

Norwegian aquaculture 2050

- A scenario planning analysis

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1 Objective and scope

The objective of this thesis is to create a set of scenarios of how the industry may develop towards year 2050 and a set of corresponding action plans that may encourage decision makers to consider possible futures that they would not have otherwise and that may serve as an aid towards achieving the goals the industry has set for development towards year 2050.

2 Introduction

The only certainty about the future is that it is uncertain. Traditional forecasting methods typically work under the assumption that the future is dependent on what has happened in the past. This assumption may prove to be accurate for a short time horizon, but when the time horizon is expanded these methods often prove inaccurate. Further, traditional forecasting methods typically don't account for unforeseen events. When the time horizon is expanded, the probability of unforeseen events occurring increase as well. This is where scenario planning differs from traditional forecasting methods. Scenario planning is a method for preparing for the future where several plausible future scenarios are created. By doing this, the method can capture a wide range of possible future outcomes and thus stimulate decision makers to consider developments they would not otherwise. Imagining these developments may make the decision makers better prepared to handle uncertainty and unforeseen events [1].

With an increasing world population, producing sufficient amounts of healthy food is a global challenge. It is estimated by the UN that within year 2050 the world population will have reached 9.7 billion people and it is projected by the World Bank that by 2030, 62% of all consumed seafood will be farm raised. The increasing demand for food resulting from the growth of the world population poses a big opportunity for the Norwegian aquaculture to increase their export [2,3,4].

Since its beginning in the 1970s, the Norwegian aquaculture industry has experienced a major growth in production volume and export turnover and in 2016, the value of exported products from the industry exceeded a value of 65 billion NOK. The industry has a goal that within year 2050 the production volume of the industry shall reach a value of 5 million tonnes. This represents a 5-times increase compared to year 2010. For the industry to achieve this goal they must have a strategy of how to seize opportunities and avoid threats that may occur in the future. Since the time horizon for the goals of the industry is long, implementing scenario planning may prove to be a good strategy as an aid to achieve these goals [5,6,7].

3 Method

Creating a basis for a scenario planning analysis

To form a basis for performing the scenario planning analysis, six interviews with seven relevant stakeholders of the industry has been conducted. In addition, a literature search on the industry's current situation, its past development, its value chain, its goals for year 2050, and the prerequisites to achieve these goals has been performed. Further, to get a good overview of the industry and the external environment it operates in, a PESTEL-analysis, a competitive force analysis and a SWOT-analysis has been performed.

Scenario planning approach

The scenario planning analysis used in this thesis is the SRI approach proposed by Stanford Research Institute. This is a qualitative method which is one of the most used methods for scenario planning. The method consists of eight steps as seen below [8].



Result validation

To ensure that the scenarios created all serve as adequate basis for decision-making the scenarios have been subjected to a validation analysis based on four criteria. These criteria are: 1) Plausibility, 2) Consistency, 3) Creativity and coherence and 4) Relevance.

4 Analysis

The most important findings of the analysis performed in this thesis are:

The strategic concerns of this scenario planning analysis are:

1. Increase the production of Norwegian salmon to a volume of 5 million tonnes.
2. Achieve a sustainable future development of the Norwegian aquaculture industry.
3. Continue to be a creator of job opportunities.

Key decision factors

The key decision factors are:

1. Generate income and economic growth.
2. Ensure an environmentally sustainable development of the industry.
3. Ensure value creation in local communities.
4. Comply with political interests.
5. Prioritize marketing and the reputation of the industry.

Environmental force analysis

The environmental forces that were identified during the interviews have been divided into four force-groups as is seen in the left figure below and their prioritization when creating the scenarios are presented in the right figure below:



Definition of scenario logics

The selected scenario logics are presented in the table below. These serve as the themes for the scenarios created.

| Scenario | Environmental force development | Political force development | Market force development | Industrial force development |
|----------|---------------------------------|-----------------------------|--------------------------|------------------------------|
| Dry Well | Worsening | Worsening | Fall | Decrease |
| Puddle | Unchanged | Worsening | Unchanged | Unchanged |
| River | Unchanged | Unchanged | Rise | Rise |
| Poseidon | Improved | Improved | Rise | Rise |

