

FEED-X Value Chain Analysis

SALMON and SHRIMP

Core business needs

Four priority areas (core business needs) have been identified both for Salmon and Shrimp:

Salmon	Shrimp
1. Identify and scale input material substitutes	1. Input substitution
2. Increase utilisation of by-products from other value chain actors	2. Waste water sludge as a by-product of shrimp farming
3. Develop Skretting's service portfolio into a key business area	3. Service development
4. Collaborate with logistics partners to review transport	4. Sustainable transports and logistics

What is Value Chain Analysis?

The Cambridge Value Chain Analysis (CVCA) was developed by the Unit of Industrial Sustainability at Cambridge University and is a component of the Problem Definition stage of FEED-X. CVCA looks at the risks and opportunities in Skretting's value chain, providing insight into value chain adaptability.

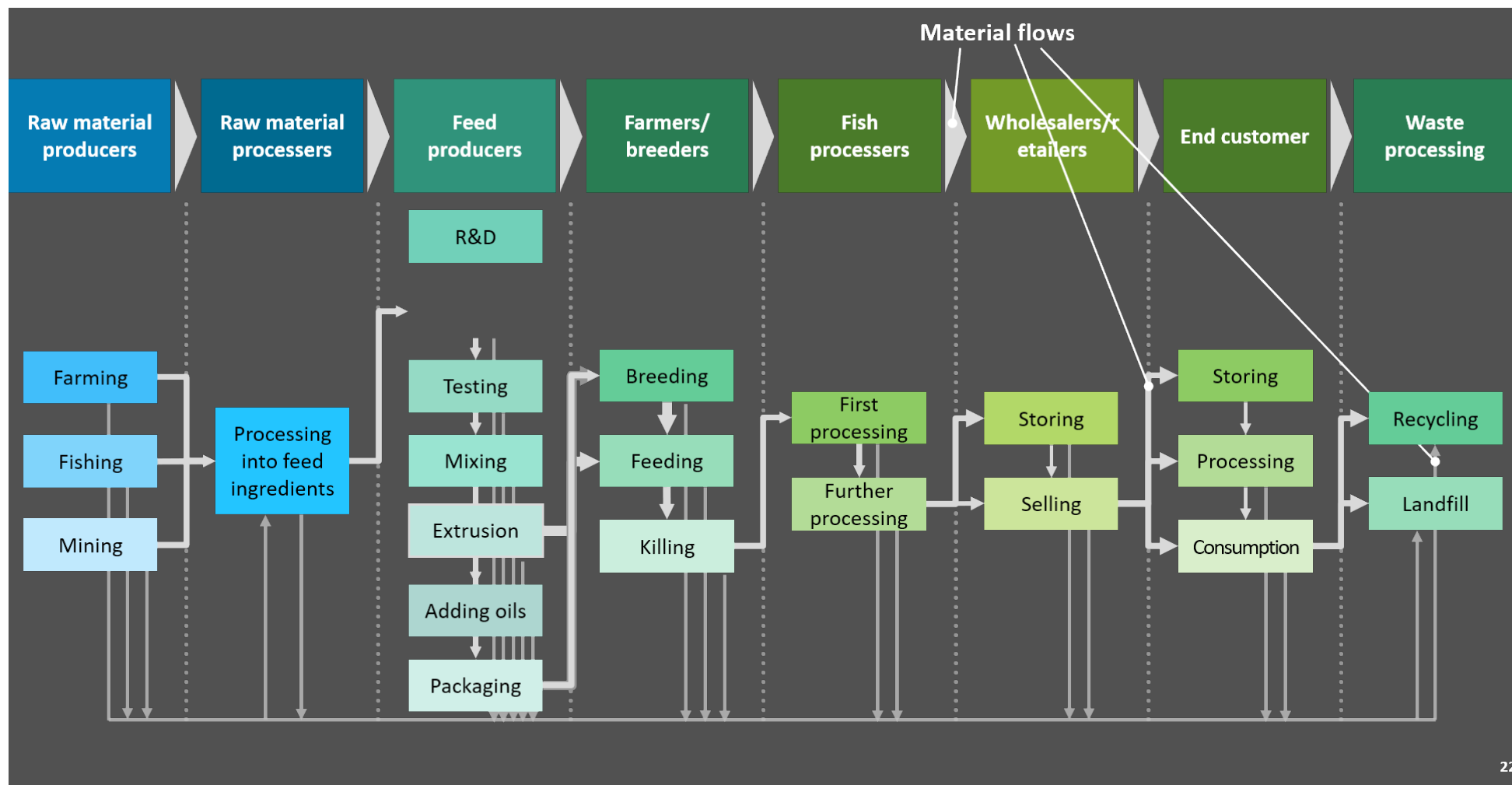
CVCA has three objectives: to identify new high-impact solutions; to kill inefficient or ineffective solutions; and to fast-track adoption of existing solutions. The CVCA feeds into the Problem Definition analysis, generating a triangulated picture of Skretting's core business needs.

