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IMPROVING RAINBOW TROUT (*Oncorhynchus mykiss*) ENVIRONMENTAL FOOTPRINT THROUGH INSECT MEAL USE IN AQUAFEED

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Rainbow trout is one of the most important fish species raised in aquaculture in Europe. From an environmental point of view, one of the main critical points is the use of feed. Several alternative ingredients have been proposed in the feeding of rainbow trout, which have shown benefits from the point of view of zootechnical performance. However, an analysis of environmental impacts is essential to be able to assess the benefits of using these ingredients. The use of an environmental impact analysis based on life cycle assessment (LCA) is presented in this study. The study aims to evaluate the use of insect meal obtained from agricultural wastes and by-products in aquafeed formulation.

As functional unit, 1 ton of fish at the farm gate was used. The processes included in the environmental analysis (**Figure 1**) were: the processing of agricultural waste and by-products; production of BSF larvae; feed production; rainbow trout rearing; and consumption of several inputs such as electricity, oxygen, transports, infrastructures and equipment. The work also estimated the gaseous and wastewater emissions of the insect- and fish-rearing stages, respectively. Primary data were collected from insect rearing trials with different substrates and trout rearing in an Italian farm. Secondary data were used to estimate the impacts of the production of raw materials, materials, transportation, energy, oxygen and emissions, using specific databases (Ecoinvent and Agribalyse) and data from the scientific literature. As environmental impact analysis method, Environmental Footprint (EF) version 3.1 was used.

Feed use remains one of the main hotspots in rainbow trout farming, contributing between 70% and 40% in the impact categories analysed. However, the results show that depending on the type of substrate used for insect meal production, the overall impact of farming is reduced by approx. 5-15% in many of the impact categories analysed. The results of this study support the importance of alternative ingredients, and insect meal in particular to reduce the environmental footprint of rainbow trout aquaculture.

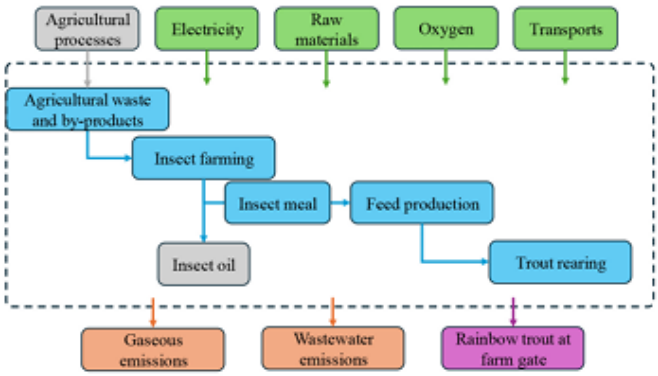

Figure 1. System boundaries considered. Light blue represents the core processes. Light green represents common inputs. Grey represents excluded processes. Orange represents emission. Purple represents output.