Lessons from the AQUABEST project for development of a sustainable aquaculture industry in the Baltic Sea region

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Baltic region SUSAQ workshop

Copenhagen 12.-13.6.2014

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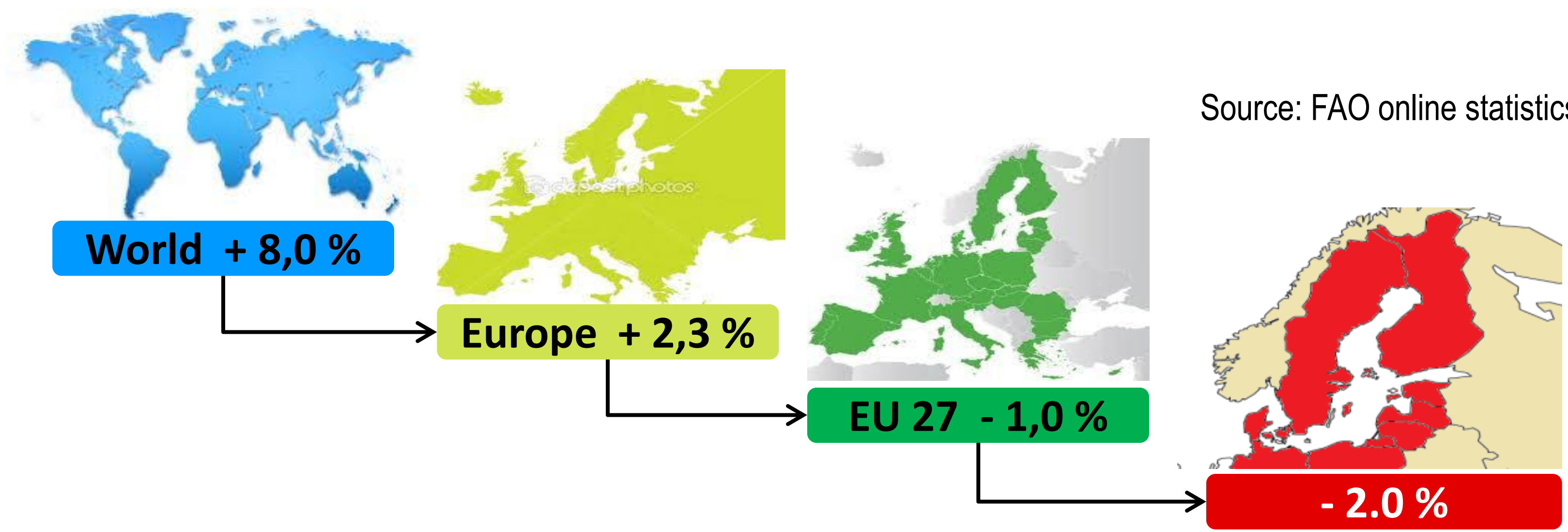
Aquaculture production and environmental effects externalized



Source: FAO online statistics

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Background for Aquabest project

- Good technologies and practices available
- Test and regulate them smartly by incentives
    - Well-intentioned emphasis on caution and control has resulted in non-incentivized regulation and stagnated production

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Perspective of project activities

- Hands on-exercices on three technologies & practices and on their regulation
  - Regional planning processes and pilots
  - Roundtable discussions with stakeholders
  - National regulation compared
  - Experimental work
- Economical and technological viability as a cross-cutting theme

