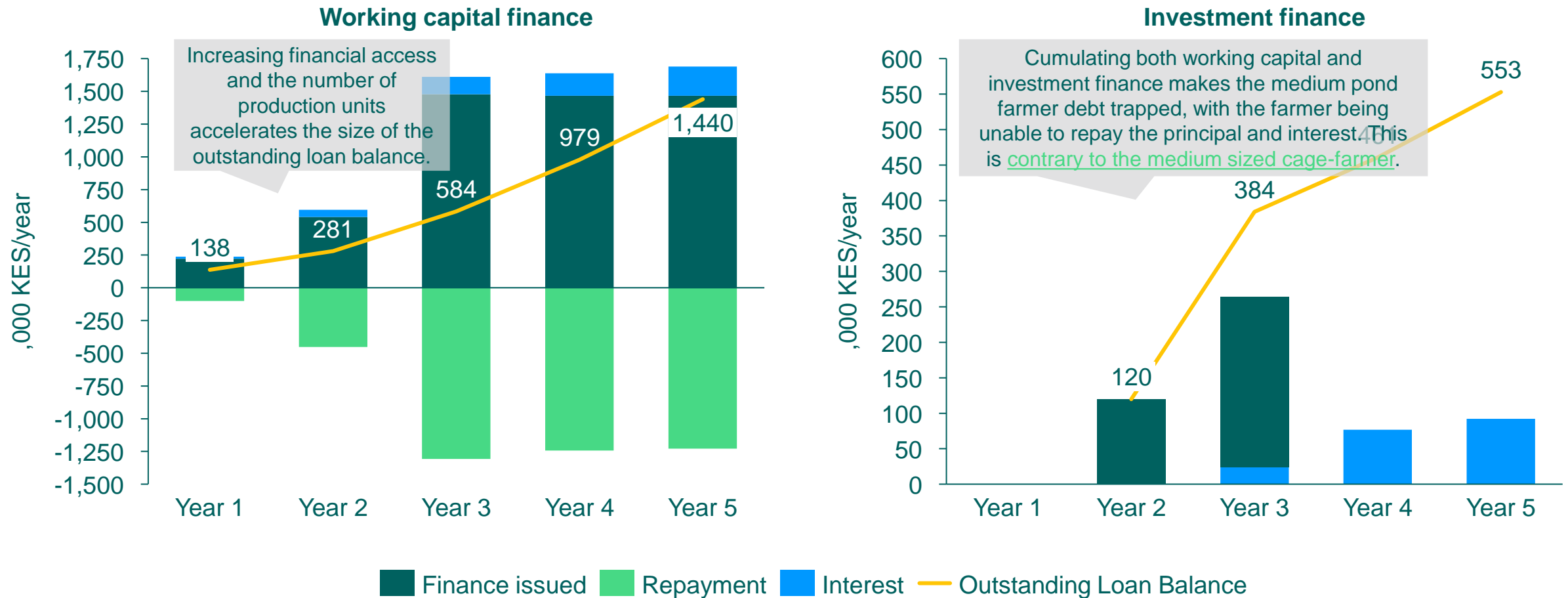
With access to finance



Investability | Unable to achieve a positive cash flow on investments, the medium size pond tilapia out grower remains constrained from repaying available working capital and investment finance, indicating an unbankable outlook.

Finance issued and OLB of medium scale out grower farmer (,000 KES/year)

