

ENVIRONMENTAL SUSTAINABILITY ASSESSMENT OF TWO CONTRASTED PILOT AQUAPONICS PRODUCTIONS (TILAPIA VS. PIKEPERCH) BY LIFE CYCLE ASSESSMENT.

A. Noël*, V. Gennotte, A. Forchino, C. Rougeot, P. Fontaine, D. Brigolin

CERER Pisciculture asbl,
Rue de la Justice 10, 4500 Tihange, Belgium.
Email : alicia.noel@cere-pisciculture.be

Aquaponics is an integrated food production technique, often promoted as a sustainable method for growing both fish and plants, the integration of recirculating aquaculture system (RAS) and hydroponics increase water and nutrient efficiency^{1,2}. However, information on the global environmental impact of aquaponics is scarce.

The aim of this work is to compare the sustainability of two contrasted fish farming scenarios in a coupled aquaponic pilot production system. The aquaponic pilot system (total volume of 18 m³) is an indoor system which has a fish production volume of 8 m³ and 50 m² of crop production on raft and NFT, equipped with LED lighting.

The two fish production models explored were tilapia (*Oreochromis niloticus*), a tropical, omnivorous and highly productive species with a low market price, and pikeperch (*Sander lucioperca*), a temperate, carnivorous, less productive species, with higher market price expectations. Vegetable production included lettuce, parsley, basil, coriander and arugula.

The sustainability of the two production scenarios was assessed by Life Cycle Assessment (LCA). An extensive data collection started at the construction of the aquaponic system and continued throughout the different productions periods. Only primary data were used and no assumptions were needed for the life cycle inventory. In order to compare the two production models, a one-year time span was considered. The system boundaries were set as the aquaponic pilot system and considered a cradle to gate approach.

Results show that the two aquaponics productions have similar profiles regarding the contribution of the processes (production, energy consumption, water consumption, transportation, aquaponic system, infrastructures) to the overall environmental impact of the aquaponic system. For the two production scenarios, energy consumption is the main environmental burden and strongly contributes to abiotic depletion (76-84%), global warming potential (73-78%) and acidification (64-60%). In terms of carbon footprint, tilapia production performs better than pikeperch. These results will help in identifying key environmental burdens and needs for improvement in aquaponic systems under temperate climate and help stakeholders decision-making concerning fish species options.

References

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