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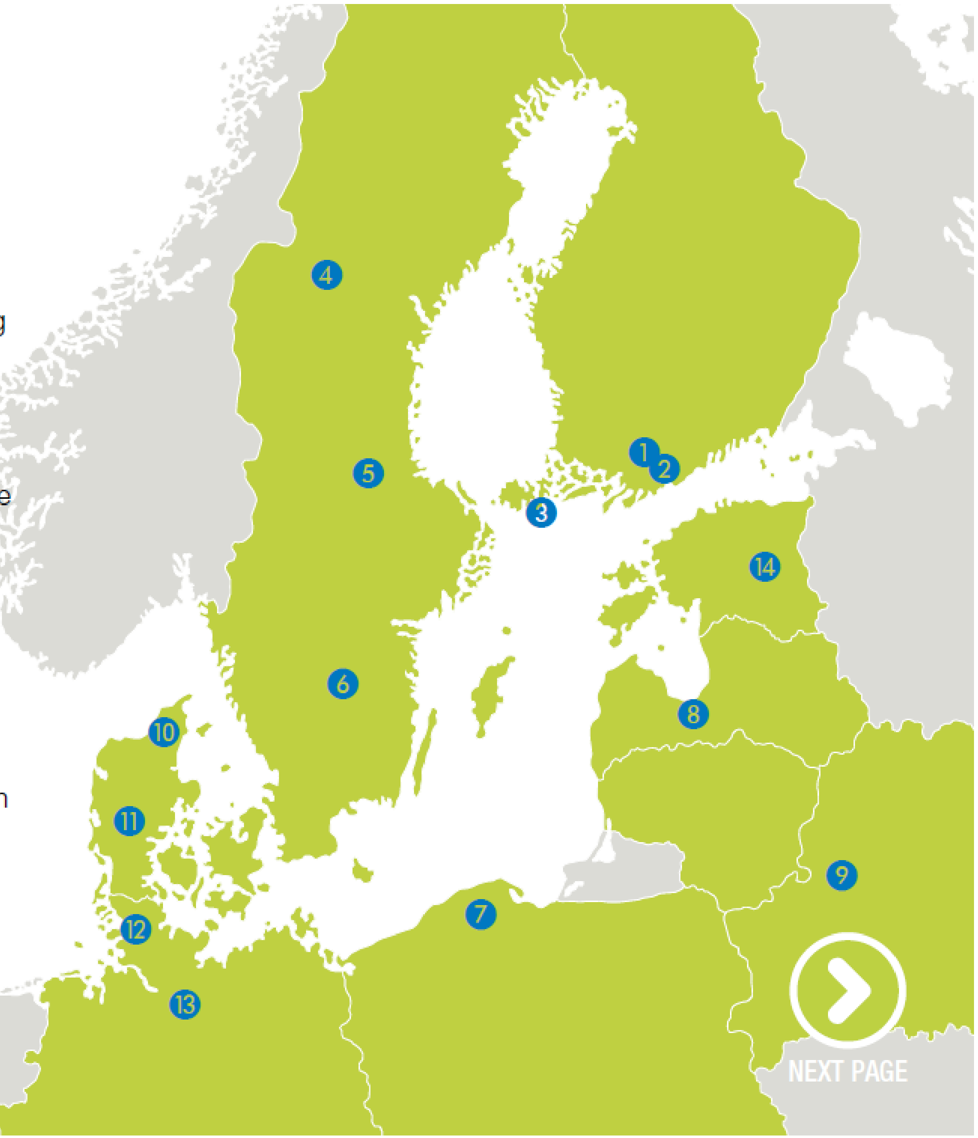
Partners

The Aquabest project has 14 partners, consisting of regional authorities, producer organizations, universities and stakeholders.

1. Finnish Game and Fisheries Research Institute
2. Helsinki University
3. The Government of Åland
4. Region of Jämtland
5. Swedish University of Agricultural Sciences
6. Swedish Board of Agriculture
7. Polish Trout Breeders Association
8. Latvian Institute of Food Safety, Animal Health and Environment
9. Belarusian State Agricultural Academy
10. Technical University of Denmark
11. The Danish Aquaculture Organization
12. GMA – Society / Association for marine aquaculture Ltd.
13. Johann Heinrich von Thünen Institute
14. Tartu University



Main themes of Aquabest

Environmental benefits of fish farming in the Baltic Sea

- Sea lice and escapees are not similar issues in the Baltic Sea aquaculture

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Lessons summarized as Aquabest Recommendations

www.aquabestproject.eu

RECOMMENDATIONS

Develop EU level guidelines on integrating aquaculture with water and marine strategy framework directives

- To facilitate sustainable growth, the need for aquaculture development should be explicitly recognised in the Water Framework and Marine Strategy Framework Directives.