MEDIUM-POND

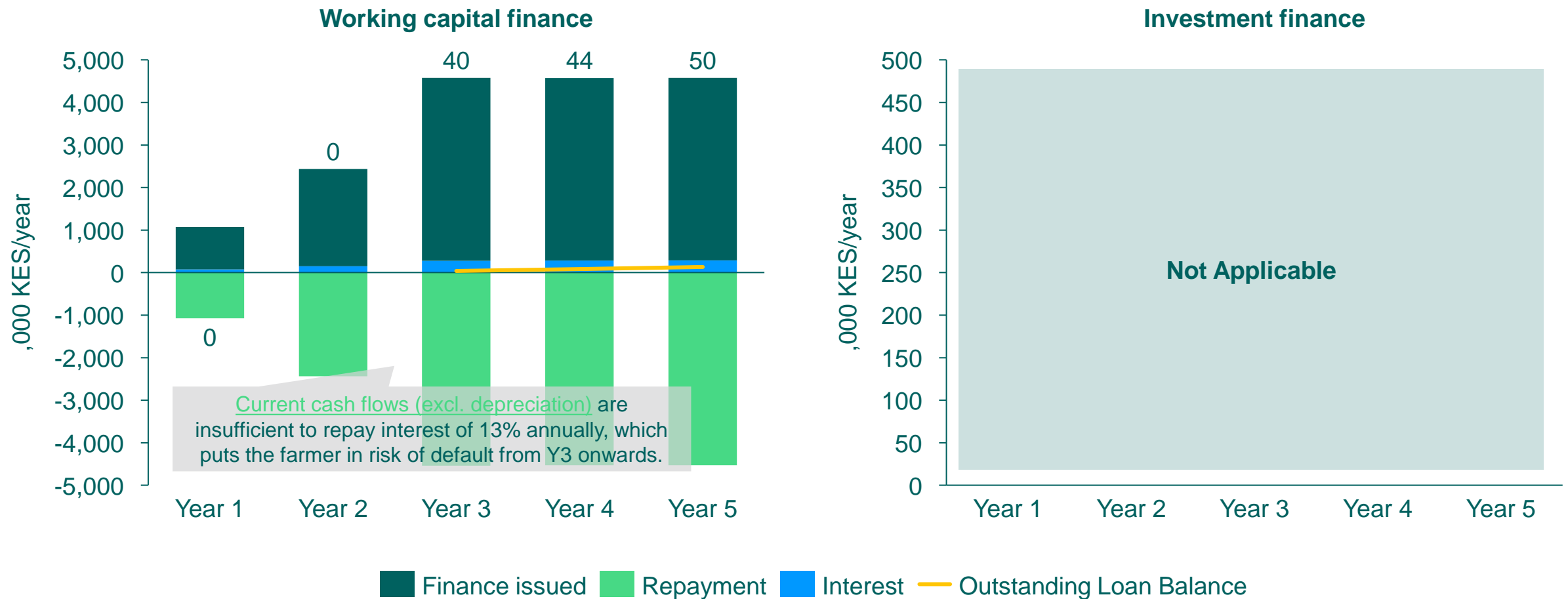




Investability | Current projected loan terms (interest 13-20%) are unsustainable in the long term for providing access to finance for feed and fingerlings to large scale pond farmers, due to too small margins from tilapia outgrowing

Finance issued and OLB of large scale out grower farmer (,000 KES/year)

LARGE-POND



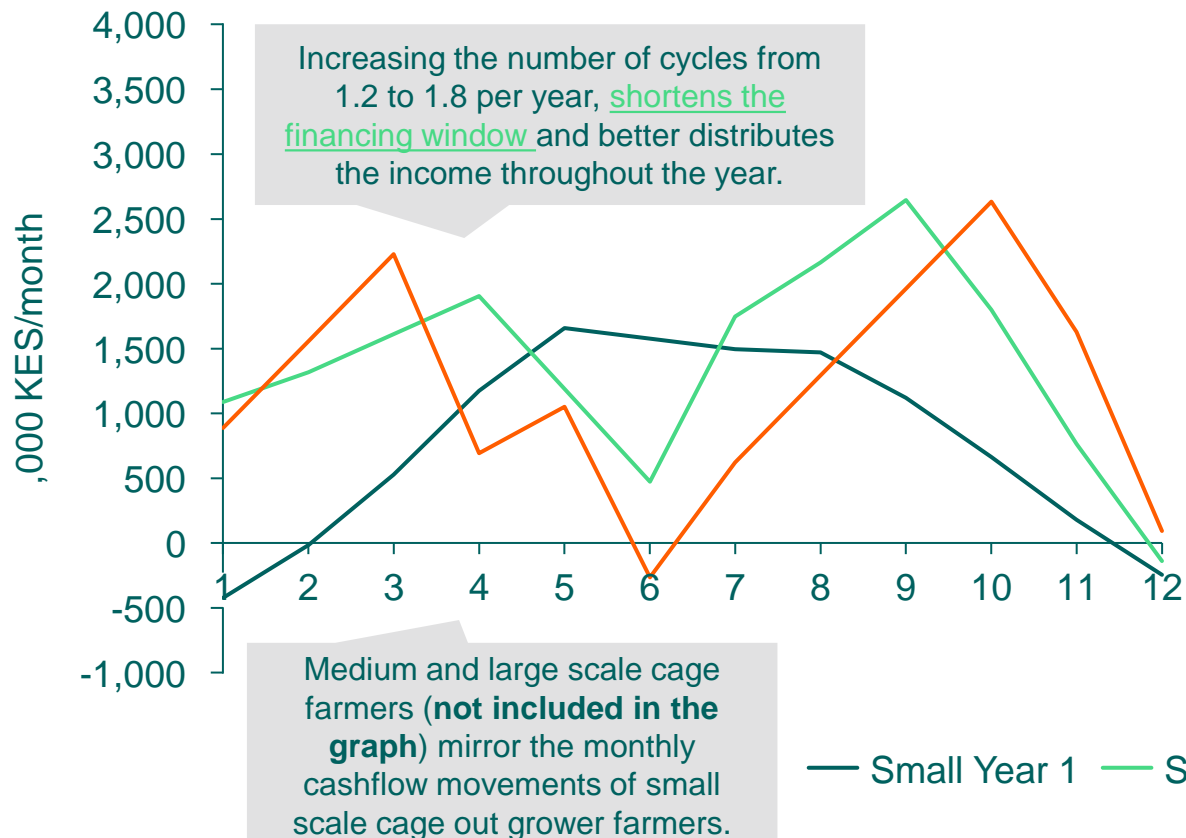


Cash flow analysis | Cage farmers can leverage access to working capital to dampen cash flow volatility and strengthen their business outlook, due to the investment in applying GAP, use of high quality feed, and increase in the number of production units.

