СТАН ТА ПЕРСПЕКТИВИ РОЗВИТКУ ОРГАНІЧНОГО СЕКТОРУ АКВАКУЛЬТУРИ В УКРАЇНІ

Актуальність. Розвиток органічного виробництва риби та інших водних організмів в світі розглядається як складова Стратегії біорізноманіття ЄС до 2030 року, Стратегії «Від ферми до видалки» разом та Плану дій ЄС щодо органічного виробництва, які прийняті в ЄС. Основна задача цього сектору не тільки продовольча, а й природоохоронна, оскільки вона передбачає мінімізацію забруднення водного середовища, контролює технологічні процеси на протязі всього продовольчого ланцюга, забезпечує сталість агропродовольчої системи.

Мета та завдання. Враховуючи означені стратегічні напрями в роботі поставлено наступні завдання: дослідити світові стратегічні ініціативи щодо сталого розвитку аквакультури; оцінити стан національного законодавчого забезпечення органічного виробництва; визначити регламенти виробництва органічної аквакультури; проаналізувати пріоритети розвитку аквакультури та стан виробництва органічної аквакультури в світі; надати рекомендації щодо розвитку органічної аквакультури в Україні.

Матеріали та методи. Оцінка стану та тенденцій в секторі органічної аквакультури, стратегічних документів та пріоритетів її розвитку у світі здійснена з використанням методів логічного аналізу. Узагальнення та співставлення даних про перспективи розвитку органічного сектору аквакультури в Україні, а також формування рекомендацій щодо розвитку органічної аквакультури в Україні в контексті світових стратегічних орієнтирів та практик здійснено з використанням методів статистичного аналізу.

Результати. В роботі досліджено стан, тенденції в секторі органічної аквакультури, стратегічні документи та пріоритети її розвитку у світі, і як результат, в контексті сучасних вимог до органічної аквакультури, визначено баць в даному секторі органічної аквакультури в Україні.

Висновки. Задача держави не тільки започаткувати, але й створювати умови для розвитку будь-яких напрямків. Порівняння національних законодавчих ініціатив та світових наприкінці сьогодення органічної аквакультури свідчить про стагнацію цього напряму. Перші кроки зроблено, але цього недостатньо для використання природно-ресурсного потенціалу, який мають регіони Українського Причорномор'я і, зокрема, Одеська область.

Ключові слова: органічна аквакультура, аквакультурна ферма, водна екосистема, товарообробник, агропродовольчо-ресурсна система.
STATE AND PROSPECTS OF ORGANIC AQUACULTURE SECTOR DEVELOPMENT IN UKRAINE

**Topicality.** The development of organic production of fish and other aquatic organisms in the world is considered as a component of the EU Biodiversity Strategy until 2030, the Farm to Fork Strategy together and the EU Action Plan on organic production, which are adopted in the EU. The main task of this sector is not only food, but also environmental protection, as it involves minimizing pollution of the aquatic environment, controls technological processes along the entire food chain, and ensures the sustainability of the agro-food system.

**Aim and tasks.** Taking into account the specified strategic directions, the following tasks are set in the work: to investigate global strategic initiatives regarding the sustainable development of aquaculture; assess the state of national legislative support for organic production; determine regulations for organic aquaculture production; to analyze the priorities of aquaculture development and the state of organic aquaculture production in the world; provide recommendations for the development of organic aquaculture in Ukraine.

**Materials and Methods.** The assessment of the state and trends in the sector of organic aquaculture, strategic documents and priorities of its development in the world was carried out using methods of logical analysis. The generalization and comparison of data on the prospects for the development of the organic aquaculture sector in Ukraine, as well as the formation of recommendations for the development of organic aquaculture in Ukraine in the context of global strategic guidelines and practices, was carried out using methods of statistical analysis.

**Research results.** The work examines the state, trends in the organic aquaculture sector, strategic documents and priorities for its development in the world, and as a result, in the context of modern requirements for organic aquaculture, barriers and prospects for the development of the organic aquaculture sector in Ukraine are determined.

**Conclusion.** The task of the state is not only to initiate, but also to create conditions for the development of any directions. A comparison of national legislative initiatives and world developments in the field of organic aquaculture shows the stagnation of this direction. The first steps have been taken, but this is not enough to use the natural resource potential of the Ukrainian Black Sea regions and, in particular, the Odessa region.