Create a level playing field across food production sectors

- Legislative frameworks need to be developed in a manner that treats food production sectors equally in terms of licensing, societal acceptance, transparency and public subsidies.

Ease maintenance of existing permits

- When monitoring prove no risk for ecosystem resiliency, unnecessary administrative burden creates uncertainty about the future and may even reduce ability to invest in best technologies.

Reduce the administrative burden of licensing

- Lead times can be significantly shortened without compromising environmental protection.

Promote the smart use of voluntary responsibility schemes

- Voluntary schemes cannot provide a substitute for regulation. In order to minimise possible conflicts with regulations, open dialogue between labelling organizations, environmental authorities and aquaculture industry is essential.

Define national priorities in legislative regulation development

- As a part of Common Fisheries Policy implementation through national growth strategies for aquaculture, countries in the Baltic Sea Region should define a set of national priorities for the improvement of aquaculture regulation.

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RECOMMENDATIONS

Find locations that enable sustainable practices

- Carrying capacity, minimized stakeholders conflicts and good conditions for operation and for the farmed species are the most important aspects for finding locations.

Seek stakeholder involvement throughout

- Consultation with stakeholders is a key factor in any successful aquaculture permitting process.

Provide the facts on aquaculture sustainability issues

- Local politicians, authorities and stakeholders must be thoroughly informed before, during and after a planning process.

Monitor for potential environmental impacts

- To ensure ongoing sustainability and to reassure stakeholders, aquaculture operations should undertake comprehensive environmental monitoring programmes.

Track sources of phosphorus in regulated river systems

- Phosphorus retention data in regulated river systems should be analysed in order to curb excess Baltic Sea nutrient loading by the large scale farming.

Develop robust production systems tailored to Baltic Sea conditions

- Moving offshore should be a gradual process, the development of which should be supported by feasibility studies, pilot projects and public investment.

Give spatial planning legal status by linking it with licensing

- Spatial planning should be easily accessible to fish farmers and authorities, and the manner of interpreting such plans should be mutually agreed upon and well documented.