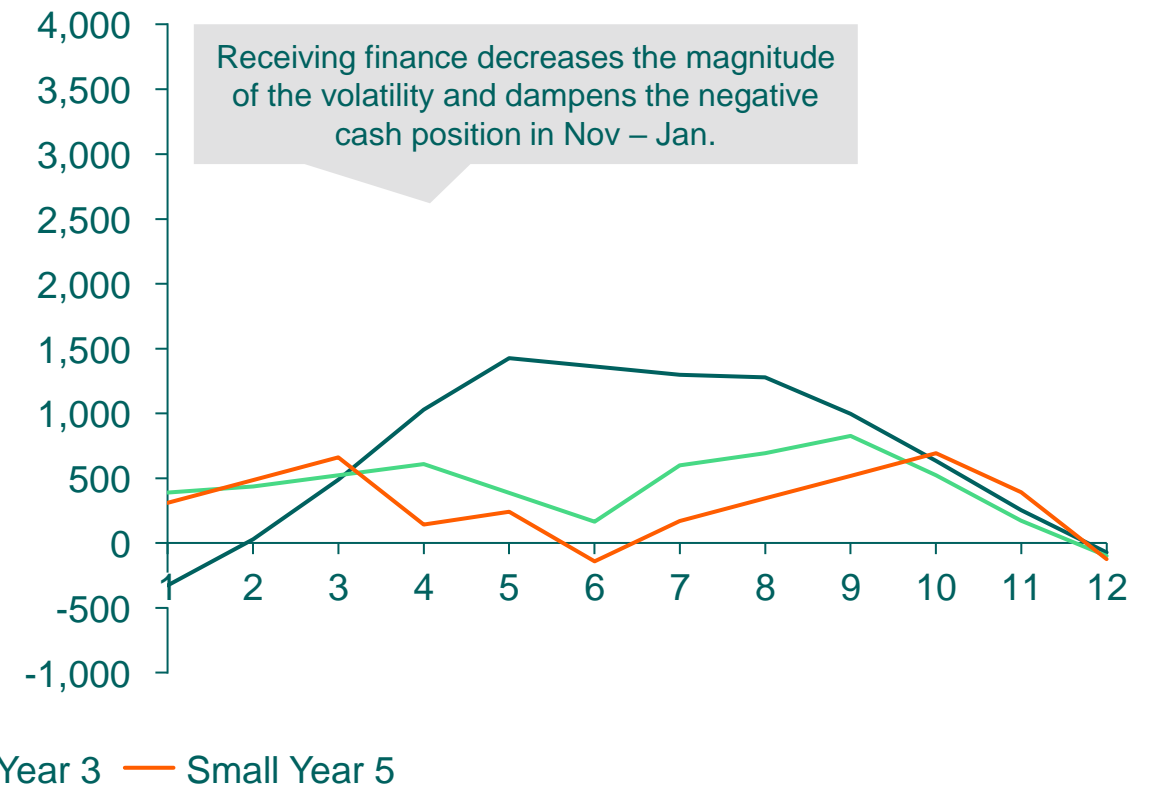
Monthly cashflow of small scale cage farmers (,000 KES/month)

CAGE

Without access to finance



With access to finance

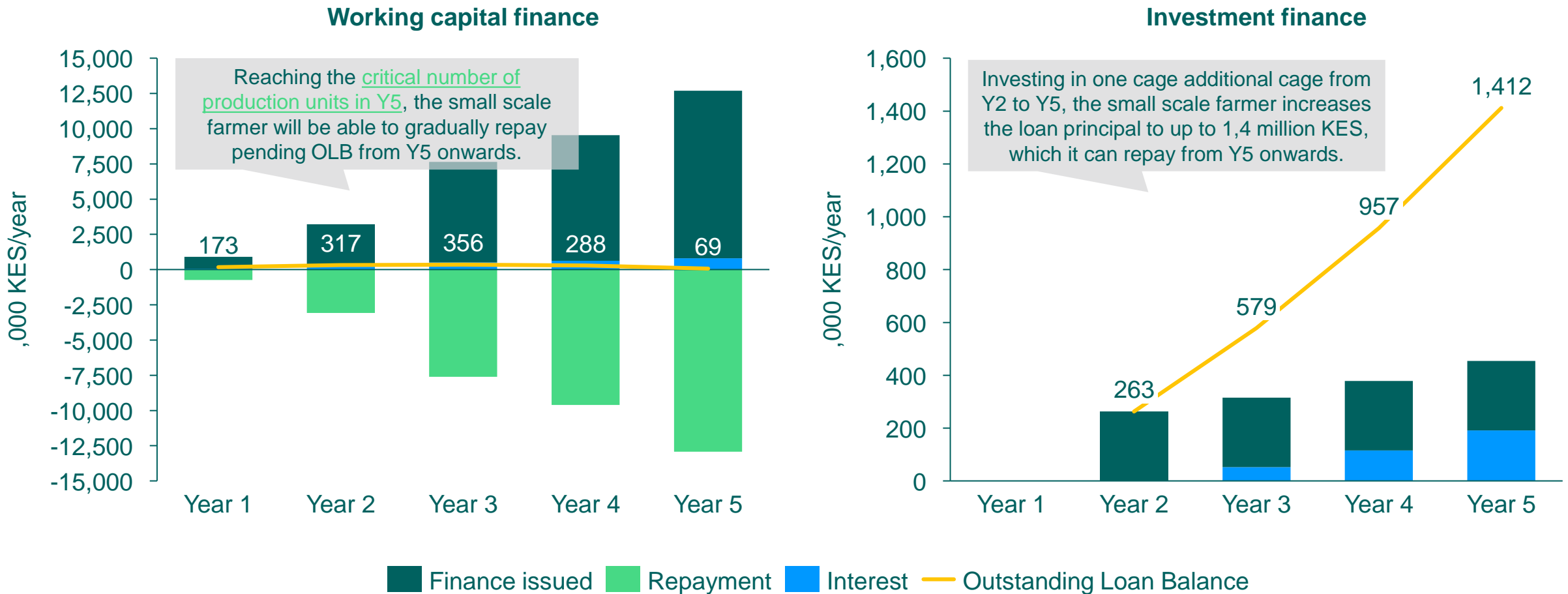




Investability | Small scale cage farmers require a long-term finance program, with a potential grace period of 3 years, which will enable them to reach the critical number of production units to repay OLBs of working capital and investment finance.

