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Research Article

A review of the situation in the aquaculture industry in Latvia

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ABSTRACT

Aquaculture provides a healthy source of food for citizens, so aquaculture can be considered an ecological, economic and socially sustainable sector. Aquaculture products play a key role in human consumption because they contain a lot of protein and little fat, and are rich in omega-3 fatty acids and vitamin D. The history of aquaculture in Latvia dates back to the 13th century and at that time the pond farm was regarded as a lucrative auxiliary agricultural sector. In Latvia development of the aquaculture sector is supported by the Latvian Ministry of Agriculture with the Action Programme for Development of Fisheries (2021-2027). This medium-term plan shows that the aquaculture sector has the potential to become a very productive, competitive and environmentally friendly sector of the national economy. Research aim is to analyse the situation of aquaculture in Latvia. In order to achieve the objective, the following specific research tasks have been identified: 1) to examine the history of aquaculture in the territory of Latvia; 2) to analyse the laws and regulations of the aquaculture sector in Latvia; 3) to analyse the main indicators of the Latvian aquaculture sector. The study found that the number of aquaculture ponds had fallen by 7.5 % between 2014 and 2022, while the area of ponds had increased by 7.1 % by 2022. Carp is the most farmed fish in aquaculture enterprises in Latvia. In total, 80% of aquaculture production is sold directly fresh. Total production and sales amounted to 2.39 million EUR in 2022.

Keywords: Aquaculture, fish farming, ponds, history

INTRODUCTION

Aquaculture holds significant importance within the agricultural sector of numerous countries worldwide. This industry plays a crucial role in providing consumers with safe and high-quality food products that are carefully monitored in controlled environments, resulting in a smaller ecological impact. Seafood and fish are vital sources of nutrition and sustenance on a global scale (Cojocaru, 2022). While aquaculture production in Latvia remains stable, it lags behind other European Union member states in terms of volume (FAO, 2022a). The growth in aquaculture production has successfully met the increasing demand for fish and continues to do so, offering a healthier and more environmentally sustainable alternative to meat in many cases. Over the past quarter-century, aquaculture production has outpaced most other food industries, nearly tripling in live weight and establishing itself as a mature and internationally recognized sector (Edwards, 2015).The demand for sustainable production methods has grown alongside the rapid expansion of aquaculture. Progress in areas such as cultivation, feeding, genetics, equipment, and process automation has led to enhanced productivity and quality, while also driving down production expenses.

Regarding the economic importance of the aquaculture sector, it employs more than 20 thousand direct workers in Europe (FAO,2022b). The produced products are sold fresh for consumption in the local market. The aquaculture product traditionally produced in fish farms is most often uniform (carp) and must compete with products grown in neighboring countries at lower production costs. The primary focus is on selling the freshly produced goods in the local market. A crucial aspect is expanding the variety of fish species that are cultivated. The consumption of fish and fish products holds significant importance for human nutrition (Mishara,2020). Approximately 30% of the necessary protein intake for individuals is derived from aquatic organisms and fish. Aquaculture has the flexibility to utilize any accessible areas that lack restrictive conditions and are not subject to any governmental limitations hindering such activities (Naylor et.al.,2023; Srivastava,2008).

Aquaculture plays an important role in various countries, but it also faces significant challenges. For example, aquaculture has long been an important economic sector along the coast of Norway. However, overcapacity is considered to be one of the main reasons for the poor financial performance of Norwegian aquaculture (Zhang D., Sikveland M., Hermansen Ø., 2018). Over the past three decades, the Icelandic aquaculture industry has had to contend with a decline in the total number of fish farmed. The industry responded with layoffs, factory closures and ship scrapping, which significantly reduced employment in industry, especially in the processing sector (Gunnlaugsson S.B., Saevaldsson H., 2016). The Belgian aquaculture industry is under pressure to prove the sustainability of its fish farming methods (Kindsa A., Sysa K. et al., 2016). Aquaculture management in Northern Ireland also includes voluntary stock management measures such as grooving for berry lobster (Yates K.L., 2014). In Sweden the importance of addressing forest owners' interests in development and management of fish and water resources is essential for successful policy programmes. Not only they own forests, they are a major group owning a pond area with fishing rights (Laitila T., Paulrud A., Waldo S., 2018).
The cultivation of aquatic organisms, known as aquaculture, plays a crucial role in ensuring food security by offering a more dependable food source compared to relying solely on wild-capture fisheries. Several studies have found that the potential for expansion and advancement in aquaculture is substantial (Kobayashi et al., 2018). Looking ahead, the outlook for aquaculture appears promising. According to the World Bank, nearly two-thirds of is projected to come from farm-raised sources by 2030 (Kobayashi et al., 2018).
The network of locations of aquaculture enterprises in Latvia is not directly related to the availability of freshwater resources, but reflects traditions and socio-economic interests of landowners to engage in this field of activity. Although aquaculture production varies year after year, since 2008 there has been a gradual increase in total marketed aquaculture production (Ministry of Agriculture, 2022).