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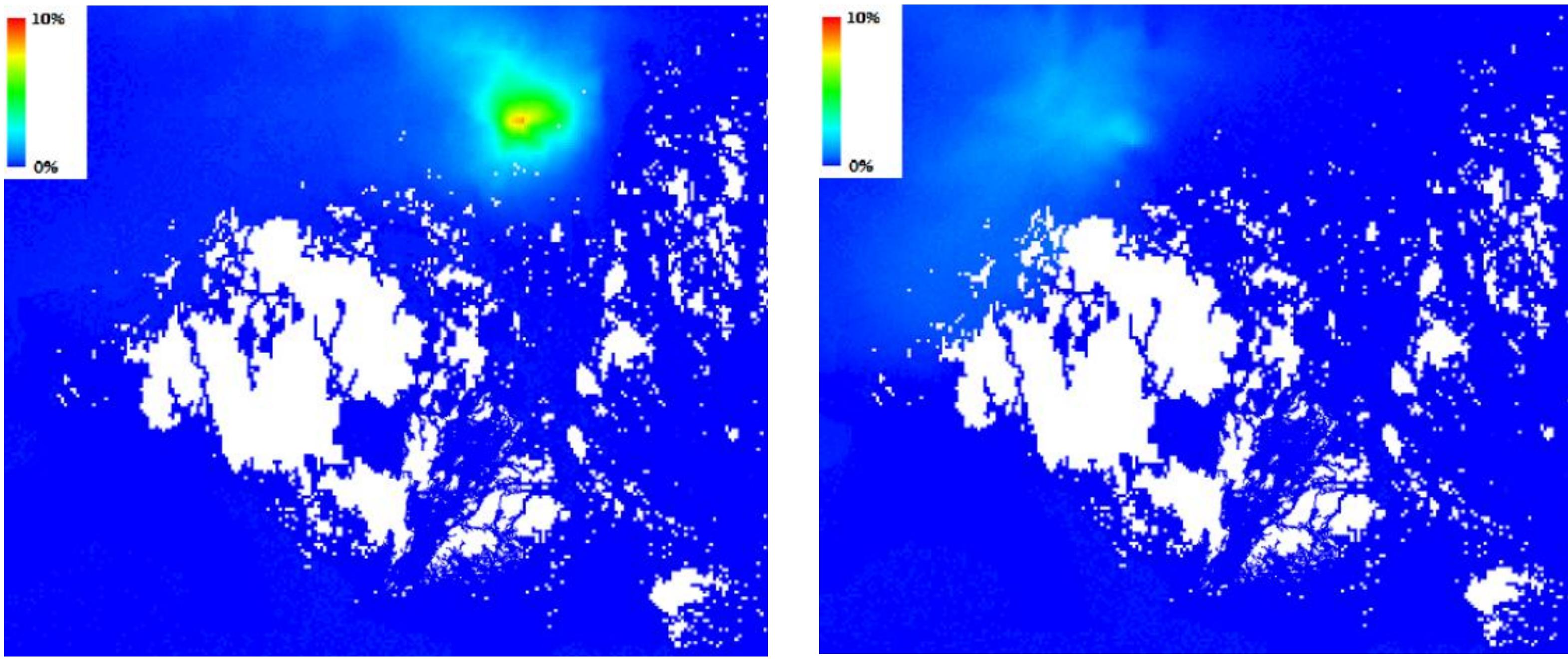
BEVIS-model – 1000 tn farm in Åland

Abrahamsson 2014, Aquabest–report 7/2014



Neglible increase in primary production in the more western location

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Large potential in hydropower reservoirs in the northern Sweden

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Adjusted Wollenweider-model

Hedlund et al. 2014, Aquabest–report 5/2014

Table 8. Phosphorus addition from the fish farming potentials stated in table 7 at direct dilution and at each reservoir's outflow, i.e. following retention and sedimentation and the share of phosphorus addition that remains within the lake.

	Turnover time (years)	Fish production (ton)	Phosphorus addition only dilution (µg/l)	Remaining phosphorus addition at lake outlet (µg P/l)	Proportion that settles (%)
Hetögeln	0.14	2508	5.77	4.20	27,23
Svaningen	0.09	3026	5.98	4.56	23/78
Flåsjön	7.02	621	11.66	3.26	72.04
Torrön	2.58	1780	9.19	3.57	61.17
Hotagen	0.32	2179	7.29	4.62	36.64
Juvuln	0.40	1354	5.70	3.54	37.83
Kallsjön	2.20	3077	8.48	3.47	59.11
Liten	0.02	3590	5.45	4.68	14.10
Gesunden	0.04	6451	4.11	3.49	15.07
Lossen	0.82	309	3.40	1.91	43.86

RECOMMENDATIONS

Agree on a common definition for Baltic Sea fish feed

- New farming with nutrient input and associated compensatory nutrient removal would not have to be located next to each other as long as the Sea's total nutrient balance remained at the targeted level.

Provide incentives for local sourcing of feed ingredients

- Any incentive system should be acceptable both to the business sector and to environmental authorities.

Avoid biased incentives by ensuring stakeholder consultation at every step

- Stakeholder discussions between the feed industry, fish farmers, environmental bodies, fishery authorities and academia are vital.

Develop local sourcing of Baltic Sea fish meal to ensure more nutrient-neutral aquaculture

- Fish meal sourced from Baltic Sea fish is the most readily available fish feed ingredient sourced from the Baltic Sea itself. However, fish meal content of cost-effective aquafeeds is decreasing rapidly worldwide.