How is Value Chain Analysis conducted?

1. **Value Chain:** Firstly, the main elements of the organisational value chain are determined.
2. **Activities:** The core processes and activities at each stage of the value chain are then identified.
3. **Stakeholders:** This is followed by a mapping of the key stakeholders involved at each stage.
4. **Interviews:** Through guided interviews with senior members of value chain stages issues such as sustainability, procurement, strategy, business model innovation and sales are explored.
5. **Intervention points - spots:** The interview results are consolidated, drawing out a) Hot spots (strongly negative economic, environmental and/or social interventions); b) Cool spots (locations of strongly positive potential interventions); and c) Blank spots (information gaps that pose potential risks, where research intervention is required).
6. **Core business needs:** The intervention points (spots) are layered together to determine the core business needs or priority opportunities for Skretting.

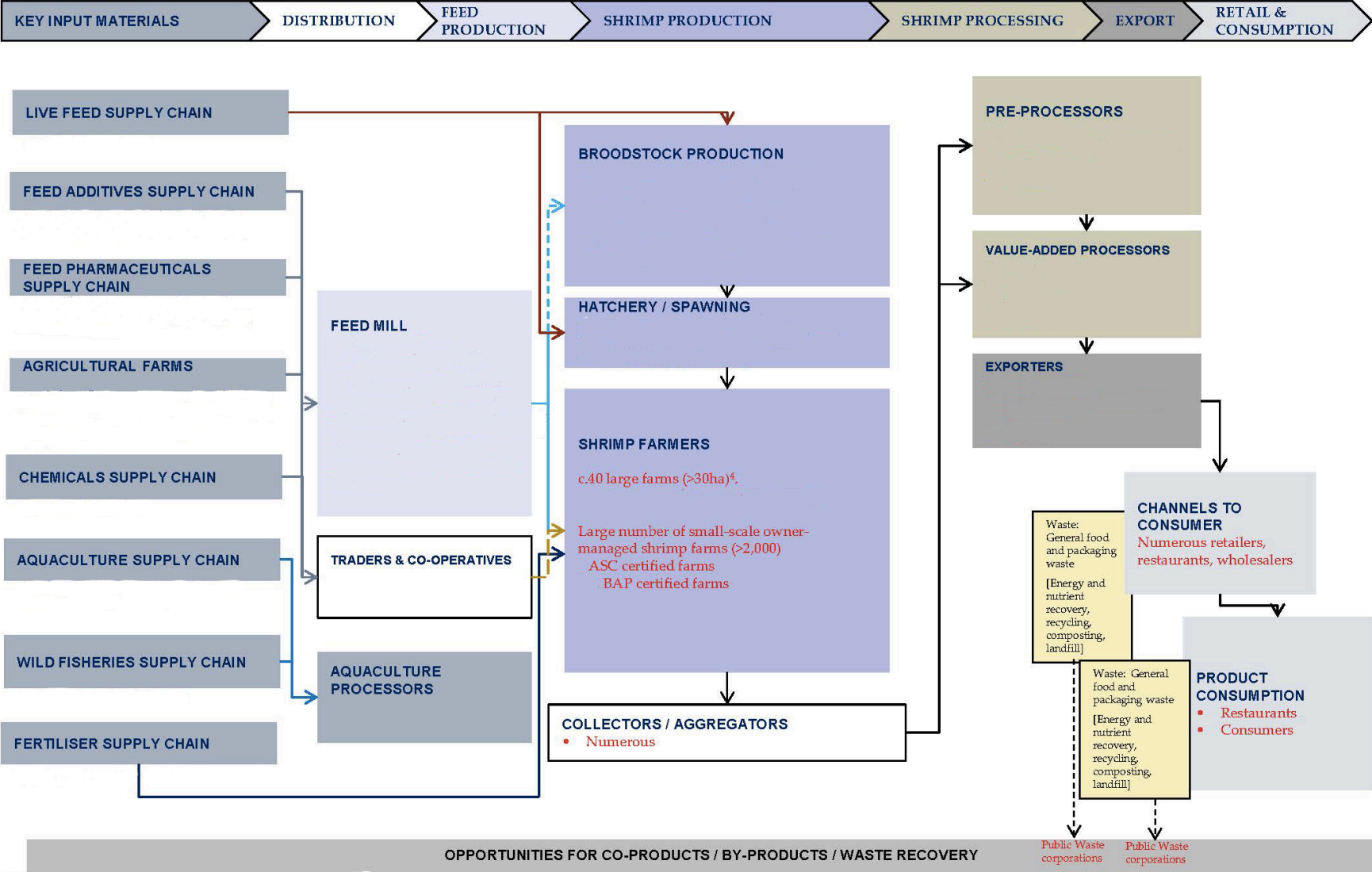
The shrimp value chain assessment took a slightly different methodological approach. Since the shrimp value chain is less consolidated and understood, more emphasis was placed on establishing the value chains for systems in four different countries and looking at how they operate.