Historical development of aquaculture

The first ponds in the present territory of Latvia date back to the 13th century in Kurzeme, where the climate and terrain are very good for setting up ponds. The ponds were set up by both feudal rulers and monasteries. In the 15th century, primitive livestock farming insecure the manure needed for the fields as a result, ponds were used to increase the yield of the fields (Sprūžs,2014). Up until the 18th century, a pond farm considered a lucrative auxiliary agricultural sector. Ancient pond dams can also be found in Vidzeme remains, but the ponds have been much smaller and may have been more used for fish caught in lakes storage, not cultivation. in the 19th century, the pond farm declined noticeably because, along with cereals, agriculture developed strongly in the global market in the Baltics – it was introduced new processing methods that raised the capacity. In the 19th century, whole ponds were built in Kurzeme systems, many of which still exist today (Sprūžs, 2014).

In aquaculture ponds, a large fraction of input nutrients endup in the sediment while the harvested fish orepresents only a minor fraction of primary production (Bosma et.all.,2011). The pond farm is the oldest aquaculture sector to include fish of various species of commodities, rearing of babies and other hydrobionts in ponds (Steffen, 2006). The pond is set up on the ground, usually with dams or artificial bodies of water restricted to dams. Ponds and ponds are quite different types depending on the species to be grown, the purpose of cultivation, water supply, etc. European commercial aquaculture production is based on relatively few major species, although a wide range of species have been tested at experimental or pilot scales. (Sturrock et al.,2008). Between 1992 and 2021 the following species were bred was carp (Cyprinius carpio), tench (Tinca tinca) and catfish (Silurus glanis). The volume of aquaculture production in Latvia has decreased by 60% (Figure 1).

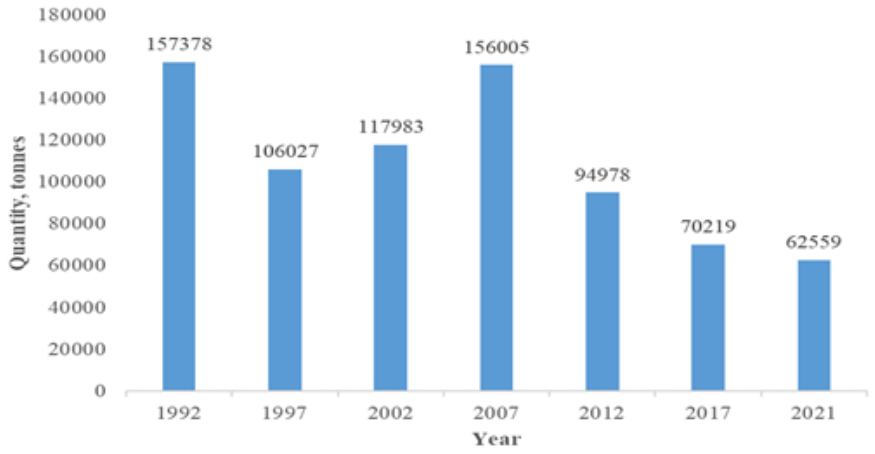

Fig. 1. Total amount of aquaculture production in Latvia 1992-2021, tonnes

Global food supply and per capita consumption of fish continued to increase faster than human population growth. Globaly, aquaculture provides over 50% of fish for human consumption. From 2000-2022 total

aquaculture production grew at annual growth rate of 5.6% (FAO,2023), but in Latvia during this time period aquaculture production has decreased by 60%. If Latvia is compared with Europe, then In Europe aquaculture production have recently increased by 24% and aquaculture producers have mainly focused on four spacies – mussels, salmon, trout and oysters, but in Latvia similar to European countries salmon and trout are grown, but oysters and mussels are not farmed yet. Global trends point to the growth of aquaculture - aquaculture production is rising, and as techniques are further refined and varied, aquaculture operations are predicted to grow rapidly in the near future. The authors conclude that necessity for a sustainable food supply is a pressing factor driving aquaculture development, together with the need to generate profit and income.