Finance issued and OLB of cage farmer (,000 KES/year)

SMALL-CAGE

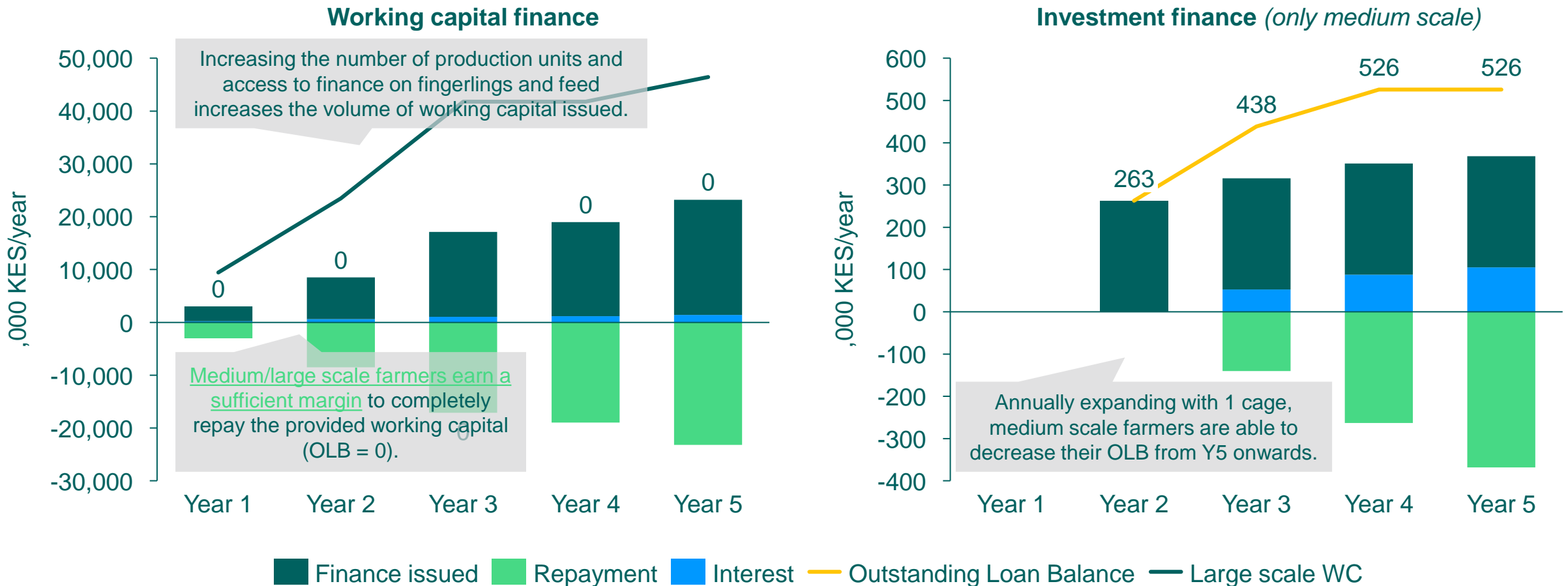




Investability | Medium and large scale cage farmers form a sustainable investment for financial service providers, due to a combination a potential of return on annual working capital and a risk mitigated return on long term investment finance.

Finance issued and OLB of cage farmer (,000 KES/year)

MEDIUM/LARGE-CAGE



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IDH Annual Report 2021

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Thanks

IDH would like to express its sincere thanks to Lattice for their openness and willingness to partner through this study. By providing insight into their model and critical feedback on our approach, Lattice is helping to pave the way for service delivery that is beneficial and sustainable for tilapia farmers and service providers



