Assessing the effect of feeding regime on the nitrogen and greenhouse gas footprint of fish production in recirculating aquaculture systems.

Level:	MSc.
Start of project:	Open
Project form:	Modeling study
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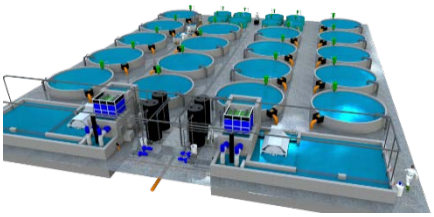
Background

Aquaculture is the fastest growing food-producing sector worldwide. It is estimated that this sector will grow to an estimated production of 109 tons in 2030 (from 82 t in 2018; FAO 2020). To reduce negative effects on the environment and to make aquaculture less vulnerable to environmental influences, recirculating aquaculture systems (RAS) have been developed. Fish in these aquaculture systems are usually fed once or twice per day with a protein-rich diet. The concentration of protein in the feed is an important factor in the amount of nitrogenous waste excreted by the animals. In addition, feeding times may have a direct effect on fish metabolism and thus on nitrogenous waste excretion. Indeed, it has been shown that providing feed with different protein content (30 vs 45%) and throughout the day (demand-fed) vs twice a day results in different growth rates and nitrogenous waste excretion in the form of ammonia (Mes et al., manuscript submitted). Ammonia is removed by biofiltration. This removal is extremely important since high ammonium concentrations lead to reduced welfare and even mortality of the fish kept in these systems.

Project aim

In this internship you will quantify the effect of different feeding regimes and feed type on the nitrogen and greenhouse gas (GHG) footprint of fish production in RAS. An environmental footprint expresses the environmental impact (e.g. kg nitrogen compounds emitted or kg CO2-eq emitted) per unit of biomass produced (e.g. kg fish) over the full life cycle of the fish produced. The life cycle includes the N and GHG emissions required to produce the feed for the fish, the energy required for the RAS and the N and GHG emissions from the RAS to the environment. Your project will lead to recommendations on the optimal feeding regime in aquaculture systems to minimize environmental footprints in a sustainable manner, i.e. without cost increases and fish biomass decreases.



References

MacLeod, M.J., Hasan, M.R., Robb, D.H.F. et al. Quantifying greenhouse gas emissions from global aquaculture. Sci Rep 10, 11679 (2020). https://doi.org/10.1038/s41598-020-68231-8.

Mes et al. (2022), submitted.