

## SECTION I. ECONOMIC THEORY, MACRO- AND REGIONAL ECONOMY

DOI 10.36074/logos-18.08.2023.01

### IMPLEMENTING RECIRCULATION SYSTEMS IN UKRAINIAN AQUACULTURE: INTERSECTORAL ECONOMIC MEASURES AND PROPOSALS

ORCID ID: 0000-0003-4864-6129

Hanna Tiutiunnyk

PhD in Economics of nature use and environmental protection, Researcher,  
Scientific secretary of the Department of Economic&Ecological  
Development of the SeaSide Regions  
*SO «Institute of Market and Economic&Ecological Research NAS of Ukraine»*

ORCID ID: 0000-0002-9815-3464

Olga Iermakova

Doctor of Economics, Professor, Head of the of the Department of  
Economic&Ecological Development of the SeaSide Regions  
*SO «Institute of Market and Economic&Ecological Research NAS of Ukraine»*

UKRAINE

Water recirculation systems in aquaculture, also known as RAS (Recirculating Aquaculture Systems), represent a new alternative to traditional fish farming methods with several important advantages. These human-controlled systems provide efficient water conservation, fish health preservation, and increased productivity.

Recirculating aquaculture systems consist of devices that allow aquaculture farms to create an artificial environment with controlled parameters, such as water temperature and flow rate. This enables the cultivation of a wide range of fish species, including exotic, valuable, and rare ones that require specific living conditions. Additionally, these systems contribute to environmental conservation, disease risk reduction, and the growth of aquatic organisms.

Recirculating aquaculture systems are the most capital and resource-intensive, but also the most productive forms of aquaculture. Regulating the parameters of these systems allows for the production of aquaculture products on both small and industrial scales, promoting the development of an ecologically sustainable approach to aquaculture through high-tech methods. Recirculating aquaculture systems are a promising direction for the development of industrial aquaculture, which can increase aquaculture production and reduce ecological risks. Moreover, they are economically advantageous as they allow for efficient resource utilization. Recirculating aquaculture systems are also widely used for reproduction and cultivation of fish fry, which are then used for commercial cultivation in hatcheries. They are an essential component of the fish farming chain in aquaculture in many countries around the world.

One way to improve the situation in the aquaculture sector is the implementation of recirculating systems. In addition, it is important to create favorable conditions for financing aquaculture enterprises and introduce preferential tax conditions. It is also advisable to involve scientists in the production processes to update the material and technical base, restore water bodies, and hydro-technical structures.

State support for the development of the aquaculture sector may include partial compensation for the construction and reconstruction costs of aqua and mariculture farms, the construction of pond lines or closed recirculating systems for fish farming. Changes to the Law of Ukraine "On State Support of Agriculture in Ukraine" are also necessary to include aquaculture and mariculture in the list of types of production eligible for budgetary subsidies.

The introduction of a certificate of origin for aquaculture products and a certificate of land plot for recirculating systems is an important step in improving the market for aqua and mariculture. These certificates can significantly reduce illegal aquaculture products on the market, protecting the interests of legitimate producers.

The certificate of origin for aquaculture products provides information about the conditions of fish or other aquaculture species cultivation and processing. This allows consumers to verify the legality of the catch and compliance with quality standards. The greater transparency of the market provided by the certificate of origin promotes competition among producers and contributes to the use of safe-to-consume products (Fig. 1).