Regulatory acts regulating the aquaculture industry

The main policy document for monitoring aquaculture in Latvia is the Fisheries action program, which also includes the rules of the European Maritime Fisheries Development Fund. Development of the aquaculture sector is supported by the Latvian Ministry of Agriculture with the Action Programme for Development of Fisheries (2021-2027). This medium-term plan shows that the aquaculture sector has the potential to become a very productive, competitive and environmentally friendly sector of the national economy (Ministry of Agriculture, 2022a). In order to successfully develop the aquaculture sector in Latvia, it is necessary to carry out research in various directions, from growing to research on the environmental and economic aspects of aquaculture. Today, the aquaculture industry is facing growing environmental challenges and support is needed to develop a sustainable governance approach.
There is no aquaculture licensing procedure in Latvia. In order to ensure the monitoring of production processes of products to be marketed in accordance with veterinary and food safety requirements, an aquaculture establishment must obtain the recognition of the Food Veterinary Service. Commencement of aquaculture production in Latvia must also receive a permit from the State environmental Service for polluting activities. Administrative procedures and supervision of aquaculture activities in Latvia comply with the requirements of food market circulation and environmental protection, they are sufficiently simple and transparent.

Activities of aquaculture activities shall be subject to the same laws and norms of separate regulations which apply to fisheries, as well as to the requirements of several regulatory enactments regulating other fields of production. Aquaculture legislation in Latvia can be divided into 2 parts - European Union regulations and National laws, regulations of the Cabinet of Ministers. The Basic Law of the Fisheries sector - the Fisheries Law (regulates the main principles for the administration of fish resources, including the management of fish resources in inland waters(Fishery Law..,1995). Although aquaculture is not defined separately in this Law, the Law refers to the general conditions for fish farming in natural bodies of water, requirements for the supplementation of fish stocks and introduction of new fish species. As a general rule, aquaculture establishments are governed by food and veterinary legislation.
Regulation No 2018/848 provides that the conditions under which aquaculture animals are kept must be appropriate to the specific needs of the species concerned, thus providing sufficient space for the animals to feel well, providing aquaculture animals with good quality water and sufficient oxygen, temperature and lighting, and providing the basis of the container as close as possible to the natural conditions (European Commision, 2023).

Regulation No 889/2008 provides that disease prevention must be based on keeping animals under the best conditions, choosing the appropriate location, developing the best farm facilities, applying good animal husbandry and husbandry practices, regular cleaning and disinfection of premises using high quality feed, maintaining an appropriate stocking density, breed and type selection. Diseases should be treated immediately to avoid suffering in animals. If necessary, chemically synthesised allopathic veterinary medicinal products, including antibiotics, may be used under strict conditions if the use of phytotherapeutic, homeopathic and other agents is inappropriate. It is important to set limits on treatment courses and withdrawal periods. The withdrawal period should be twice the withdrawal period for the medicinal product or 48 hours if this period is not specified. Immunological veterinary medicinal products may be used. Veterinary treatment relating to the protection of human and animal health, which is compulsory under Community legislation, is also authorised(European Commision, 2023).
Regulation 2016/429 lays down animal health requirements (for the placing on the market, import and transit of aquaculture animals and their products), minimum preventive measures on diseases in aquaculture animals and their preparedness to fight them, as well as minimum control measures to be applied in the event of suspicion or outbreaks of certain diseases in aquatic animals. According to the Directive, the placing on the market of aquaculture animals is subject to animal health certification (European Commision, 2023).
On-farm staff must possess the necessary basic knowledge and skills relating to animal health and welfare. Farms should ensure aquaculture practices (including catering, appropriate infrastructure and equipment, density of animals in a given area and water quality) with strict respect for animal development, physiological and ethological needs. Aquaculture techniques should be implemented to minimise the negative environmental impact of the holding(European Commision, 2023). Authors suggested that the regulatory acts whichs

regulates the aquaculture industry elucidate all rules in aquaculture industry, however, the regulatory acts of the aquaculture sector are not completed and it is worth supplementing the policies and laws that would promote the development of aquaculture.

