

SUSTAINABILITY ASSESSMENT OF THE ARCTIC CHAR (*Salvelinus alpinus*) VALUE CHAIN: A CASE STUDY IN ICELAND

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Introduction

Iceland is the largest producer of Arctic char worldwide with a production in 2014 of 3411 metric tonnes and contributing to approximately 40% of the global supply and a value of \$27 million. The Arctic char production has increased greatly since 1987, when the world production only amounted to 31 metric tonnes (FAO statistics).

The aim of this study was to gain an overview of the development of the land based Arctic char production in Iceland, assess the sustainability performance of the production and to answer the question whether the Arctic char industry can be regarded as a success? Sustainability assessment of products entails a holistic lifecycle approach, including environmental, economic and social impacts (UNEP, 2011). A vision beyond the farm and including the value chain is vital to ensure a viable business and at the same time to safeguard practices with minimal impacts on the ecosystem and the environment, while contributing to well-being of workers and communities and providing safe and acceptable products for the consumer.

Materials and methods

Guiding principles on Sustainable Food Value Chains Development (SFVCD) were conveniently adapted to the study (FAO, 2014). The first phase concentrated on assessing the economic, environmental and social impacts of the four largest Arctic char producers in Iceland. The second phase, explored underlying factors which gave insights to understand the performance. Thirdly, success factors leading to improvements were identified.

Results

Phase 1 Economic, environmental and social assessment

The profits the firms made in 2014 according to their actual production quantities in that year were compared to the results of the maximum profits they can attain based on estimated cost functions. The estimates indicate that each producer is currently producing much less than would be needed to maximize profits. Fish farming of salmonids usually rely on economics of scale to be profitable and competitive. This is clearly observed, for example, in the Norwegian salmon industry (Asche & Bjørndal, 2011). By exploiting the economics of scale identified by the estimates, average costs would decrease and profits could increase by a factor of almost seven (Heimisson et al., 2016).

A benchmark for the environmental performance of Arctic char production was based on public Green Bookkeeping reports, Life Cycle Assessment (LCA) studies and results were compared with literature data. Relative to the salmon farming industry with respect to the impacts of feed used in aquaculture, the Icelandic Arctic char industry does not exhibit environmental superiority when comparing the feed conversion ratio (FCR), energy use and the climate change impact (kg CO₂eq/kg fish).

Social impact assessment in the context of Social Life Cycle Assessment (S-LCA) was based on a questionnaire focused on adherence to labour standards and national laws, and communication of the companies' policy regarding labour standards, as well as workers' rights to join trade unions, their employment conditions, wages and working hours. Additionally, questions were included on the status of occupational health and

safety training, training related to employees wellbeing and the actions of the companies to address issues regarding the influence of the company on the local communities both concerning remedies and additional costs as well as offering opportunities to local people (Smith and Barling, 2016).

Phase 2 Exploring underlying factors to explain performance

The industry (based on assessment of the four largest companies) has neither been markedly profitable nor has it grown at a significant rate. Since 2009, production increased annually by 6%, value added by 1.8% and profits declined by 5% (compared with increase of 7%, 12%, 13.5%, respectively, in the Norwegian salmon industry). The Icelandic currency has large impact on the results of the economic assessment.

The limited growth of the industry has been explained by the lack of capital to invest in new facilities, and inefficient administration procedures and infrastructure support from authorities. Genetic factors and the inherent growth rate of the Arctic char may also explain the performance of the industry.

Phase 3 Success factors leading to sustainable Arctic char value chain

The prospects for land based aquaculture in Iceland are favorable when considering the access to coastal areas, water and renewable energy as well as the lower risk of escape and diseases compared with marine cages. There is foreseen growth and new licenses have been issued where the industry will benefit from activities in the last years including:

- A regulatory framework (Act no. 71/2008; 49/2014) and requirements based on Norwegian standard (NS 9415:2009).
- Environmental monitoring and uptake of voluntary standards on responsible practices (AquaGAP, IMO, Whole Foods standard)
- Research on Arctic char (Breeding program, growth rate, sexual maturation, feed composition, salinity, temperature, water quality, density, animal welfare)
- Marketing studies (US and Europe)

Discussion and conclusion

According to stakeholders in the value chain, more focus should be on breeding programs, as well as marketing efforts to differentiate Arctic char products especially in Europe. The results of the sustainability assessments can be applied to respond to accountability and transparency of actions regarding a holistic sustainability performance.

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