



Polymakers' Event 31.02.2021

Nutritious, safe, and sustainable seafood for consumers

Novel sustainable feed ingredients for tailor-made farmed fish and multi-trophic aquaculture

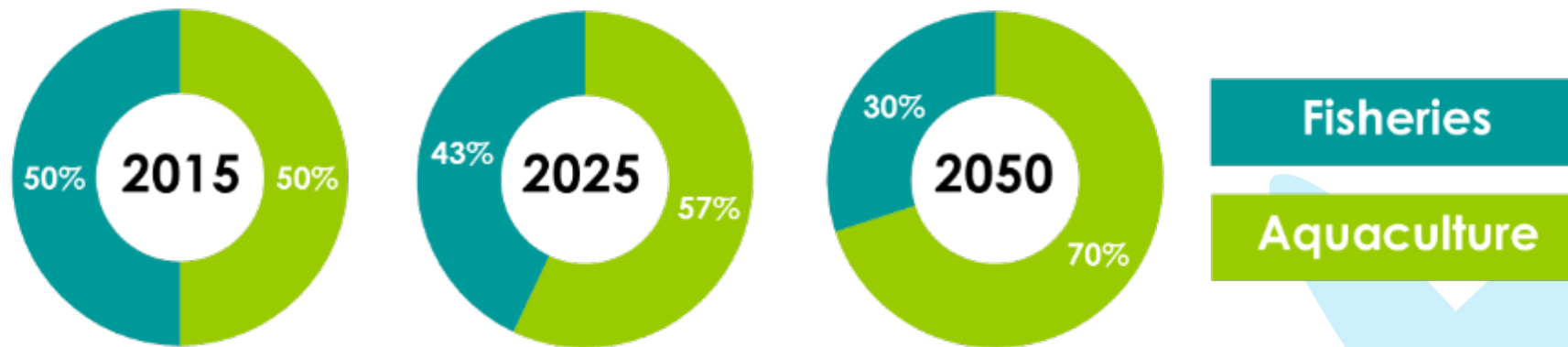
Jorge Dias – SPAROS LDA (PT)

Contribution of aquaculture to seafood supply



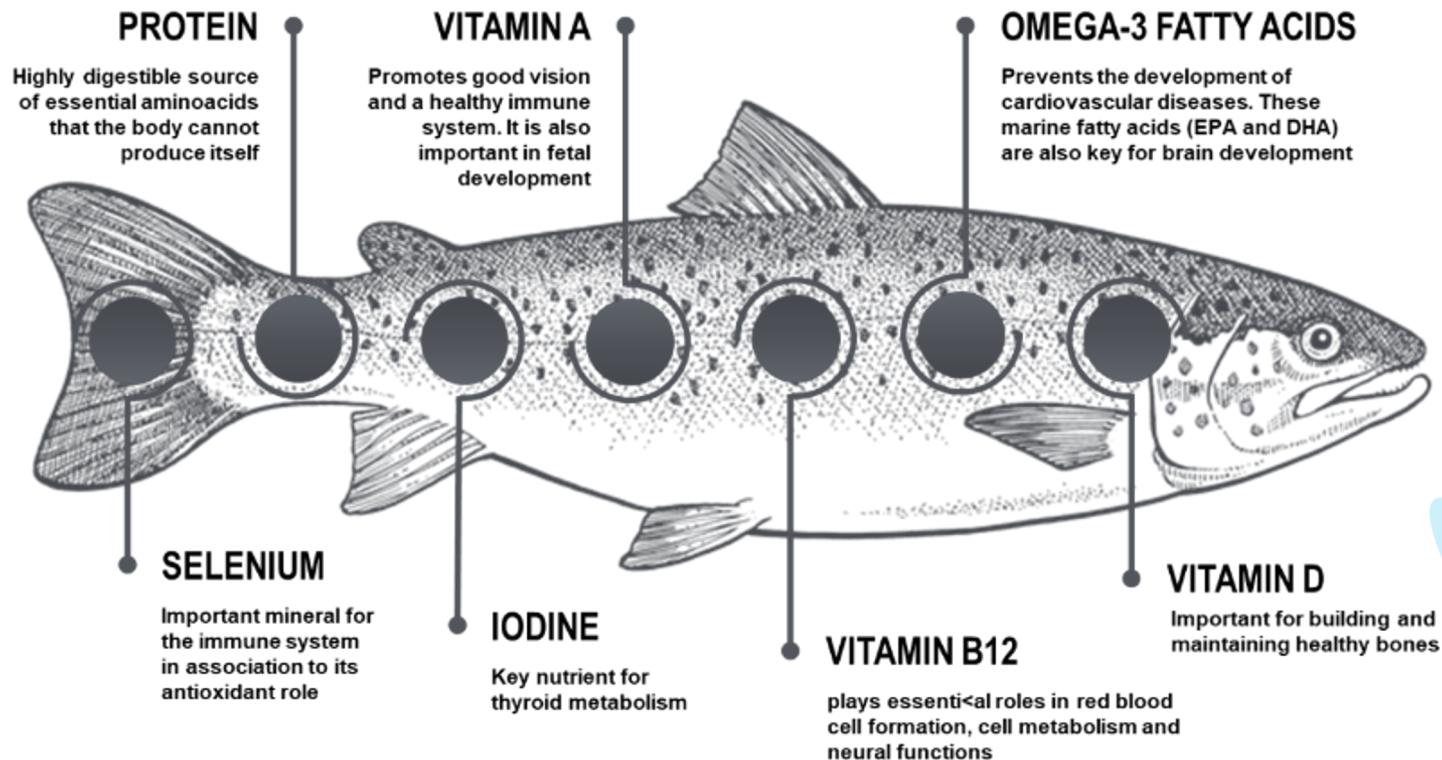
Aquaculture is one of the most resource-efficient ways to produce protein

