



# The Development of Oyster Farming in Italy: An Innovation Opportunity for Mollusks Farming Diversification

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## DESCRIPTION

Pacific oyster (*Crassostrea gigas*; Thunberg, 1793) is the most farmed and consumed bivalve worldwide, with over 6,000,000 tons and a global market value of about 58 billion USD, in 2020 [1]. As aquaculture in general, its production is expected to rapidly grow in the next years, and to play a key role in food security [2]. In fact, except for some developed countries where oysters are considered a luxury food, globally they are widespread in the human diet, as fresh or processed food (i.e., Far-East coastal countries). Although native to the Pacific area, this species is now considered cosmopolitan as it was accidentally or voluntarily introduced into many temperate geographical areas, including the Italian coasts and the Po Delta, where it has been present since the second half of the 1960s. Its large diffusion is due to the wide tolerance and rapid growth performance. In fact, it is an estuarine species that can survive both on stable bottoms, fixed to solid substrates, as reefs or rocks, and on muddy or sandy-muddy bottoms, from the mid-tidal area to 40 m depth, in a range 0.5%-3.5% salinity and -2°C to 35°C temperature [3]. In Italy, oysters are definitely an appreciated product, but today almost all of them are imported, especially from France. National production is, in fact, still almost completely negligible, less than 300 tons/year, compared with an annual consumption of around 10,000 tons.

Even though Italy is the cradle of European tradition of oyster farming, that dates back to ancient Roman times, with the fall of the empire the tradition was lost and only during the renaissance production restarted, but only on the tables of the French aristocracy, to the point of becoming a product totally linked to France in the collective imagination. Only in the last ten years has the tradition been resumed. Significant examples are the pink oyster of the Lagoon of Scardovari (Po River delta), the green oyster of the Gulf of Poets in Liguria, the white oyster of the Gargano, the Sardinian oyster and the oysters of the Lagoon Goro (Po River delta). Recently, in Goro, two new genotypes have been selected, the Golden and the Black oysters, with vivid

colours and shades of shells, determined by combined effects of both genetic features and specific environmental conditions.

The municipality of Goro is located in the province of Ferrara, overlooking the homonymous lagoon, locally called "Sacca", in the southernmost part of the Po Delta. The Sacca di Goro is the leading producer in Europe for clams and, although oyster farming is still in its beginning, it is a notably interesting case study because it is the unique farming site in Italy that uses seeds produced in local hatchery and not imported from France. Farming consists of four phases. Seed production in local hatchery, a pre-fattening of 2-3 months, that can be performed both in lagoon and on off-shore long-line plants, a fattening of 7-10 months in long-line plants, and finally, selection, depuration and packaging.

The evaluation of opportunities related to the development of oyster farming in Italy cannot overlook the assessment of environmental sustainability and economic feasibility. Based on Life Cycle Assessment (LCA) applied to the case of Goro, it emerged that oyster farming at km 0, using local seeds and with pre-fattening in lagoon, ensures an environmental impact about 0.35 kg of CO<sub>2</sub>-eq/kg of fresh live product [4]. This carbon footprint can be considered very low and close to the lowest of manual oyster farming, carried out in Chinese lagoon and which produces 0.07 kg CO<sub>2</sub>-eq/kg of live weight [5]. Based on the study of Hilborn et al. [6], in general, bivalves environmental impact as CO<sub>2</sub>-eq has been estimated about 20 times lower than the impact of beef production and 10 times lower than the impact of chicken and pork production for the same unit of edible biomass of protein. Thus, if only 10% of the current consumption of beef or chicken were replaced with oysters, about 360 or 120 million tons of CO<sub>2</sub>-eq emissions, respectively, would be saved annually as CO<sub>2</sub>-eq. emissions due to meat production, without considering the extra savings due to carbon sequestration in shells by oysters, which would account for other 2-3 million tons of climate-altering gases subtracted to atmosphere.

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In recent years, Italian clam farming has experienced a series of difficulties, as first seed scarcity due to scarce recruitment in the wild and mortality due to eutrophication related phenomena, exacerbated by climate change and temperature increase. Within this scenario, local farming has highlighted the vulnerability and weaknesses typical of a traditionally not-diversified sector. In the face of this, the opportunity to introduce new species of commercial interest has recently become increasingly strong, and various experiences have been already showing that the oyster could be an excellent candidate.

## CONCLUSION

Oyster farming certainly represents an opportunity for Italy, having wide margins for increasing production compared to demand, but it is clear that the challenge for new enterprises is still all uphill, since in the face of future potential, risks and investments are present. The main point of weakness in the diffusion of oyster farming is therefore the current reluctance of fishermen and farmers to undertake new production and new investments, to develop a supply chain that today is principally structured for the needs of local restaurants and must be entirely built, from the upstream with local materials suppliers for farming, to the downstream of logistics and distribution. The possibility of adopting a cooperative management could become an advantage in terms of product promotion, being able to access marketing channels that the individual producer would not be able to approach. The current imaginary mostly linked to France needs for a targeting promotion of Italian oysters as a whole, to spread a new perception of the Italian product.

Several elements support the potential opportunities of undertaking an innovative production, creating an Italian oyster culture, also with the advantageous perspective of diversification in a mono-economy context based on mussel or clam farming, integrated with an overall territorial promotion.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest

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