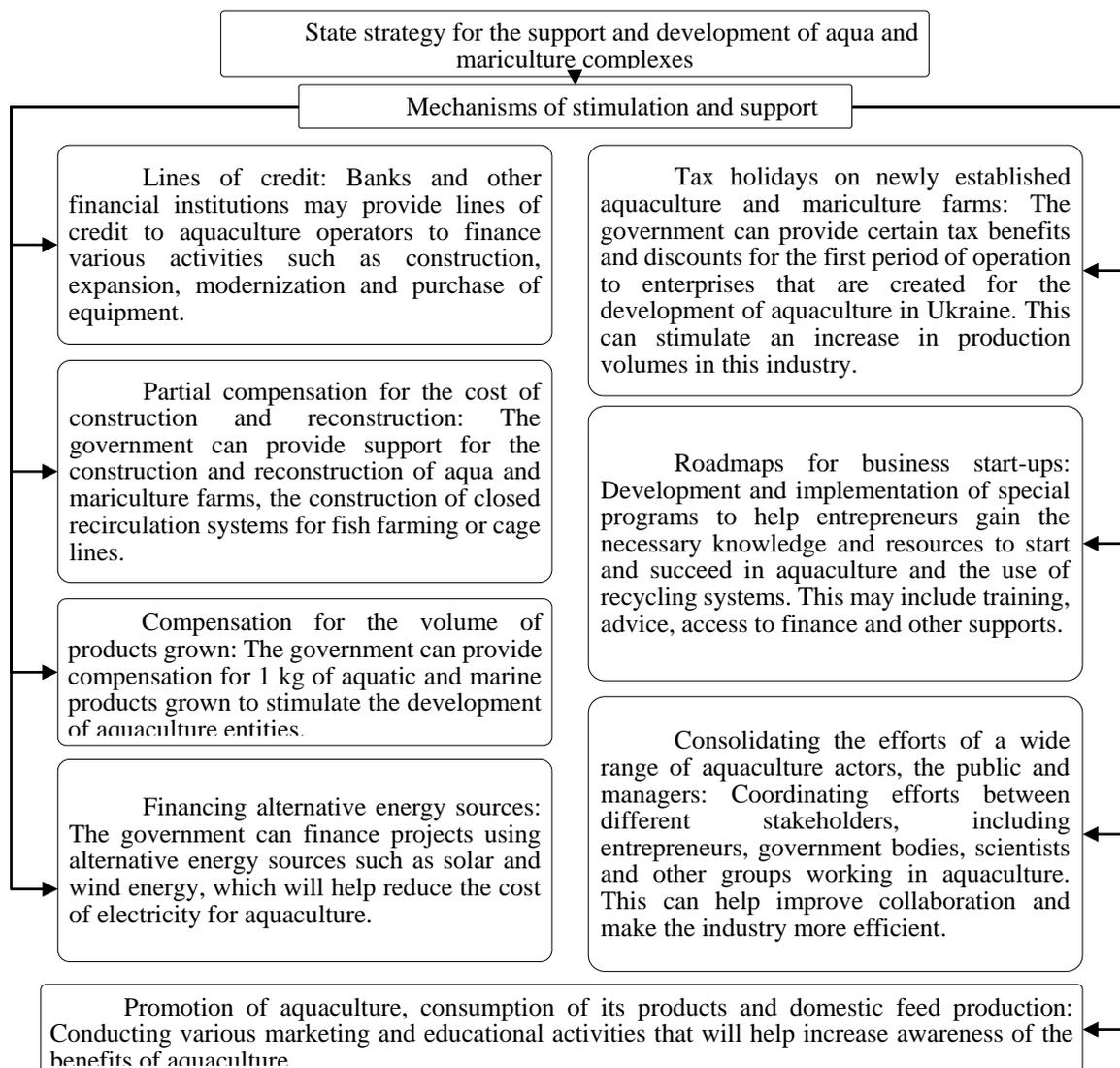


Fig. 1. **Proposals and measures to support the aquaculture industry in Ukraine**  
 Source: compiled using [3, 4].

In general, the implementation of origin certificates for aquaculture products and land plots for recirculating systems improves the market of aquaculture and mariculture. They ensure control over product quality, reduce the amount of illegal aquaculture, and promote transparency and market competitiveness. Such certificates are important tools for protecting the interests of consumers and legitimate producers in this industry [1, 2]. One of the key steps to achieving success in aquaculture is the development of cooperatives, associations of aquaculture producers, and smart aquaculture clusters. This process aims to achieve the following main objectives.

The first objective is to create a foundation for the reorganization of aquaculture, which was previously a labor-intensive industry, into a modern, technological industry through advanced technologies such as information and communication technologies and artificial intelligence. This will contribute to improving the productivity and competitiveness of aquaculture.

