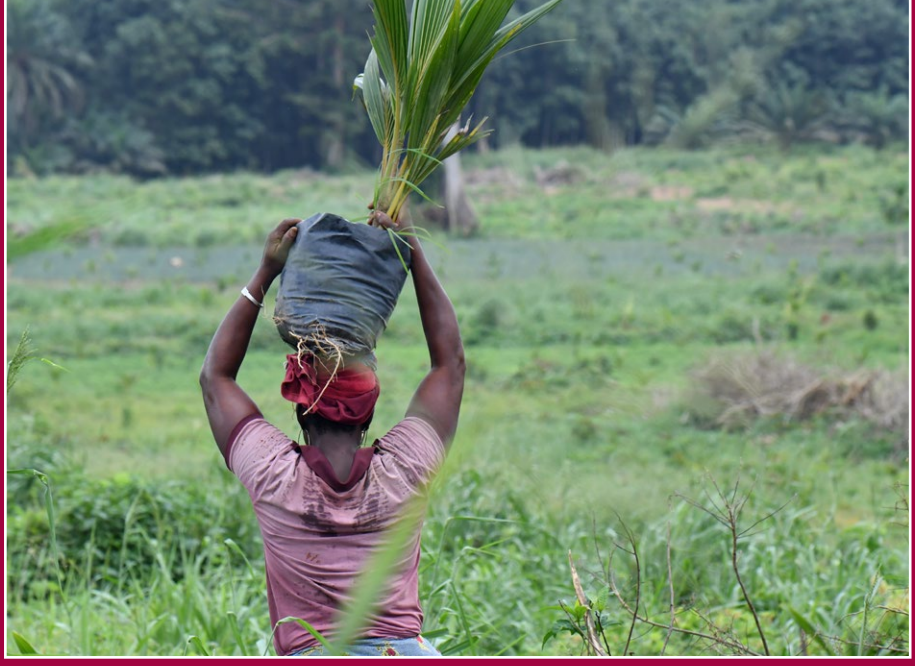

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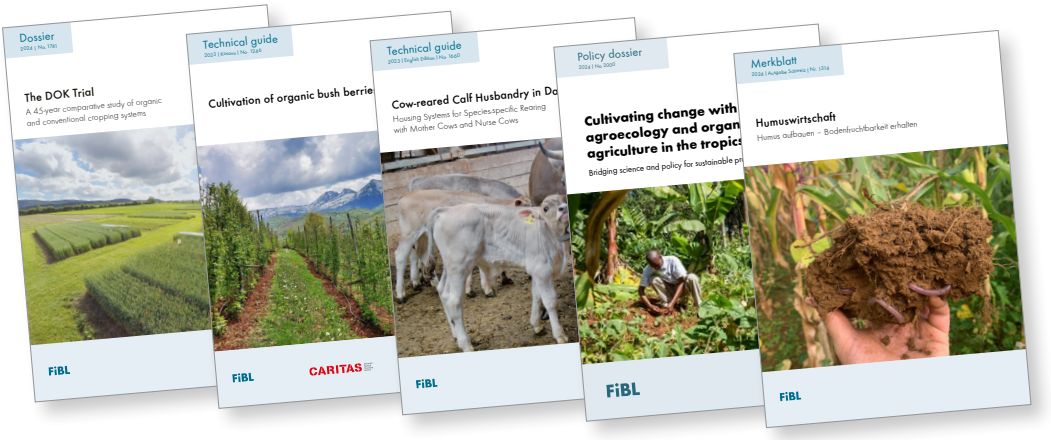

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Edited by

Helga Willer, Jan Trávníček and Bernhard Schlatter

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Enabling and Constraining Factors for Developing Organic Aquaculture in Europe

GIUSEPPE LEMBO[1] AND LOLA TOOMEY[2]

Aquaculture is the fastest-growing food-producing sector globally, contributing to 51 percent of the world's fisheries and aquaculture production in 2022, excluding algae (FAO, 2024). However, organic aquaculture remains a niche market, accounting for a production of 330,789 metric tons (Willer et al., 2024) in 2022, representing about the 2.8 percent of the global aquaculture production. The bulk of global organic aquaculture production is led by China, followed by European nations (Willer et al., 2024). In Europe, organic aquaculture represented solely 6.7 percent of total aquaculture production in 2020 (EUMOFA, 2022). According to the latest report from EUMOFA (EUMOFA, 2022), within the European Union (EU), mussel farming dominates organic aquaculture production with 41,936 metric tons, trailed by Atlantic salmon (*Salmo salar*; 12,870 metric tons), rainbow trout (*Oncorhynchus mykiss*; 4,590 metric tons), common carp (*Cyprinus carpio*; 3,562 metric tons), oyster (3,228 metric tons), and European seabass/gilthead seabream (*Dicentrarchus labrax* and *Sparus aurata*; 2,750 metric tons).