**Keywords:** organic aquaculture, aquaculture farm, aquatic ecosystem, commodity producer, agri-food system.

Problem statement and its connection with important scientific and practical tasks. The development of industrial aquaculture is considered from two positions: as a sector that provides a guaranteed volume of products with high nutritional value and as a source of impact on the surrounding water environment, especially on coastal water areas. The very fact of growing hydrobionts in a limited space already causes a local increase in the load on the ecosystem. At the same time, the situation of a decrease in the number of certain types of water resources in the natural environment and the impossibility of their industrial production can be corrected exclusively through commercial reproduction only under the conditions of aquaculture.

At the same time, the degree of anthropogenic influence of aquaculture facilities the ecological state of water bodies is determined by the features of the water body itself, namely the self-cleaning capacity of the reservoir, which is a function dependent on many factors - the intensity of circulation of water masses, wave mixing, the presence of temperature and ice conditions, the degree of salinity. And it is these and other hydrochemical indicators of water quality that determine the degree of suitability of a reservoir for growing one or another species. A change in these conditions worsens both the state of the reservoir and the state of natural and cultivated hydrobionts. All this determines not only the choice of the object, but also the need for constant monitoring (on average twice a year to determine hydrochemical parameters) of the industrial environment for aquaculture purposes. But the change in bottom sediments remains unobserved.

Scientific research in this area has made it possible to develop a single European standard, which should be guided by fishing activities. These standards are based on the principles of Modeling - Ongrowing fish farm - Monitoring (MOM). It is this standard that determines the list of species suitable for growing hydrobionts, which are tolerant to variations in water quality indicators and, at the same time, the suitability of the reservoir for industrial use. Therefore, monitoring data are mandatory for commodity farms. But the problem - in determining the small list of the most informative, not high in cost, indicators during the intensive cultivation of various types of aquatic organisms, which can be controlled by the producer, remains relevant.

Analysis of recent publications on the problem. Theoretical and legislative aspects of organic aquaculture in Ukraine were considered in their works by Makhyboroda K.V., Gafurova O.V.,...
Nakonechna K.V., Dyudyeva O.A. etc. The analysis of prospects for the development of the organic aquaculture sector in Ukraine was carried out by such scientists as D. V. Fedchyshyn and I. V. Ignatenko.

Despite the contribution of scientists to the development of these areas, the question of the real state and prospects for the development of the organic sector of aquaculture in Ukraine is open.

**Allocation of previously unsolved parts of the general problem.** The novelty of the research lies in strategic assessment of the development of the aquaculture sector in Ukraine, based on the analysis of national opportunities regarding the feasibility of organic production, the availability of conditions, infrastructure support and demand.

**Formulation of research objectives (problem statement).** In this work the essence, directions and mechanisms are determined responsible development of aquaculture at the national and regional levels, in the direction of supporting aquatic ecosystems and introducing sustainable aquaculture practices in Ukraine.

**Materials and Methods.** The assessment of the state and trends in the sector of organic aquaculture, strategic documents and priorities of its development in the world was carried out using methods of logical analysis. The generalization and comparison of data on the prospects for the development of the organic aquaculture sector in Ukraine, as well as the formation of recommendations for the development of organic aquaculture in Ukraine in the context of global strategic guidelines and practices, was carried out using methods of statistical analysis.

**An outline of the main results and their justification.** The organic aquaculture sector is young compared to organic agriculture. Worldwide, aquaculture covers 18.8 million hectares of land, but only 209,900 hectares of aquaculture farms have been certified organic. Meanwhile, this direction is considered niche in the international market of organic products.

The first organic fish was certified in 1995, when the first Naturland standard appeared. Natureland standards apply to a whole line of products, including aquaculture and sustainable commercial fishing. According to the Association of Organic Agriculture, "Natureland" functions as a private certifier and certifies the entire value chain for any product produced according to the organic scheme. The association develops recommendations for organic aquaculture and implements pilot projects in Germany and other countries around the world. It is quite difficult to acquire the status of an organic farm. Even closed water supply systems, which meet the principles of sustainability and do not allow harmful substances to enter the environment, cannot receive the status of an organic farm in EU countries from the point of view of biocertification.

IFOAM approved a version of its standard for organic aquaculture and carried out regulation during 2007-2010. At the same time, there are more than 80 standards for various types of organic aquaculture, developed in different countries of the world. Organic farms in developing countries must meet the standards of the countries where they intend to sell their products. EU countries are such a market for Ukraine. Therefore, it is necessary to focus on European legislation and adapt the national legal framework in accordance with its requirements.

The European Union has established certain requirements for the organization of the cultivation of hydrobionts, which can be labeled as "organic products" and, accordingly, have quotas for import into EU countries and for setting the price. Such requirements are dictated by significant misuse of the terms "ecological" and "organic" by manufacturers. That is, there are restrictions and requirements for aquaculture enterprises that want to have such labeling on their products.

