Seafood sustainability: Optimization of Integrated Multi-Trophic Aquaculture (IMTA) with seaweed and salmon

SEAFOOD TOMORROW
NUTRITIOUS, SAFE AND SUSTAINABLE SEAFOOD FOR CONSUMERS OF TOMORROW


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SUMMARY

Integrated Multi-Trophic Aquaculture (IMTA) is an environmentally sustainable farming method whereby seafood species at different trophic levels are co-cultured in such a way that waste from one species can be recycled as nutrients for species at a lower trophic level. This study demonstrated a successful IMTA system for seaweed and salmon in commercial scale trials. The systems were tested at three different sites on the west coast of Norway, with varying environmental conditions, exposure levels, and technical setup. Results show improved growth of seaweed near salmon farms, although large variations in seaweed growth were observed between sites. The trials clearly demonstrated the benefits of IMTA, namely better utilisation of aquaculture sites, higher diversity of production with higher yields, and potential reduction of the environmental impact of fish farming.

KNOWLEDGE NEED

IMTA is acknowledged as a promising solution for the sustainable development of aquaculture, however IMTA with salmon and seaweed at a commercial scale is still in the early development phase. There is a need for improved knowledge, production protocols and technical solutions to validate IMTA as an economically viable method for producers. This requires extensive Research and Development on the commercial production of seaweed alongside fish species. This will include ensuring mutual benefit, assessing ecological and socio-economic issues, including knowledge of the entire value chain, growth fluctuations, and measure to balance upscaled salmon production with seaweed production. This study focused on the natural growth season of seaweed in Norway from October to May when the impact of the salmon is at its lowest.


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IMPACTS

IMTA has the potential to be an economically viable method for producers to farm salmon and seaweed together, while also ensuring that the growing aquaculture industry remains sustainable and environmentally positive. Further studies are needed, but IMTA has the potential to increase turnover and reduce production cost to be competitive in the market, reduce the environmental impact of salmon farming and produce healthy fish, and support good animal welfare. This will ensure the sustainability of the aquaculture industry. The knowledge contributes to a positive image of the seafood industry, and improves consumer confidence in the sector.

Contributes to the UN Sustainable Development Goal 12: Responsible consumption and production.

RESULTS

This output consists of expert knowledge and technical guidance gathered during two years of experimental seaweed and salmon IMTA production. Pilot scale seaweed-salmon IMTA systems were adapted and tested at three locations on the west coast of Norway with varying environmental conditions. Learnings from the study include:

- Seaweed can be grown in close proximity to commercial scale salmon farms
- IMTA configuration is site and farm dependent, and will vary depending on currents, water depth, light conditions, exposure to wind and waves, and other factors.
- Operational restrictions at individual farms must be taken into consideration.
- At exposed sites, measures to avoid entanglement of seaweed ropes must be taken.
- Seaweed grown nearest to salmon cages show better growth than seaweed located further away.
- Knowledge of prevailing currents should be used to inform the placement of fish cages and seaweed rafts.
- Salmon grown in IMTA systems with seaweed are comparable to fish grown at a monoculture site in terms of nutritional value, sensorial quality, and contaminants.
- No negative effects were observed on the overall benthic conditions, but additional data is needed to assess the impact of increasing the total biological load.

END-USERS & APPLICATIONS

Scientific community: researchers working in the area of salmon/fish and seaweed systems can use the validated datasets and new knowledge and experience to support further research on IMTA and Research and Development on quality and growth optimisation.

Salmon / fish and seaweed producers: can use the knowledge gained from the trials to improve production systems and harvesting logistics at their farms

Seafood industry managers: can use this knowledge to support market development, upscaling and implementation of similar IMTA systems at production sites across Europe, promoting aquaculture as a sustainable and environmentally friendly sector.

DISSEMINATION AND EXPLOITATION

Dissemination activities for scientific community:

- Project newsletter and news articles
- Promotion on Twitter and LinkedIn
- Publication and open access validated data sets coming soon; see seafoodtomorrow.eu

Exploitation activities for seafood industry:

- Horizon Results Platform: seafoodtomorrow.eu/horizon-results-platform
- Tarelaks and Moreforsking have reached out to salmon farmers in Norway and shared this knowledge through small-scale and commercial trials of the method.

Exploitation activities for policy makers:

- Managers, regulators and policy makers will be reached through the final SEAFOOD TOMORROW event, EC info session, and a dedicated EU policy event

INNOVATION STATUS

Technology Readiness Level 6 – demonstrated at commercial scale

Patents and IPR: Not applicable

FUTURE RESEARCH

Further research is necessary to prolong the growth season of seaweed either by using different species, or developing new protocols for off-season growth. Other uses for seaweed grown in summer and autumn must also be investigated. To complete and qualify the system, the potential impacts must be showcased to investors to support further Research and Development on other species and their seasonality, and to upscale production to assess the total environmental impact.

CONTACT AND CONTRIBUTORS

Contact: Grethe Adoff, **grethe@adoff.no**

Contributors: Tarelaks, Moreforsking

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