Help mussel farming achieve commercial viability

- Baltic Sea mussel meal is a locally sourced fish feed ingredient with clear environmental benefits, but such meal is not currently viable as a source of commercial fish feed.

Develop feed ingredients from waste streams and by-products

- Microbial proteins have the potential to be very sustainable from the point of view of resource efficiency and low carbon footprint.

Identify ways to make experimental feeds commercially viable

- Experiments with arctic char, turbot and rainbow trout feeds have shown that regional feed ingredients can be used in the production of high quality fish feeds.

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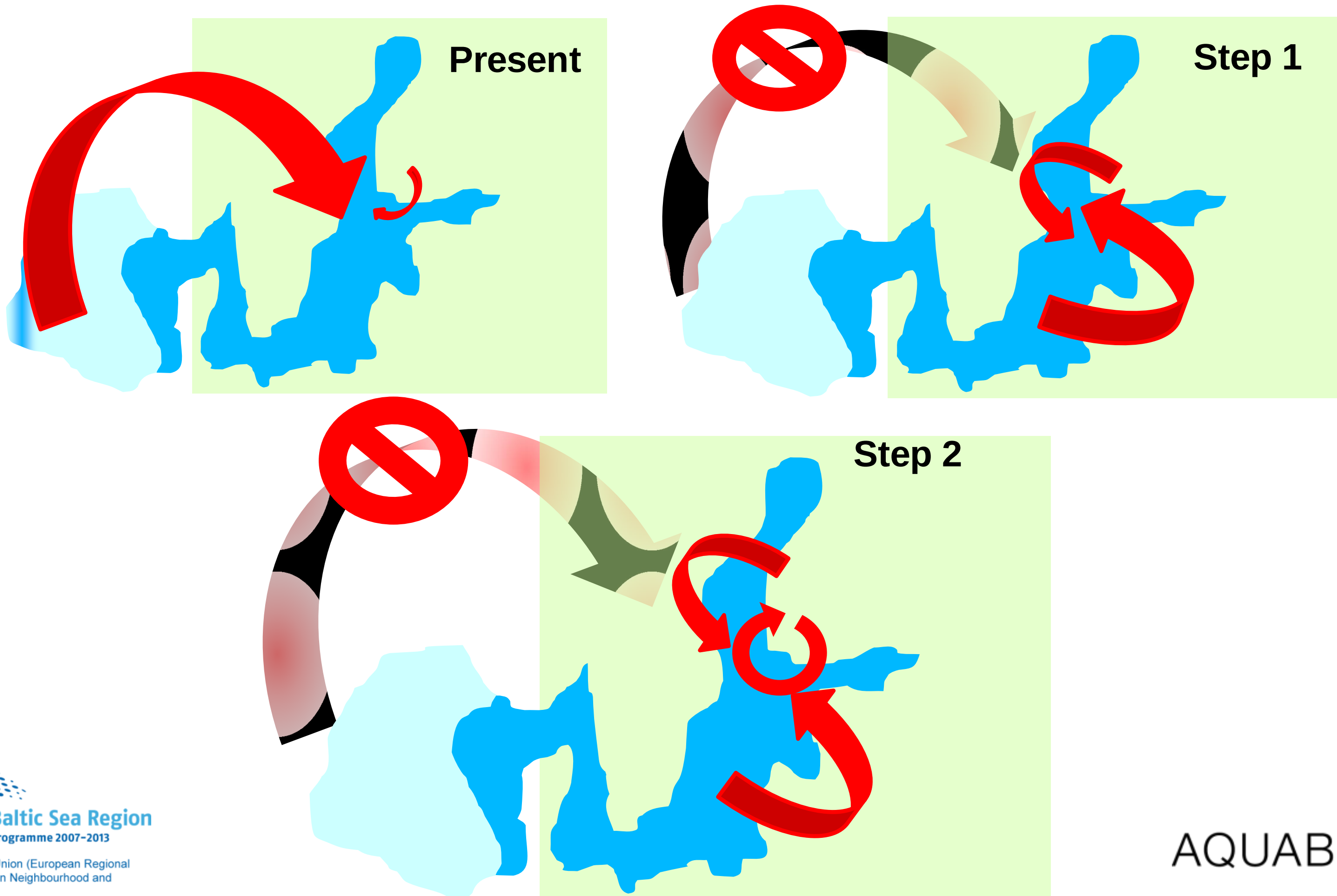
Steps towards Baltic Sea fish feeds



