Carbon, nitrogen, and phosphorus flow analysis of a combined aquacultural / agricultural production system from a life cycle perspective

Project description

Carbon, nitrogen, and phosphorus flows are associated with several challenges of our times, such as the planetary boundaries for climate change, ocean acidification and biogeochemical flows. Disruptions of the global cycles of these vital elements can impact energy systems, food production and availability, and pose a threat to life. Therefore, national and international sustainable development research programmes are aiming at reducing undesired carbon, nitrogen, and phosphorus emissions by implementing technologies that transform waste in resources, in a circular economy.

Biochar, the product of biomass pyrolysis, is a promising technology to mitigate climate change and improve soil quality. In this project, we investigate developing and applying Nutribatt, a nutrient-enriched biochar, to control carbon, nitrogen, and phosphorus flows in a combined aquacultural/agricultural production/waste treatment system.

In this thesis, we want to i) set up and explore different scenarios for Nutribatt production and application and ii) perform carbon, nitrogen, and phosphorus mass balance analysis to assess degrees of circularity and identify risks.

The following tasks are included:

- Define scenarios for production and application of the Nutribatt technology
- Map system processes that involve carbon, nitrogen, and phosphorus for the different scenarios
- Perform mass balance assessment for carbon, nitrogen, and phosphorus
- Identify circularities and risks

The project will be conducted at the Division of Environmental Systems Analysis (ESA) at the Department for Technology Management and Economics (TME) during the spring of 2023. Nutribatt is a novel environmental technology that is developed in collaboration with other universities and companies, and therefore this project provides the opportunity to liaise with various stakeholders and also visit the aquaculture facility in Floda where trials will be made in the Nutribatt project.

Qualifications

This project is ideal for two students with a background in chemical engineering, civil engineering, biotechnology, or similar. We welcome students from the master’s programs Industrial Ecology or Sustainable Energy Systems or similar. Basic knowledge in Life Cycle Assessment (LCA) or Environmental Systems Analysis is preferrable.

Contact

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