5.6 Summary of action plans

| Scenario | Implication with respect to key decision factors | Validation of original assumptions supporting strategies or proposed decisions | Implication for the design and timing of strategies | Threats | Opportunities | Critical issues | Cases to be addressed by specific contingency plans | Necessary flexibility and resilience | Factors for monitoring |
|----------|--|--|---|---|---|---|---|--|---|
| Dry Well | Environmental sustainability should receive higher priority than income and economic growth. | Yes, it shows the effect failure to fulfill the aim of the key decision factors may have on the industry. | Create concrete plans of how to handle a worsening in the different force-groups. | Salmon lice, access to feed-resources, poor fish health, reduction in development concessions, rules and regulations, loss of reputation, shift in customer's preferences, decrease in demand, loss of market share, negative price development, actors going out of business and higher entry-barriers for new actors. | None. | Ripple effect of a worsening in the situation of the environmental forces on the other forces that affect the industry. | Environmental issues where salmon lice receive the highest priority. | High flexibility to be able to quickly alter the strategy to account for change. Resilient strategy that include plans of how to handle a worsening of the different force-groups. | Efficiency of salmon lice treatment, access situation of feed-resources and development of fish health among the cultivated salmon. |
| Puddle | Environmental sustainability should receive higher priority than income and economic growth. Political interests should receive higher priority. | Yes, it shows the effect failure to fulfill the aim of the key decision factors may have on the industry. | Improve the focus on how the forces that affect the industry are connected and the impact they have on each other. Account for the effect of not achieving change within a force-group. | Salmon lice, poor fish health, access to feed-resources, unsustainable way of production, political resistance, stop in development concessions and new actors seizing market shares. | Achieving exposed aquaculture and increase in global demand for salmon. | Not gaining political will for an upscaling because there are no signs of improvement regarding the environmental issues. | Environmental issues where salmon lice receive the highest priority and communication of this plan to the public. | Flexible strategy that can be altered quickly to account for change. Resilient strategy that include plans of how to handle a worsening of the different force-groups. | Occurrence of salmon lice, fish health, degree of sustainability of the feed-resources and the public view of the industry. |
| River | Environmental sustainability should receive higher priority than income and economic growth. Political interests should receive higher priority. | Yes, it shows the positive effect of keeping economic growth and marketing a high priority when the global demand is increasing and how not keeping environmental sustainability a high priority may inhibit the growth of the industry. | Continue marketing of the market situation for efficient marketing. Account for the effect of not solving the environmental issues. | Salmon lice, high costs of production at exposed locations, strict rules and regulations for companies operating close to the shore and smaller companies struggling to upscale their production. | Achievement of exposed aquaculture, increase in world population, increase in demand for Norwegian salmon, seizing of new market shares, improved reputation of the Norwegian salmon and a positive price development of the Norwegian salmon. | Not gaining political will for an upscaling of the production near the shore and high investment cost to start exposed aquaculture making it difficult for smaller companies to upscale their production. | Environmental issues at the shore where salmon lice receive the highest priority and lowering the cost of starting exposed aquaculture. | Resilient strategy to handle a worsening of the political force-group. | Degree of technology innovation, development of the market situation, customer's preferences, price development of the Norwegian salmon, occurrence of salmon lice at production locations near the shore and the public view of the industry. |
| Poseidon | Environmental sustainability should receive higher priority than income and economic growth. | Yes, it shows the importance of complying with the key decision factors and how doing so is beneficial for the development of the industry. | Account for all the key decision factors. None, and the effect they have on the force-groups. | Collaboration within the industry to solve the environmental issues, achieving exposed aquaculture, consolidation within the industry to cope with high costs of exposed aquaculture, new technology for salmon lice treatment, new areas for production, maintaining a shore-based production, sustainable feed-access, political will for upscaling of production, improved reputation of the industry, increase in demand, positive price development of Norwegian salmon and creation of job opportunities. | Collaboration within the industry to solve the environmental issues, achieving exposed aquaculture, consolidation within the industry to cope with high costs of exposed aquaculture, new technology for salmon lice treatment, new areas for production, maintaining a shore-based production, sustainable feed-access, political will for upscaling of production, improved reputation of the industry, increase in demand, positive price development of Norwegian salmon and creation of job opportunities. | The importance of the industry complying with the key decision factors to ensure a positive growth of the industry. Solving the issue of salmon lice is especially important. | Environmental issues where salmon lice receive the highest priority. | Resilient strategy to cope with not achieving change or experience a worsening of the salmon lice situation. | Degree of technology innovation, development of the market situation, degree of sustainability of feed-resources, public view of the industry, customer's preferences, demand for Norwegian salmon and price development of the Norwegian salmon. |

6 Conclusion

The thesis does fulfil its objective as the scenarios created all describe possible future developments which may encourage the decision-makers presented to them to consider developments they would not have otherwise. Further, since there are many advantages associated with implementing scenario planning as a part of a company's long-term strategy, doing so may enable the companies to better seize opportunities and avoid threats in the future given that they are aware of the pitfalls of using scenario planning. Therefore, since the scenarios and action plans may cause the stakeholders presented to them to see the value of implementing scenario planning, the thesis fulfills the aim of serving as an aid towards achieving the goals for year 2050.