140 MT by 2050



+32% (30 Million tons) by 2050!!!

Farmed fish are identified as a rich source of...

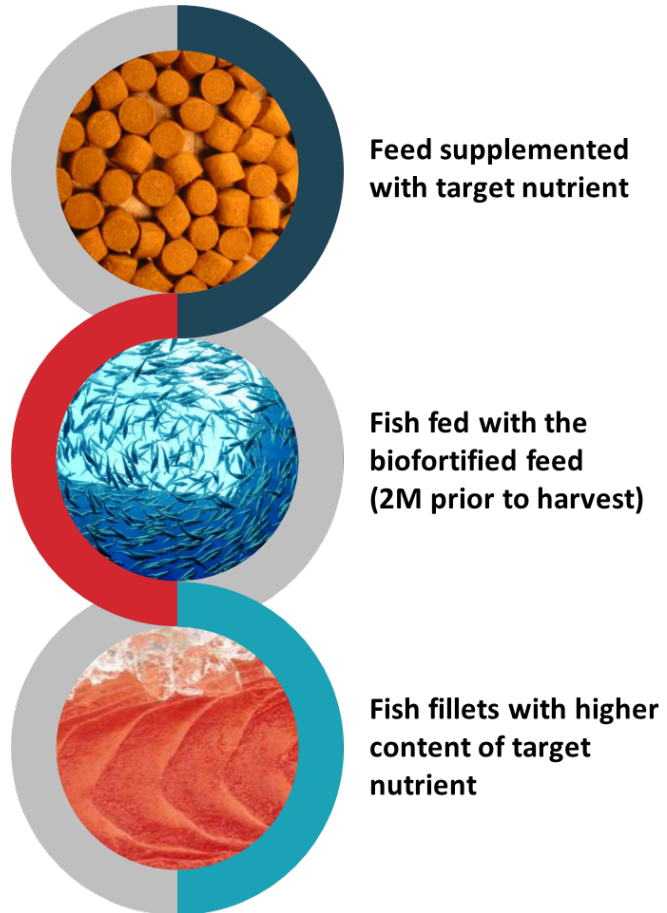


The sustainability drive towards a reduction of fishmeal and fish oil in aquafeeds can potentially alter the nutritional value of fish:

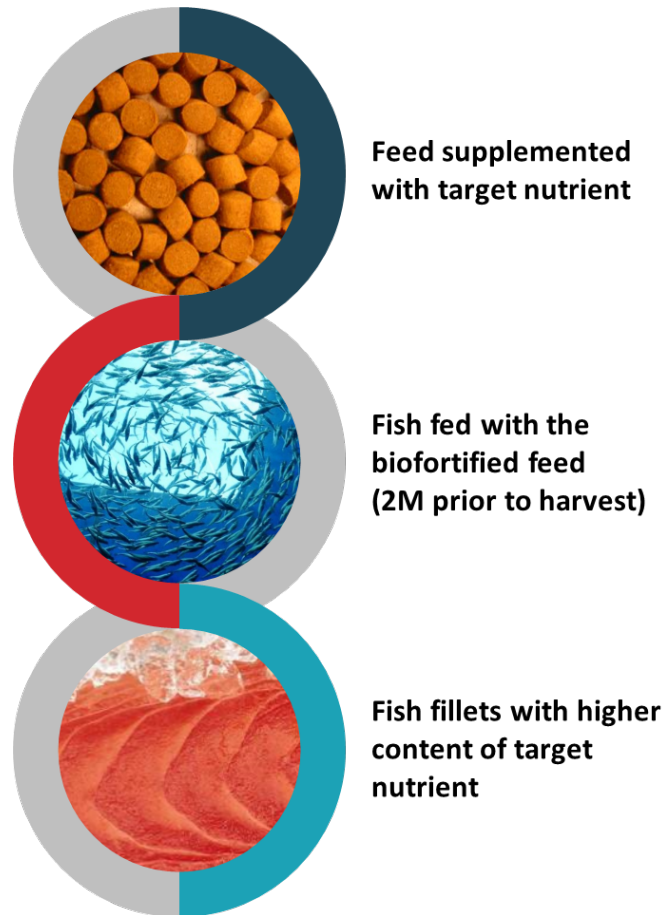
- Lower levels of omega-3 fatty acids (EPA and DHA)
- Lower levels of vitamin D and minerals (e.g. iodine, selenium)

What can be done to counteract this trend?

Biofortification of farmed fish with health-valuable nutrients



Biofortification of farmed fish with health-valuable nutrients



When embracing a biofortification concept, we should never lose sight of consumer benefits and perception

Biofortification targets should be:

- Familiar nutrients (already known to be present in fish or clearly valued)
- From natural and sustainable sources (good fit with a healthy food concept)
- In strict compliance with all legal and safety use limits
- Industrially relevant (e.g. market availability, cost, manufacture process)

Moreover, the biofortification strategy should

- Not compromise the growth performance and welfare of the fish
- Not enhance environmental burden

Biofortification scenarios tested in the project



Aquafeeds formulated with seaweeds, microalgae and yeast and therefore richer in health valuable nutrients were tested in various species at both **pilot and farm-scale**



Seaweeds:

- iodine
- other trace minerals
- antioxidants



Microalgae:

- omega-3 fatty acids (DHA)
- selenium
- carotenoids
- antioxidants



Selenised Baker's Yeast:

- selenium

FEEDING TRIALS



Gilthead seabream



Common carp



Rainbow trout

No detrimental effects on fish performance (growth, feed efficiency)

No changes on fish physiology and overall welfare status

No negative impact on sensory properties of fish

Biofortified fish...

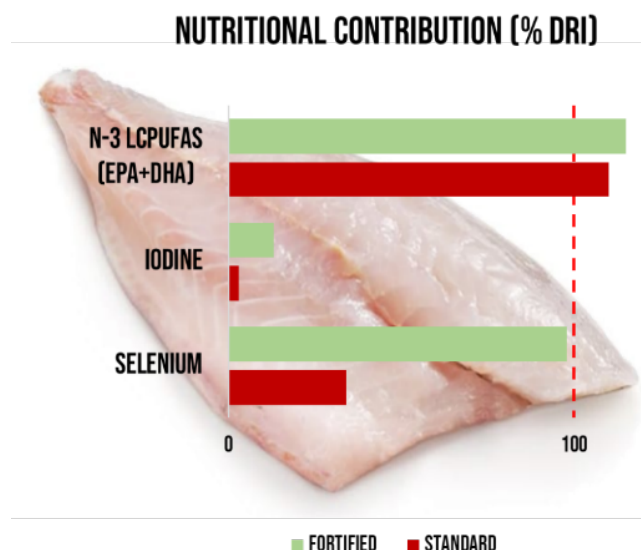
DRI values for adults (EFSA)

I = 150 µg/day

Se = 70 µg/day

EPA+DHA = 250-500 mg/day

Per 150 g serving (fillets)



Gilthead seabream

% DRI (EFSA)	STANDARD	FORTIFIED	
Iodine	9%	12%	+3%
Selenium	24%	68%	+44%
EPA+DHA	219	264	+45%

showed a higher nutritional contribution to cover EFSA's Daily Recommended Intake (DRI) of target nutrients



