

18. An in-DEBt look at the offshore aquaculture of seaweed and bivalves

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In order to feed the growing human population, we cannot continue with a protein production chain that overexploits soils and threatens biodiversity. While 70% of our planet is covered with oceans and seas, this area currently provides only 7% of the world's total protein production. Low trophic aquaculture (LTA), which consists of e.g. algae, seaweeds, and shellfish, offers opportunities for increased marine food production. An LTA protein production chain based on the combined offshore cultivation of seaweeds and mussels can diminish eutrophication in coastal waters, stimulate CO₂-uptake, and can be combined with other activities in the marine environment such as wind or solar energy production, hence truly contributing to sustainable protein production. The farming of seaweed in Europe is currently underdeveloped, and large-scale cultivation in the North Sea might have a detrimental effect on the availability of phytoplankton, the base of the marine food web. In this project we will use Dynamic Energy Budget (DEB) theory to model food web dynamics in the marine ecosystem. Our first goal is to investigate ecosystem responses to the cultivation of seaweeds within the natural marine environment. How will competition for resources between seaweeds and phytoplankton affect the marine food web? Our DEB-based ecosystem model will also include the role of bivalves in the food web: how will their feeding on phytoplankton affect the overall marine primary production? In a third step we will incorporate hydrodynamics. Then finally, the project aims to assess different LTA scenarios that are in balance with the marine ecosystem.