The second objective is to promote digital growth through the use of a shared information system and the popularization of smart farming productivity. This opens up new opportunities for optimizing processes in aquaculture and improving their management.

The third objective involves creating a synergy effect through the integration of related objects, such as research and development of smart farming technologies, education, production capacities, seeds, feed, veterinary preparations, as well as distribution and sales facilities. This will contribute to the creation of an efficient production and distribution chain for aquaculture products.

The fourth objective involves improving the logistical infrastructure, including refrigeration chambers, processing, and direct marketing. In addition, the exchange of information and knowledge is important for improving the quality and efficiency of aquaculture production.

To achieve these objectives in aquaculture, it is necessary to make smart investments in the field of innovation and knowledge transfer. Specific directions for such investments include the development of technical, scientific, or organizational knowledge in aquaculture companies, the cultivation of new breeds with high market potential, the creation of new or improved products, processes, or management and organization systems, as well as the verification of the technical and economic feasibility of innovations, products, or processes.

Support for scientific research in the field of aquaculture is also important, including the creation of networks for knowledge transfer in applied research. Financial support and cooperation with research institutes can significantly contribute to the development of innovations and their practical application in aquaculture.

Aquaculture faces a range of issues such as an aging workforce and production inefficiency. However, the use of information technology and the concept of "smart" production in intelligent aquaculture farms can improve the quality and efficiency of aquaculture production. These farms employ digital and intelligent technologies to address problems such as labor shortage, water pollution, high risk, and low efficiency. They simplify work processes for the older generation and attract young people to agriculture.

Smart aquaculture utilizes advanced technologies such as robotics, big data, Internet of Things, artificial intelligence, 5th generation Internet, 3D printing, cloud computing, and remote control to ensure the efficiency of aquaculture and high production yield per unit area. Deep-sea marine farming and multitrophic ecological agriculture are important aspects of aquaculture that require the use of information

and communication technologies for their implementation. Multitrophic ecological agriculture is an effective solution for aquaculture as it efficiently utilizes three-dimensional space, creating a healthy ecosystem with diverse aquaculture species, aquatic plants, microorganisms, and aquaculture environment.

To overcome the problems in aquaculture, the implementation of innovative feed sources is necessary. Combining recirculating systems with the cultivation of algae, vegetables, and plants is an important step in creating efficient and environmentally friendly food production systems. Such systems promote species adaptation to environmental changes and ensure stable production of vegetables and fish throughout the year. Aquaponics, which combines plant cultivation with fish farming, is an innovative solution for efficient and environmentally friendly food production. Integrating aquaponics into agriculture and aquaculture promotes sustainable development in rural areas and reduces dependence on food imports. It can also serve as a platform for teaching students about complex systems and management, contributing to the development of STEM education.

---

### References:

- [1] Tiutiunnik, H. O., & Kupinets, L. Ye. (2020). Concentration of environmentally safe agricultural land: economic and organizational support. Monograph. Institute of Market Problems and Economic and Environmental Research, National Academy of Sciences of Ukraine. <https://doi.org/10.31520/978-966-02-9298-7>
  - [2] Tiutiunnyk, H. Institutional Ensuring of Mariculture: International and Ukrainian Context. *Economics. Ecology. Socium* 2022, 6, 1-20. <https://doi.org/10.31520/2616-7107/2022.6.2-1>
  - [3] Jeong, H., Heo, T. W., & Lee, I. W. (2021). Domestic Smart Aqua-farming Technology. *Electronics and Telecommunications Trends*, 36(5), 62-73. <http://dx.doi.org/10.22648/ETRI.2021.J.360507>
  - [4] Office of Effective Regulation. (2020). *Analysis of the fish industry in Ukraine*. Green Book. Kyiv.
  - [5] Ushkalov, V. (2023). Discussion of the state and prospects of recirculating aquaculture at the Ukrainian Laboratory of Quality and Safety of Agricultural Products. National University of Life and Environmental Sciences of Ukraine. <https://nubip.edu.ua/node/64020>
-