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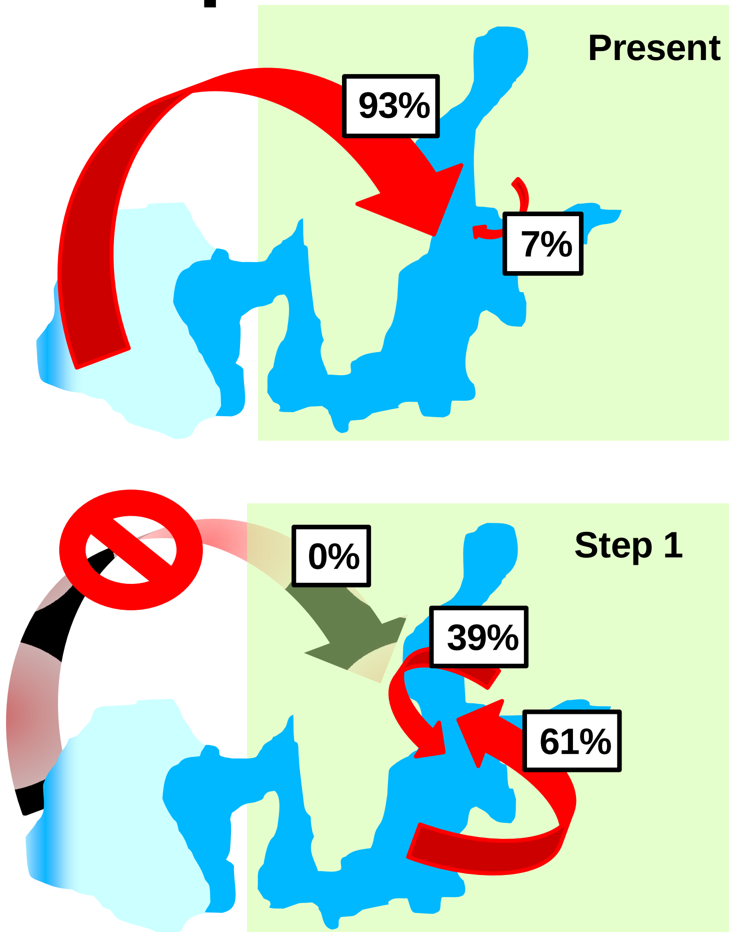
Nutrient flows Step 1

Feed ingredient	"BaU"	Step 1
Regular fish meal	320	-
Soybean meal	130	-
Soy protein concentrate	170	-
Baltic Sea fish meal	-	320
Bream and roach silage	-	-
Mussel meal	-	-
Rapeseed protein	-	265
Field bean	-	65
Fish oil	200	200
Wheat meal	170	140
Premix	10	10
Total	1000	1000