The main indicators characterizing the aquaculture sector

Available in the territory of Latvia surface and groundwater shall be sufficient to enable aquaculture activities to be carried out and its further development. The total length of the Latvian seashore line is almost 500 km, and the state territorial waters up to 12 nautical miles from the coastline are under jurisdiction. However marine aquaculture is not yet practiced in Latvia, but in Latvia aquaculture fish are grown in freshwater ponds and recirculation systems. More and more entrepreneurs in Latvia choose fisheries as an economic sector, growing carp and other fish in a pond, thus demonstrating that fish farming is a growing and profitable sector. Freshwater pond aquaculture is often characterised as a low input system, with low labour and capital input, serving mainly local markets (Adamek et.al.2019).

Aquaculture is a relatively small industry in many countries of the world, but as indicated Gutierrez et.al. (2020), both in terms of number of enterprises, number of employees and net turnover, but there is a noticeable increase in the indicators characterising it. Also today, ponds are the main aquaculture enterprises in Latvia, although initially aquaculture was only an additional source of earnings, only 10% of aquaculture enterprises produce fish in pools or recirculation systems. Carp is the most farmed fish in aquaculture enterprises, but their share tends to decline. Pike, sturgeon, trout and sami are also grown. In total, 80% of aquaculture production is sold directly fresh. It can be seen that total production and sales are also increasing. It amounted to EUR 2.39 million in 2022 (Ministry of Agriculture, Fisheries 2023). Fisheries in Latvia, 2022). In recent years, the number of economically active aquaculture enterprises in Latvia has decreased by 22% between 2015 and 2020.

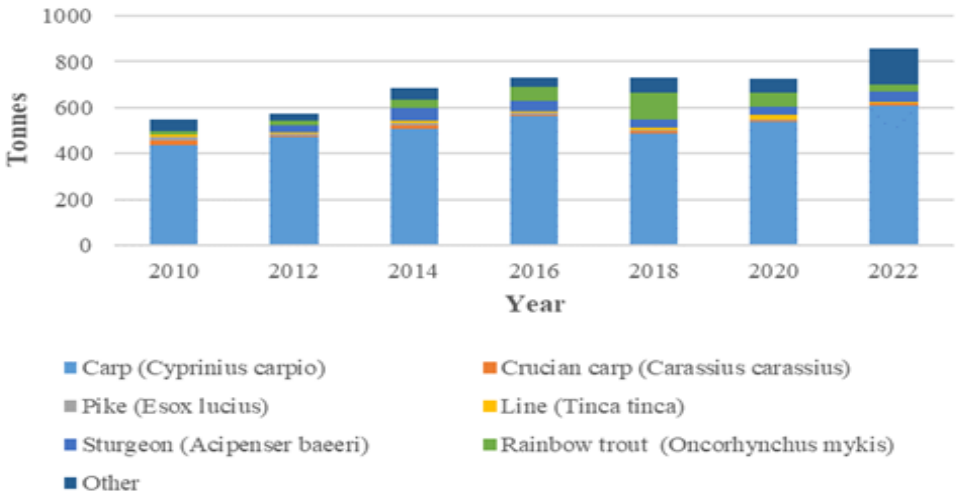

Fig. 2. Sold fish and crustceans in aquaculture in Latvia 2010-2022, tonnes

The authors opinion is advanced that the biggest problems for the development of aquaculture in the country are the shortage of high-level specialists. The specific professional skills required in the aquaculture sector can only be acquired at the lowest level in Latvia. However, a significant contribution to the field of aquaculture research and education is provided by BIOR fish farm Tome of the state institute with its five branches, which implements the program of reproduction of fish resources in state waters. Aquaculture producers are unable to ensure a sufficiently stable volume for the permanent production of aquaculture products, therefore further industrial processing of fish from aquaculture has not developed widely in Latvia. The productivity of the aquaculture sector is only EUR 6300 per worker, which is 5-6 times lower than in the fishing and fish processing sectors (FAO,2023). However, the development of aquaculture in Latvia has a perspective.

