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Improving the resilience of agriculture,
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Environmental impact of fish farming cages under different production and management scenarios

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Abstract

Aquaculture is the fastest growing agri-food sector globally. Seabass and seabream are among the most important fish grown in Europe in terms of production volumes and value, especially in the Mediterranean basin. The European Union plays an important role in this market and intends to support it more and more through dedicated policies under the Farm to Fork Strategy. At the same time the environmental sustainability of food production is increasingly important for the Commission. Several environmental assessments of seabass and seabream farming have been done, highlighting the criticality of aquafeed as the main impact driver. However, greater attention would also be needed for infrastructures. These are often neglected in LCA studies because considered not relevant or due to lack of data. This study, on the other hand, intends to investigate how different production and management can affect the environmental impact of aquaculture off-shore plants.

For this purpose, a cradle-to-grave LCA of a floating off-shore collar cage (diameter 25 m) was performed, thus considering production, maintenance and disposal. Different scenarios were explored by varying the management of nets and other structures (raw materials used, periodic maintenance, thus including diesel and oil consumption by vessels, and life span). Inventory data were retrieved from the literature (Vázquez-Olivares 2003; Mendoza Beltran et al., 2018; Avadi et al., 2019); background data from the Ecoinvent® database. The characterization method used was the established ReCiPe 2016.

The results confirm that an optimal management of an off-shore aquaculture plant can lead to significant environmental improvements. This emerged for all the impact categories evaluated, even if not in equal measure. Nets management was of particular importance, given their reduced life span compared to that of the rest of the plant. Nets production and maintenance (anti-fouling washing and periodic replacement) were in fact the environmental hotspots of the entire plant impact. The disposal method on the other hand (i.e. recycling of raw materials against generic waste) had a minor role. Considering that off-shore aquaculture is expected to grow in the future, also due to the increasingly lower energy and economic convenience of in-land production, the results of this contribution represent a first interesting survey on how an optimal design and management of the plants can limit the impact of fish production, which is necessary to be further investigated.

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