Partners



Ministry of Foreign Affairs



Swiss Confederation
Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO

BILL & MELINDA
GATES *foundation*

DANIDA





7

Annex



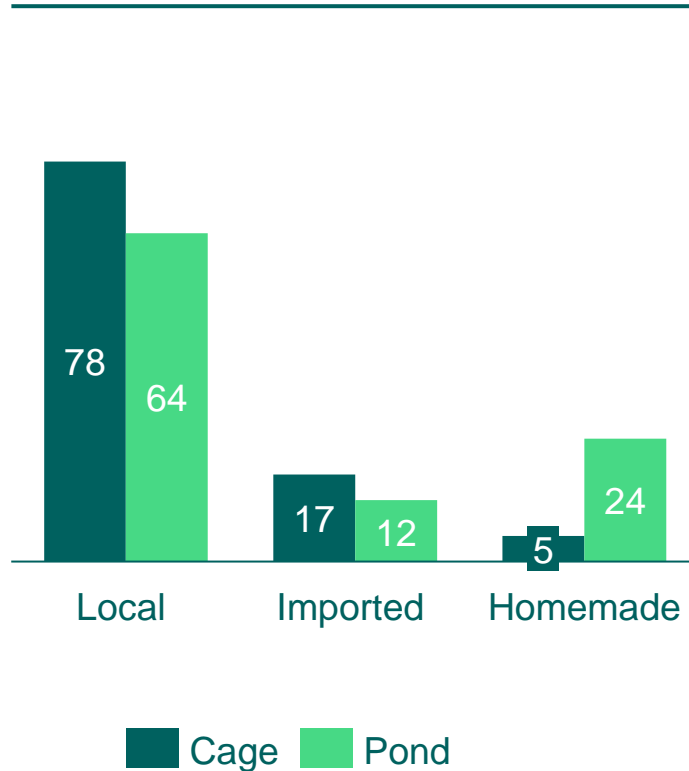
7.1

Profile of baseline farmers

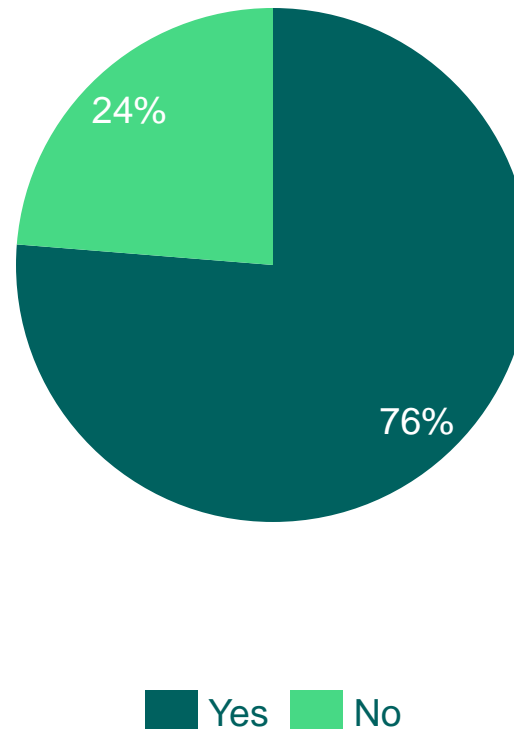


Feed use - baseline farmers | The majority of fish farmers use local commercial feed and don't know the FCR as a metric to evaluate the performance of feed, which shows the need to increase access to high-quality feed and awareness of FCR.

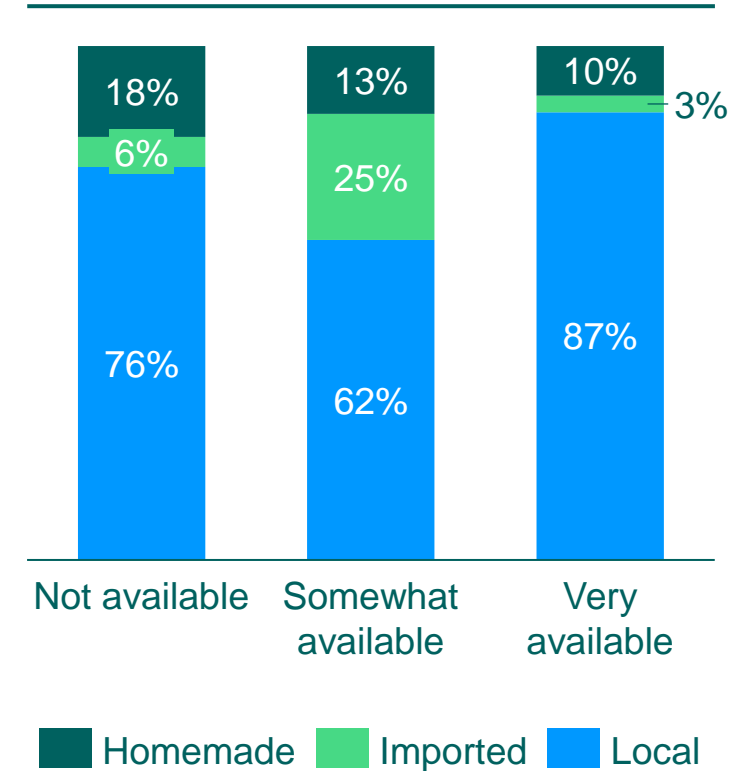
Feed Usage (%)



Knowledge of Feed Conversion Rate (FCR)