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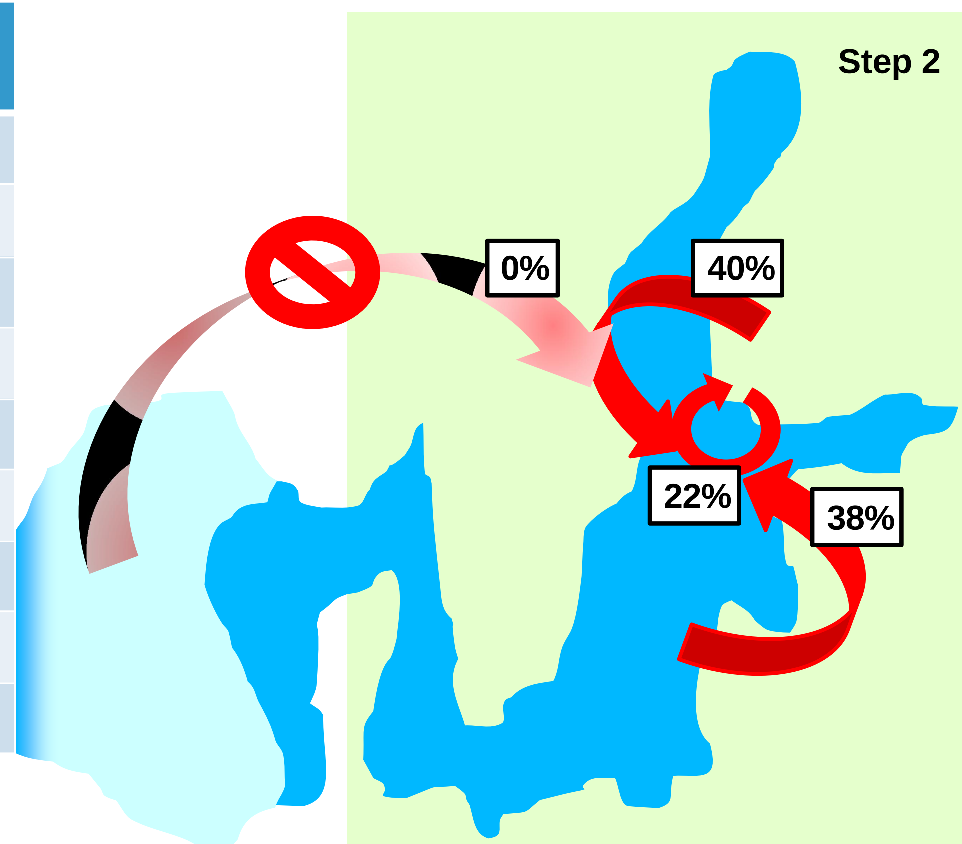
Nutrient flows Step 2

Feed ingredient	Step 2 % of diet
Baltic Sea fish meal	17
Fish silage from local catches	16
Mussel meal	9
Rapeseed protein meal	23
Field bean meal	6
Fish oil	16
Wheat meal	12
Premix	1
TOTAL	100



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RECOMMENDATIONS

Determine the feasibility of advanced RAS farming technologies

- Feasibility evaluations are a prerequisite to investment in advanced farming technology. Studies must take into account all factors affecting viability.

Ensure that advanced technologies will increase revenues

- RAS farms must be large enough and, ideally, grow fish with a better market price than those bred using conventional technologies.

Solicit international expertise to gain RAS farm licensing knowledge

- National authorities must dialogue with RAS industry experts to build licensing bodies' competence in RAS farming best practices.

Ensure success through education, training and skills development across the value chain

- We strongly recommend a common and focused platform for cooperation on research, education, training and the exchange and transfer of knowledge, from research to farming practices.

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Economical feasibility of model fish farms

Figure 1. Abild model trout farm in Denmark. Photo: Peder Nielsen.

Figure 2. Løjstrup model trout farm in Denmark. Photo: Peder Nielsen.

Other good practices and technologies adopted in the region

- Low phosphorus diets (by e.g., phytase enzyme)
- Feed waste monitoring (by e.g., Akvasmart)
- Restricted feeding: feeding tables
- Genetic improvement in feed efficiency
- Third-party environmental monitoring

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Conclusions

- There are viable technologies and practices to increase aquaculture production without compromising ecosystem resiliency
  - For cage farming, primary production modeling and following multi-stakeholder site selection, with an extra benefit through recycling marine nutrients
  - For land-based farming, RAS technologies are available but their long-term viability needs further development (technology, biology, regulation)
  - Precision feeds, feeding methods and stock improvement
- Baltic Sea aquaculture is not facing problems of sea lice or genetic pollution through escapees

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Thank you for your attention

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