There is no unified legislation in the field of organic aquaculture. The dynamics of changes in European legislation are presented in Table 3.

According to the rules of the Commonwealth (clauses 28, 33), established by the Regulations, they should contribute to the establishment of a harmonized concept of organic production. Authorized authorities, regulatory bodies and control bodies must refrain from any actions that could cause obstacles to the free movement of relevant products that have been certified by a control body or control body of another participating country. In particular, they should not require passing additional control. Organic products imported into the European Community can be sold and bought on the Community market as organic if they have been produced in accordance with the production rules and subject to a control system that complies with the rules and systems set out in Community legislation or are equivalent. In addition, products

The requirements of the new European regulation are used as basic (international) requirements. The basic requirements will be the requirements of Regulation (EC) No. 2018/848 dated November 11, 2020. The previous Regulation (EC) No. 834/2007 should be extended until 31.12.2024, to allow certification bodies time to overcome the impact of the COVID-19
pandemic and prepare for the implementation of the provisions established by the new Regulation (EC).

The main provisions of the new Regulation on aquaculture are based on the experience gained during the application of Regulation (EC) 834/2007 and are summarized as follows:

1. determines which products the Regulation applies to. First of all, it should cover agricultural products, including aquaculture. Products falling within the scope of this Regulation, whose source of origin is hunting for wild animals or fishing, are not considered organic, since their production processes cannot be fully controlled (clauses 10, 13);

2. emphasis is placed on the need to develop detailed production rules for aquaculture products, including rules for harvesting wild plants and algae (paragraph 27);

3. in organic production, production methods should be used that prevent or minimize any environmental pollution (clause 31);

4. the regulation reflects the objectives of the new Common Aquaculture Policy, which plays a key role in ensuring sustainable, long-term food security, as well as growth and employment, while reducing the burden on commercial fish stocks, in the context of the growing global demand for aquatic food products (paragraph 47);

5. organic aquaculture is recognized as a relatively new field of organic production, compared to organic agriculture, where there are many years of experience only at the level of individual farms. A further increase in the transition of fish farms to organic production is likely. This will lead to an increase in experience, technical knowledge and development, improve organic aquaculture, which should be reflected in the rules of production (clause 48);

6. organic aquaculture must be based on the rearing of juveniles originating from organic production units. Organic aquaculture animals are not always available for breeding or grazing in sufficient numbers and are not always of sufficient quality to meet the needs of aquaculture operators. The regulation emphasizes that, under certain conditions, it should be possible to introduce aquaculture animals caught in the wild or bred in an inorganic way into organic production units (clause 49);

7. the current principle of equivalence is replaced by the principle of compliance with EU standards. This means that the consumer will receive quality products with the EU logo, regardless of the country of origin. Equivalent standards will be recognized only within the framework of bilateral trade agreements between the EU and other countries (paragraphs 94, 95);

8. since operators producing algae or aquaculture animals in the EU face high costs, a system of group certification is provided for in connection with organic certification in order to reduce certification costs and ensure equal conditions of competition. For this reason, the concept of "group of operators" should be introduced and defined, and rules should be established that reflect the needs and resource capabilities of small farmers and operators (clause 85). Meanwhile, such a group can include only small farms, which must undergo an annual inspection by the certification body (Prokopenko K., Udova L., 2022).

Based on the requirements of European regulations and national rules of organic production and circulation of organic products, it is possible to formulate the main requirements for organic aquaculture (Table 1). Taking into account the specifics of the requirements, it is advisable to divide them into groups reflecting the stages of the technological cycle:

- preventive measures;
- environmental and economic requirements;
- maintenance requirements;
- feeding requirements;
- treatment requirements;
- processing requirements;
- transportation requirements.

The specified requirements to a certain extent inform the producer about the peculiarities of the technologies of artificial cultivation of water bodies according to the organic scheme. But investors' interest in this area did not increase due to lack of experience. Sustainable fish farming develops extremely slowly, in contrast to organic farming, animal husbandry and beekeeping. Currently, only 0.5% of the world's aquaculture fish is organically labeled. Organic fish are sometimes referred to as a dying species.