Availability of feed

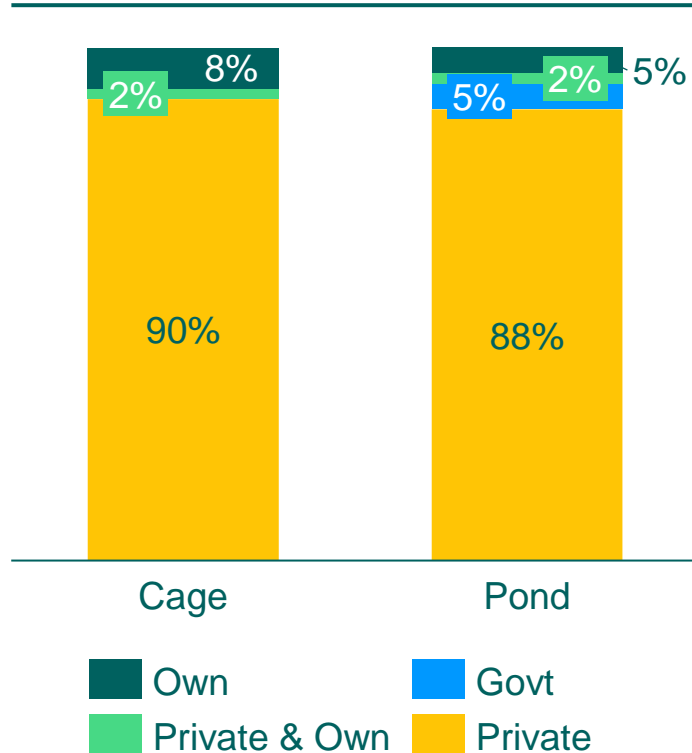


Source: IDH-Lattice Baseline Survey

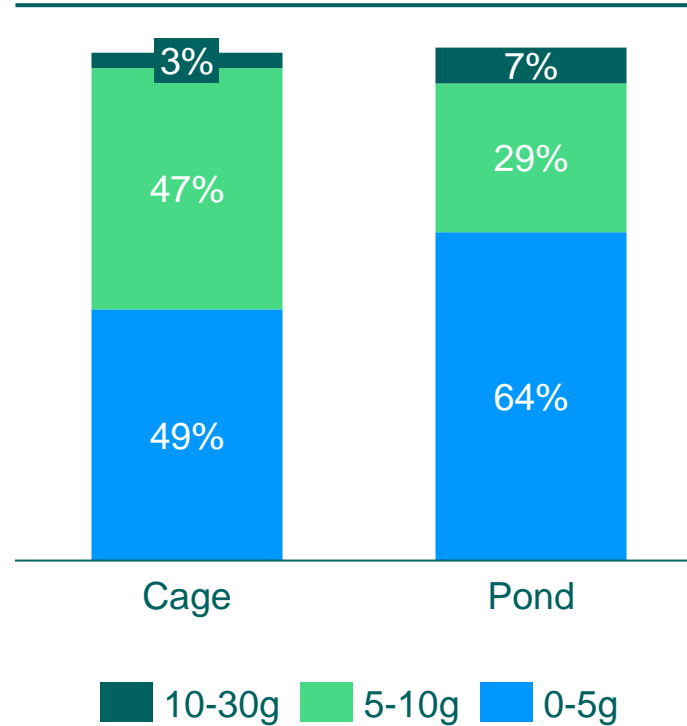


Fingerlings - baseline farmers | Fingerlings are generally best available at private nurseries, from which farmers purchase too small fingerlings, increasing mortality rates and production cycle length

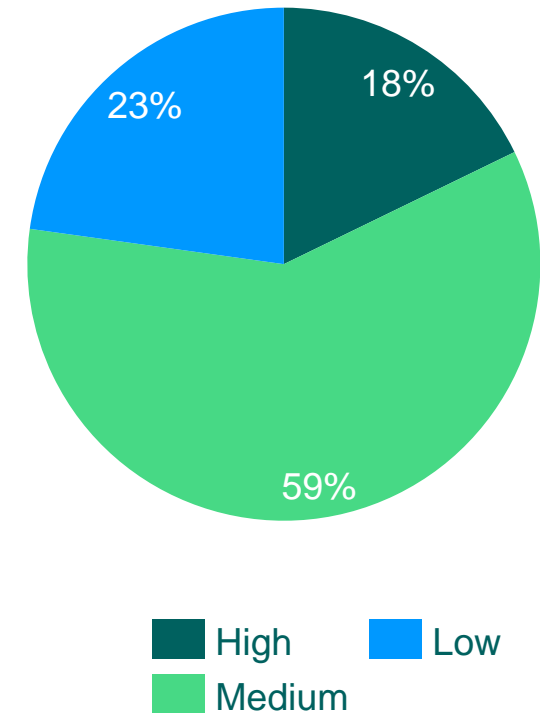
Fingerlings Source (%)



Stocking Size (%)



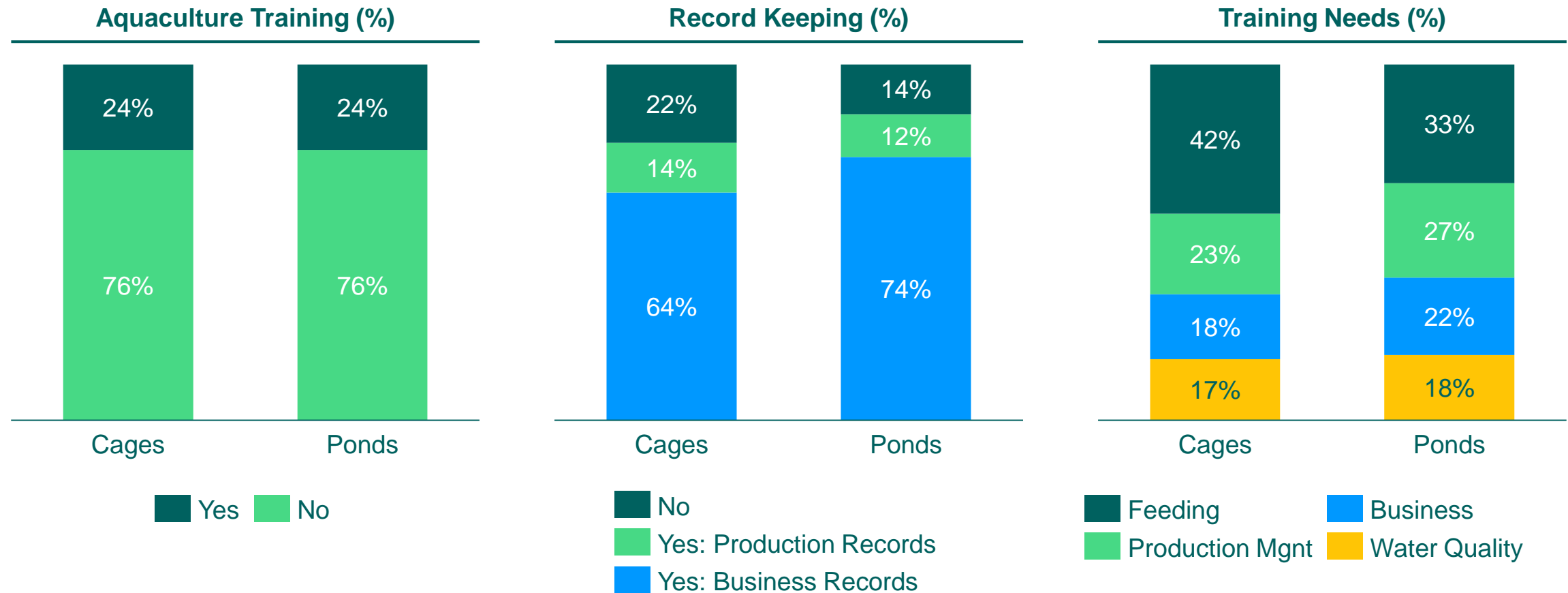
Fingerling Availability (%)