Common carp

% DRI (EFSA)	STANDARD	FORTIFIED	
Iodine	<LOQ	18%	+18%
Selenium	16%	111%	+95%
EPA+DHA	30%	90%	+60%

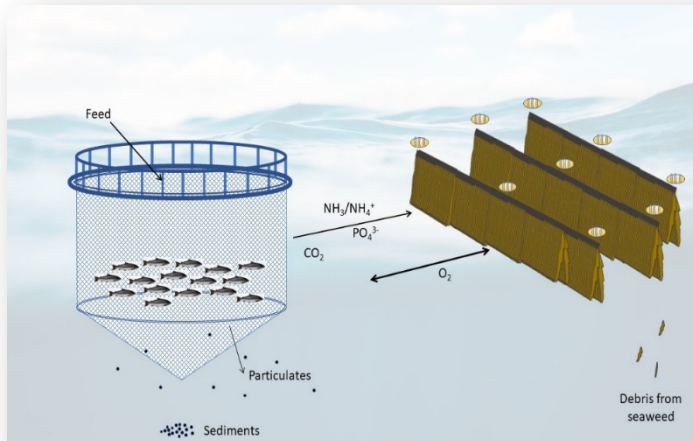
Compliance with maximum EU limits for iodine and selenium in feeds

In the case of trout...

Feed contained 3% of an iodine-rich seaweed (*Saccharina latissima*) produced by Integrated Multitrophic Aquaculture (IMTA), in association to a salmon farming site in Norway

Nutrients released from a fish farm are used to grow seaweeds in a adjacent area

- **Environmental benefits**
- **Economic benefits: seaweed has commercial value**
- **Job creation**



Rainbow trout

% DRI (EFSA)	STANDARD	FORTIFIED	
Iodine	10	47	+37%

Is it industrially feasible?



FEED MILL	TROUT	CARP	SEABREAM
Availability of fortification raw materials	OK	OK	OK
Increase in feed formulation cost	+6%	+9%	+11%
Current feed manufacturing process	No changes	No changes	No changes
Legal compliance	OK	OK	OK
FISH FARMER	TROUT	CARP	SEABREAM
Production performance	No changes	No changes	No changes
Animal welfare	OK	OK	OK
Biofortification efficacy	YES	YES	YES
Legal compliance	OK	OK	OK
MARKET	TROUT	CARP	SEABREAM
Sustainable ingredients	OK	OK	OK
Natural & healthy image	OK	OK	OK

Potential constraints

Higher levels of biofortification (iodine and selenium) can be achieved without detrimental effects on fish

But currently limited by maximum authorised limits in feeds

Full economical feasibility is dependent on a product and cost differentiation positioning at the retail level

The Integrated Multitrophic Aquaculture (IMTA) approach will require

- An extension of exploitable areas
- Further R&D effort on algae production (species, spatial planning)
- Standardization of quality and safety criteria of algae

The impact

Iodine deficiency (ID) is the world's leading cause of preventable brain damage. Up to 360 Million European citizens are exposed to ID disorders

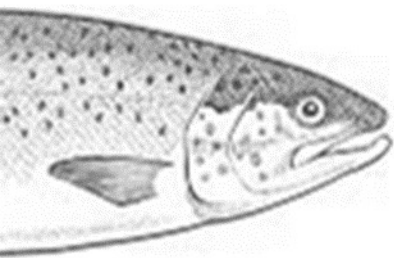
Euthyroid Project: <https://cordis.europa.eu/project/id/634453>

Suboptimal **selenium** status is reported to be widespread throughout Europe, the UK and the Middle East

Stoffaneller and Morse (2015). Nutrients. DOI: <https://doi.org/10.3390/nu7031494>

In 74% of the countries covered (17 EU countries) by the study, average **EPA + DHA** intake was below EFSA's recommendation

Sioen et al. (2017). Annals of Nutrition & Metabolism. DOI: <https://doi.org/10.1159/000456723>.



Biofortification of farmed fish is an efficient and cost-effective approach to naturally raise the intake of shortfall nutrients and mitigate associated deficiencies



Thank You

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Joint effort by:



Technical University
of Denmark



Tarelaks AS



MØREFORSKING