In 2022, there were 69 aquaculture enterprises in Latvia employing 310 employees, which had the right to farm fish for their consumption and to grow juvenile fish for the reproduction of resources, which was also ensured by the fish farm “Tome” of the Scientific Institute of Food Safety, animal Health and Environment with its five branches (Ministry of Agriculture, Fisheries 2022b). The main activity of the State fish farm and its branches is the reproduction and supplementation of fish resources of natural water bodies. The network of locations of aquaculture enterprises in Latvia is not directly related to the availability of freshwater resources, but reflects traditions and socio-economic interests of landowners to engage in this field of activity. In Latvia 667 ponds with a total area of 5582.9 ha were used to produce aquaculture production (Ministry of Agriculture, Fisheries 2022b). As shown in the table 2, the number of ponds has decreased by 7.5% since 2014, while the area of ponds has increased by 7.1% by 2022.

Between 2008 and 2022, the average annual volume of total marketed aquaculture production varies around 689 tonnes. The most significant increase in the volume of marketed production was observed in 2021, when

it reached 902 tonnes, but the least developed production was sold in 2009 – 517 tonnes (Ministry of Agriculture, Fisheries 2022b). Although aquaculture production varies year after year, since 2008 there has been a gradual increase in total marketed aquaculture production. The total market value of Latvian aquaculture production, taking into account changes in markets, was 3.3 million EUR in 2022(Ministry of Agriculture, Fisheries 2023). In 2022, a total of 15.6 thousand pieces of fish and crustaceans were raised, of which 98% were raised for the restoration of natural water resources, and 2% for aquaculture (OSP,2022). It would be important to promote the development of aquaculture in Latvia, increase production, the cultivation of new fish species and to preserve the existing ones, as well as to create new jobs in aquaculture.

Conclusions, proposals, recommendations

1)Latvia has sufficient water resources – internal and underground waters as well as aquaculture activities of the marine and land area for provisioning. This is also reflected in the increase in fish farming in basins and recirculation systems. The aim of the research was achieved - the history of aquaculture in Latvia was examined, the legal framework for aquaculture in Latvia was examined, as well as the main indicators characterising the Latvian aquaculture sector were analysed.
2) Between 1992 and 2021, the volume of aquaculture production in Latvia has decreased by 60%. The necessity for a sustainable food supply is a pressing factor driving aquaculture development, together with the need to generate profit and income.
3)An effective management system has been established for the management of aquaculture in Latvia (Ministry of Agriculture, PVD, BIOR, LAD and Public organisations for fish and crayfish breeders), which is regulated and there would be no basis for building additional or new administrative burden. Development of the aquaculture sector is supported by the Latvian Ministry of Agriculture with the Action Programme for Development of Fisheries (2021-2027). This medium-term plan shows the aquaculture sector has the potential become it a very productive, competitive and Environmentally friendly sector of the national economy.
4)The network of locations of aquaculture enterprises in Latvia is not directly related to the availability of freshwater resources, but reflects traditions and socio-economic interests of landowners to engage in this field of activity. In recent years, the number of economically Verdegem active aquaculture enterprises in Latvia has decreased by 22% between 2015 and 2020.
5)Carp is the most farmed fish in aquaculture enterprises, but their share tends to decline. Pike, sturgeon, trout and catfish are also grown. In 2022, a total of 15.6 thousand pieces of fish and crustaceans were raised, of which 98% were raised for the restoration of natural water resources, and 2% for aquaculture.
6)In total, 80% of aquaculture production is sold directly fresh. It can be seen that total production and sales are also increasing. It amounted to EUR 2.39 million in 2022. The most significant increase in the volume of marketed production was observed in 2021, when it reached 902 tonnes. In Latvia 69 aquaculture enterprises employing 310 employees in 2022.
further research should be conducted to understand the benefits of banking consolidation and outstanding benefit to the banking industry.

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