Source: IDH-Lattice Baseline Survey



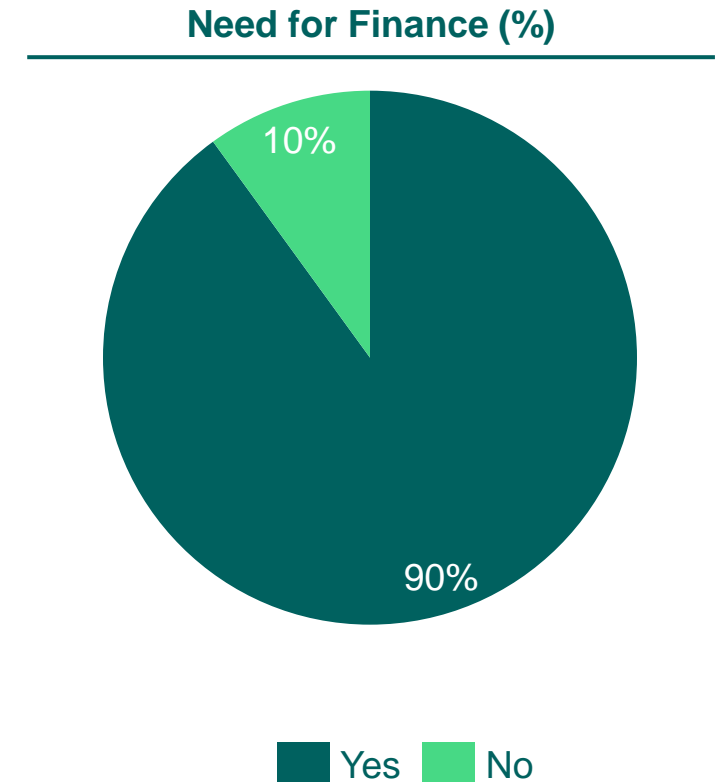
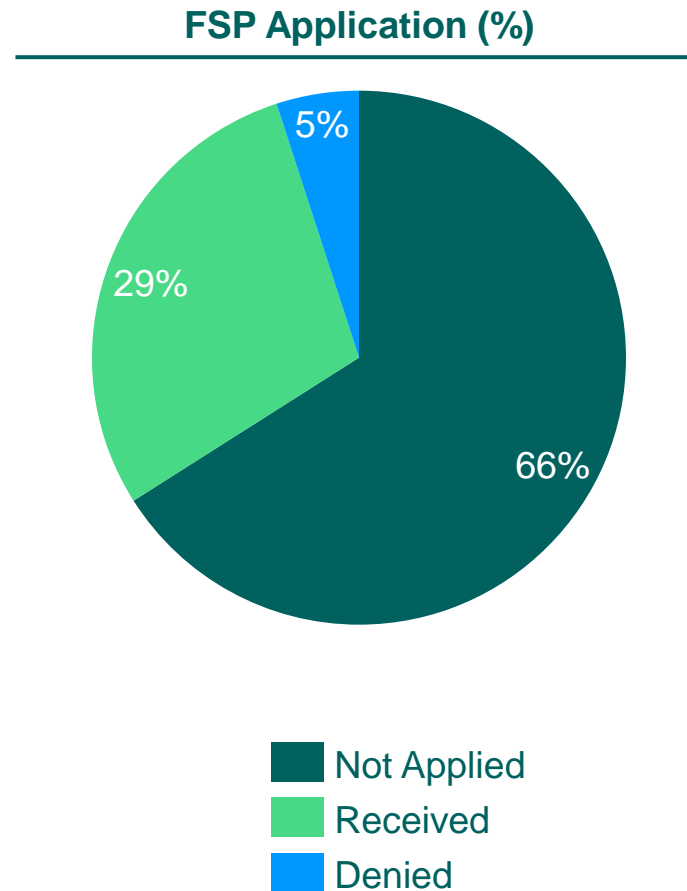
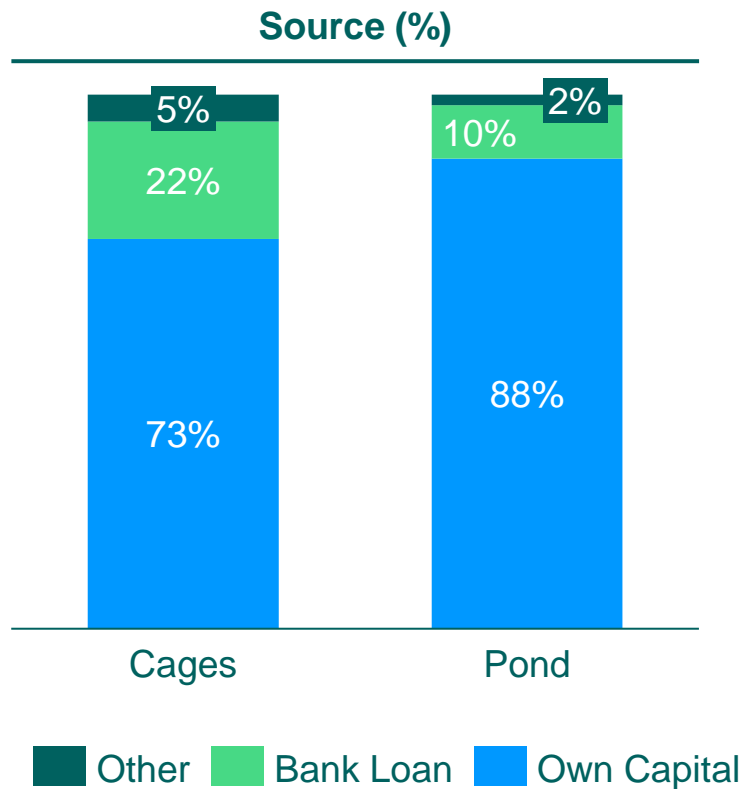
Training access - baseline farmers | Knowledge of aquaculture by the farmers before venturing into the enterprise is limited. Knowledge acquisition is majorly through peers and self-learning through experience.