Skretting's Salmon value chain



Shrimp value chain

SHRIMP AQUACULTURE SUPPLY CHAIN – INTENSIVE FARMING



Hot spots, cool spots and blank spots

The specific hot spots, cool spots and blank spots are set out in the detailed CVCA syntheses for salmon and shrimp. The table below simply illustrates the location of the primary negative interventions (hot), positive innovation potential (cool) and information gaps (blank).

	Salmon	Shrimp*
Raw material production	3 hot, 3 blank	5 hot, 5 cool, 2 blank
Raw material processing	3 blank	4 hot, 2 cool, 1 blank
Feed production	7 hot, 10 cool, 3 blank	4 hot, 3 cool, 5 blank
Farming / breeding	2 hot, 7 cool, 4 blank	4 hot, 1 cool, 3 blank
Fish processing	1 cool, 3 blank	4 hot, 2 cool, 2 blank
Wholesaling / retailing	3 blank	3 cool, 1 blank
Use and consumption	1 cool, 3 blank	
Waste processing	3 blank	1 hot, 1 blank

*Where the same point was being made in more than one country it was counted once

Shrimp value chain assessment of opportunities

The unconsolidated nature of the global shrimp value chain resulted in no clear point of intervention along the value chain, there were many opportunities therefore it was felt more meaningful to assess opportunities thematically across the four countries and taking account of the overall sustainability opportunities offered. This analysis resulted in the following table.

	Extension/training		Technology Use			Inputs (Feed ingredients related)				Footprint Reduction			
	Service Development	Partnering to improve FCR	SMART/AI forecasting technologies	Automatic feeders	Traceability (certification)	Disease reduction	Food waste Use	By-product utilisation	Input substitution	Sustainable Transport	Energy/ GHG emissions	Plastic reduction/ recycling	Waste/ sludge re-use
<i>Needs to be verified by stakeholder interviews</i>													
Ecuador	✓		✓	✓	✓		✓	✓	✓	✓	✓		✓
Thailand	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Vietnam	✓	✓			✓			✓	✓	✓	✓		✓
India	✓				✓		✓		✓	✓			✓

This allowed the areas of common opportunity to be identified.

Priority opportunities

Overlaying the hot, cool and blank spots in both value chain assessments resulted in four areas of priority opportunity and a fifth priority for shrimp:

Input substitution – salmon and shrimp

Input substitution is the replacement of conventional materials used to produce aqua feed, with new materials that have a better economic and environmental performance. The objective is to produce resources more locally at low cost; with shorter transport routes; with a secure and steady supply; and more predictable prices. Using new and superior input materials, should also replace inputs based on scarce resources, wild-caught fish, or monoculture agriculture that is supplanting rainforests and other sensitive ecosystems.

There are already a range of potential substitutes for unsustainable inputs (soy and fish), such as macro and micro algae and insect meal, some of which are already used or tested. The main challenges lie in deciding which materials to invest in; scaling production to achieve financial viability; preventing competitors from precluding Skretting and wider industry access to these resources; understanding the sustainability issues associated with these new ingredients; and putting in place safeguarding frameworks for those not yet covered by the Marine Stewardship Council (MSC), Aquaculture Stewardship Council (ASC) and other certification schemes.