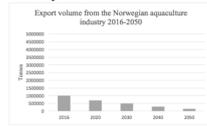
The conclusion of this thesis is presented that the scenarios and action plans created do fulfil the objective of the thesis, but for the actors within the industry to have more use of a scenario planning analysis they should implement it as a part of their own company's long-term strategy.

5 Results

The result of the scenario planning analysis are four scenarios named Dry Well, Puddle, River and Poseidon which describe a possible future state of the industry in year 2050 and the development leading up to this state. For each scenario created, a corresponding action plan has been created aiming at helping the industry seize opportunities and avoid threats in the different scenarios.

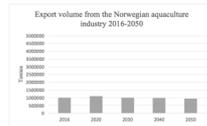


5.1 Dry Well



In the Dry Well scenario, the industry experience a major downturn in their production levels and turnover. The main reason for this is that the industry has lost control over the salmon lice situation. This has caused the government to introduce new rules and regulations and a stop in development concessions which is inhibiting the growth of the industry. The worsening in the environmental situation further caused the Norwegian salmon to lose its good reputation and thus, the demand for Norwegian salmon has dropped. This has caused the export volume from the Norwegian aquaculture industry to drop to 150,000 tonnes.

5.2 Puddle



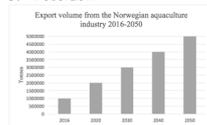
In the Puddle scenario, the growth of the industry has stagnated and the export volume from the Norwegian aquaculture industry is 950,000 tonnes. The reason for this is that the industry has not managed to improve the situation of the environmental issues in their production. This has caused the public to lose faith in the industry being able to solve these issues and thus, the government has introduced a stop in development concessions. Despite an increase in global demand, the stop in concessions has inhibited the industry from growing and seizing new market shares.

5.3 River



In the River scenario, the industry has achieved exposed aquaculture and thus eliminating the issue of salmon lice at the exposed locations. However, due to high production costs, only the large seafood companies can run production at exposed locations. At the locations near the shore, the industry is still subject to strict rules and regulations inhibiting further growth of the industry. Therefore, the industry has not managed to reach their goal of a 5-time increase in production and the export volume from the Norwegian aquaculture industry is 2.110.000 tonnes.

5.4 Poseidon



In the Poseidon scenario, the industry has achieved all their goals of future development and the export volume from the Norwegian aquaculture industry has reached 5.000.000 tonnes. This positive development is the ripple effect of a choice of the industry made in 2018 to in collaboration solve the environmental issues of the industry. This choice proved very successful and due to new salmon lice-removal technology, the issue of salmon lice was eliminated. This caused political will for upscaling and this combined with an increase in global demand and good marketing efforts, the industry is now the main exporter of salmon in Brazil, Russia, India, China and South Africa.

5.5 Action plans

For each scenario, a corresponding action plan has been created by answering the following questions presented below [8]. A summary of the action plans is presented in the table in part 5.6 of this poster.

- What are the implications with respect to key decision factors?
- Does the information about the future validate the original assumptions supporting strategies or proposed decisions?
- What do the scenarios imply for the design and timing of strategies?
- What threats and opportunities do the scenarios suggest?
- What critical issues emerge from the scenarios?
- What special cases deserve to be addressed by specific contingency plans?
- What kind of flexibility and resilience do the scenarios suggest are necessary from a company/industry's planning perspective?
- What forces and forces deserve monitoring considering information from the scenarios?

The intention of these action plans is to serve as an aid for the industry when making decisions. Further, the action plans suggest priority changes that the industry should make to steer the industry towards the development it is aiming at. The common denominator in the action plans is that environmental sustainability should receive a higher priority if the industry is to reach its goals for 2050. Another denominator is that salmon lice is responsible for inhibiting the growth of the industry in all the scenarios where the industry does not reach its 2050-goals. Therefore, all the action plans suggest that the environmental issues should be addressed by specific contingency plans.