Source: IDH-Lattice Baseline Survey



Capital Baseline Farmers | Utilization of the formal lending system by farmers is very limited with on average 81% of the farmers relying on their own capital to invest in fish farming, despite the high capital need



Source: IDH-Lattice Baseline Survey

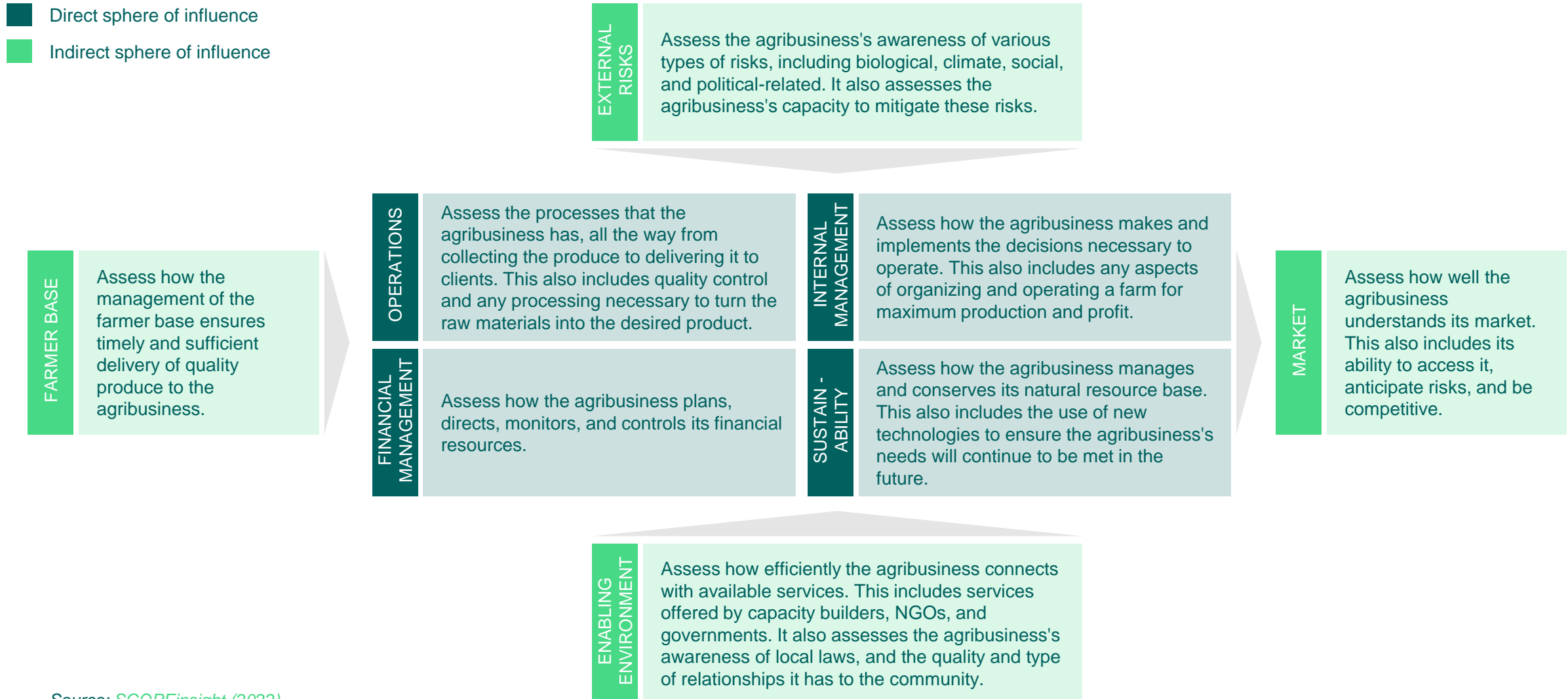


7.2

Assumptions & Methodology



Annex 1 | Farmer organisation professionalism assessment framework



Source: [SCOPEinsight \(2022\)](#)



Annex 2 | Business Model Canvas

Key partners <ul style="list-style-type: none">• Who are your key partners?• Who are your key suppliers?• Which key resources are we acquiring from partners?• Which key activities do partners perform?	Key activities <ul style="list-style-type: none">• What key activities do your (A) value proposition require?• (B) Your distribution channels?• (C) Customers relations• (D) Revenue streams	Value propositions <ul style="list-style-type: none">• What value do you deliver to your customer?• Which one of your customers problems are you helping to solve?• What bundles of products and services are you offering to each customer segment?• Which customer needs are you satisfying?	Customer relations <ul style="list-style-type: none">• What type of relation does each of your customer segments expect you to establish and maintain with them?• Which once have you established?• How are they integrated with your business model?• How costly are they?	Customer segments <ul style="list-style-type: none">• For whom are you creating value?• Who are your top customers?
	Key resources <ul style="list-style-type: none">• What key resources do your (A) value proposition require?• (B) distribution channels?• (C) Customers relations• (D) Revenue streams			Key channels <ul style="list-style-type: none">• Through which channel do you reach your customers?• How are the channels integrated?• Which once are effective and cost efficient?• How are you integrating the channels with customers routines?
Cost structure <ul style="list-style-type: none">• What are the most important costs inherent to your business model?• Which key resources are most expensive?• Which key activities are most expensive?			Revenue streams <ul style="list-style-type: none">• For what value are your customers really willing to pay?• For what do they currently pay?• How are they currently paying?• How would they prefer to pay?• How much does each revenue stream contribute to overall revenues?	

Source: [Strategyzer \(2023\)](#)