Recommendations

- **Identify additional substitutes** to establish comprehensive set of options
- **Determine the most adequate substitutes** according to key parameters, like realisable price, nutritional values, security of supply, and sustainability performance
- **Partner with non-competitive co-purchasers** to find necessary investments and provide incentives to scale up operations, like pre-orders or purchasing commitments

By-product utilisation – salmon and shrimp (in 3 out of 4 countries)

Like input substitution, by-product utilisation is the replacement of convention input materials, but with *by-products* from the value chain. The objectives are the same as for input substitution. Some by-products are already successfully used by Skretting, including cuts from salmon processing. Identifying additional by-products that can be recycled into the value chain is a priority action, but also looking for input substitution ingredients that are by-products combines two of the priorities. To incentivize the improved use of by-product feed content clear targets could be set across the regions, but for OPCOS in particular.

Recommendations

- **Identify additional by-products** in first and last value chain steps
- **Set target quotas** for by-product, according to nutritional properties, price and availability
- **Improve process efficiency** to decrease the overall amount of necessary inputs

Development of services – salmon and shrimp

Servitisation is the acceleration of Skretting's diversification into service offerings for their customers and the development of adequate revenue mechanisms. The objective is to generate an additional and sustainable revenue stream in face of compressed margins for Skretting's core product; improve the environmental and economic performance of their customers; gain access to data for further service and product R&D; and improve customer relationships and retention.

Skretting already offers a range of training, extension and advice services to its customers, many of which are free to the customer. With its resources and capabilities Skretting would be well-placed to develop a service package which is monetised and ensure that customers are charge adequately. In Ecuador, shrimp feed manufacturers have developed digital services for farmers to enable better yield forecasting. Similarly, nutritionally optimised feeds and services e.g. Cargill's 'SmartShield' programme, promote shrimp health, growth and survivorship, and reduces disease, positively impacting the Feed Conversion Ratio (FCR)¹.

The main challenges lie in transforming Skretting's knowledge and expertise into solutions that are valued by the customer and to share this value in a way that does not antagonise customers who are used to getting services for free, perhaps offering bronze, silver and gold service options. Optimising the sustainability from digital tools also requires shrimp (and salmon) farmers to have in place sufficient technical infrastructure - this is a risk to uptake and would need to be assessed in terms of specific geographies.

Recommendations

- Explore **revenue mechanisms** for the currently offered services without alienating customers that are used to no cost advisory
- Explore **additional services**, based on:
 - Skretting's expertise on salmon and shrimp
 - Big data analytics combining this expertise with data points from the environment
 - Providing advice on feed type and amount, timing, medication, disease prevention etc.
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Sustainable transportation – salmon and shrimp

Aside from the farming and fishing operations for Skretting's input materials, transport is an area of considerable environmental impact in the value chain. Sustainable transport is the substitution of elements of the current transportation system with more sustainable technologies and configurations. The objective is to reduce the distance travelled to reduce fuel and emissions; alter the mode of transport to those with a better sustainability performance; and substitute to better technologies within a mode of transport, recognising that there can be negative environmental consequences of replacing vehicles.

Sustainable transport can be achieved by working with Skretting's logistics partners. Besides communicating and setting the right incentives, the main challenges lie with finding the necessary financial investments in a way that does not jeopardise the relationship between Skretting and its logistics partners.

¹ The amount of feed (in kilograms) required to produce 1 kg of farmed animal (round weight)

Recommendations

- **Analysing the transport system and replacing with more sustainable transportation** in close collaboration with logistics partners
- **Analysing the supplier network and identifying opportunities to source locally**

Waste water sludge by-product utilisation - shrimp

Waste water sludge is comprised of shrimp faeces and uneaten mud that collects in shrimp ponds. To maintain clean grow-out conditions for the shrimp, and thereby minimise the disease risk, sludge is removed from shrimp ponds. Filtration systems use a central drain to clear sediment and detritus material from the bottom of the pond multiple times per day. The objective of using waste water sludge as a by-product is to generate income from sludge as a crop fertiliser and to reduce the environmental impact of sludge dumping in waterways, estuaries or on land.

Fertilisers derived from waste water sludge can be used in local agriculture production e.g. rubber, coconut and sugarcane plantations. Seaweeds can also be used manage the nutrient levels of the sludge as they remove dissolved nitrogen (up to 93% of ammonium nitrogen) and other organic compounds thereby improving water quality. This can be a significant sustainability gain if it saves on waste water treatment.

Recommendations

- **Identify feed additives** that can improve the clumping properties of feed.
- **Explore species of seaweed** that can grow off sludge nutrients and have a high protein content
- Work with farmers (through service development) to **process sludge** either for fertilizer or growing seaweed as part of circular economy

Findings by Cambridge University, Edited by R. Wisemann

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