While European organic aquaculture production has seen a consistent rise in recent years, with a notable increase of 60 percent between 2015 and 2020 (EUMOFA, 2022), this growth trajectory is not sufficient to meet the objectives outlined in the European Union's Farm-to-Fork Strategy, which aims for at least 25 percent of agricultural land to be organic by 2030 and calls for a substantial increase in organic aquaculture. Despite the increasing consumption of organic aquaculture products, the European aquaculture sector has yet to fully realise its growth potential (Kaimakoudi, 2024). Since its inception, the organic aquaculture sector has encountered numerous challenges, including regulatory constraints related to quality, health, and environmental standards. Additionally, technical hurdles in production, such as adhering to organic regulations for reproduction and incurring extra feed costs, have posed obstacles. Reduced profitability, limited market demand, and competition with other certification schemes were also, for instance, reported to further impede the growth of European organic aquaculture.

Recently, in the framework of the OrganicTargets4EU project[3] a quantitative systematic literature review was carried out to investigate the impact factors that act as either constraining or enabling factors for the development of European organic aquaculture. Special emphasis was placed on key farmed species in European organic aquaculture,

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[3] More information about the OrganicTargets4EU project can be found on https://organictargets.eu. See also the article by Lampkin et al. in this volume.

encompassing both freshwater and marine species, namely Atlantic salmon, rainbow trout, common carp, European sea bass, gilthead seabream and shellfish.

The major constraining factor reported in the literature is the perceived feasibility of organic aquaculture among farmers, which encompasses practicality, viability, and ease of adopting and implementing organic aquaculture practices. Specific requirements often cited as limiting factors include the limited stocking densities (potentially requiring higher production capacity), restrictions on antimicrobial and chemical treatments (e.g., problematic for sea lice treatment in Atlantic salmon), and limitations on recirculating aquaculture systems.

The availability of organic juveniles also presents a significant challenge due to various factors, including limitations on live animal movements, risks associated with relying on a limited number of suppliers for eggs/juveniles, expenses and environmental impact (e.g., long-transport), and hesitancy to introduce new individuals into farms due to potential pathogen load or unsuitability for the local (geographical) environment (e.g. genetic or population, resistance to different diseases, growth performances, reproductive cycle, behavioural characteristics, etc.) (Gambelli et al., 2019a; Lembo et al., 2019; Sicuro, 2019).

Furthermore, constraints on organic feed formulation, such as bans on amino acid supplementation and on the use of genetically modified organism material (e.g., unavailability of vitamin B2 [riboflavin] to be included in the feed formulation for carnivorous species), can hinder the development of organic aquaculture (Lund et al., 2011; Mente et al., 2019). The limited options and higher cost of ingredients available to match amino acid and fatty acid profiles, and to adequately cover the dietary needs of essential nutrients, also present challenges for the feed industry in meeting organic regulation requirements (Mente et al., 2019). The small scale of organic production makes it more vulnerable to global/financial crises.

Despite these constraining factors, overall consumer attitudes toward organic aquaculture products are rather positive (Feucht and Zander, 2017; Gambelli et al., 2019b; Sicuro, 2019). It is reported that consumers are concerned about environmental issues, potential environmental benefits from specific rearing practices (i.e., environmental benefit and ecosystem services), as well as health concerns, which drive a trend towards a healthier diet (Jacobs et al., 2015b, 2015a), all of which are expected to increase demand for organic aquaculture products (Altintzoglou and Honkanen, 2020). The perceived impact of aquaculture practices on the natural environment is a key factor in the social acceptability of aquaculture products (Kraly et al., 2022; Cavallo et al., 2023). Another key factor lies in consumer preferences driven by ethical considerations, notably animal welfare (Honkanen and Ottar Olsen, 2009; Alexander et al., 2016; Cavallo et al., 2023). Moreover, the purchasing power/willingness to buy organic products has been mentioned in many documents as a supporting factor (e.g. Gambelli et al., 2019a). Enhanced public knowledge regarding the added value of organic products could encourage consumers to choose organic aquaculture products, despite their generally higher cost.

In conclusion, significant constraints hinder the development of organic aquaculture, including the applicability of regulations, production costs, challenges in provisioning organic inputs, and price differentials compared to conventional products. Incentives, such as eco-premiums, and research for innovative solutions are widely suggested to overcome these barriers. Moreover, tailored marketing strategies and effective communication channels are needed to inform consumers and increase demand. However, constraining and supporting factors are often interrelated, necessitating a holistic approach and strong effort from EU, Member State policymakers, farmers, and stakeholders to achieve the objectives outlined in the EU's farm-to-fork strategy for organic aquaculture.

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