At the same time, the world's leading companies that develop this line of business achieve competitive advantages due to intellectual property, which allows manufacturers to offer the market high-quality and cheap products. Such experience is accumulated over the years, but it is easily copied. Note that aquaculture products produced using traditional technologies do not always have the proper quality, especially those originating from China or Taiwan.
Table 1

<table>
<thead>
<tr>
<th>Preventive measures</th>
<th>Assessment of the state of the environment and the impact on it at the volume of commercial production of more than 10 tons. The presence of a buffer zone, separate production facilities, a farm management plan. Preventing aquaculture facilities from entering the natural environment. Selection of aquaculture facilities that do not harm natural species.</th>
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<tbody>
<tr>
<td>Environmental and economic requirements</td>
<td>The production of organic aquaculture products is carried out on areas that have not been subject to pollution. Taking into account the local or regional ecological balance when choosing an option for commercial production of fish or non-fish products. Maintenance of biological diversity of natural aquatic and terrestrial ecosystems. Ensuring the use of renewable energy sources and materials subject to secondary processing. Drainage and drainage. Reduction of production cost.</td>
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<tr>
<td>Maintenance</td>
<td>Capacities for the production of organic aquaculture, on which organic and inorganic production are carried out, must be separated. The ability to adapt to being in artificial conditions, or water bodies and fishery technological reservoirs. Cultivation of aquaculture objects originating exclusively from organic breeding stock. Origin of aquaculture facilities with organic brood stock and organic farming. The possibility of polycultural cultivation of various aquaculture objects. Minimizing the risk of physical damage and stress to aquaculture facilities. Arrangement of natural filtration, including biological. Minimizing the impact on the bottom of a natural reservoir. Availability of a waste collection system at aquacultures. Availability of conditions for the normal existence of aquaculture facilities. (space, planting density, oxygen, water quality, lighting, length of daylight, temperature, manual pollution control method). The use of ultraviolet light and ozone is allowed only in incubators and nurseries. Prohibition of the use of GMOs, GMO derivatives or products produced by GM organisms, except for veterinary drugs. Ensuring maximum safety when creating aqua farms for birds and animals in need of protection.</td>
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<tr>
<td>Feeding</td>
<td>Compliance of feeds with the nutritional needs of aquaculture facilities at different stages of development. Adherence to feeding standards regarding the composition and quality of feed, their origin, ratio of feed ration ingredients, feed regime. Use of inorganic feed materials of plant, animal and mineral origin. The use of synthetic fertilizers is incompatible. Complete absence in feed growth activators and synthetic amino acids, hormones and hormonal supplements.</td>
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<tr>
<td>Treatment</td>
<td>Stimulation of natural immune protection. Conducting disease prevention through the selection of appropriate species for artificial cultivation, the location and optimal construction of facilities, compliance with the sanitary condition of facilities and equipment, high-quality fodder ration. Use of only approved drugs (homeopathic solutions, probiotics, immunostimulants, etc.). The use of synthetic fertilizers is incompatible. The use of special schemes of non-homeopathic treatment depending on the period of cultivation of aquaculture objects. The inadmissibility of the suffering of the object of aquaculture, the use of phytotherapeutic and homeopathic, in cases of their impracticality, the use of traditional veterinary drugs, including antibiotics, immunological veterinary medical drugs. Absence of delays in the case of the need for medical measures. Availability of a health management plan for aquaculture facilities (disease prevention, health maintenance of aquaculture facilities).</td>
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<tr>
<td>Processing</td>
<td>A complete ban on the use of ionizing radiation in the processing of organic food products and fodder.</td>
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<tr>
<td>Transportation</td>
<td>Adherence to proper conditions for keeping aquaculture facilities during transportation (quality of tanks, stocking density, water quality).</td>
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Source: compiled by the author using:
https://zakon.rada.gov.ua/laws/show/970-2019-%D0%BF#n633
https://zakon.rada.gov.ua/laws/show/2496-19#Text
https://zakon.rada.gov.ua/laws/show/3677-17#Text
https://zakon.rada.gov.ua/laws/show/5293-17/ed20210302#Text
https://minagro.gov.ua/storage/app/sites/1/uploadedfiles/%D0%9C%D0%A0_%D0%B7%D0%B0%D0%BA%D0%BE%D0%BD%D0%BE%D0%B4%D0%B0%D0%B2%D1%81%D1%82%D0%B2%D0%BE.pdf
Summarizing the list of requirements for organic aquaculture, it can be stated that the most problematic issues for the development of this sector are:

1. national policy on the development of organic aquaculture;
2. technologies (water quality, reproduction of young animals, methods of maintenance, restriction of antibiotic treatment, ban on the use of artificial fertilizers);
3. organic feed (vegetable raw materials of organic agriculture, special requirements for fishmeal (although there is an opinion that the use of fishmeal increases the burden on aquatic ecosystems due to the growth of pelagic fish), prohibition of artificial antioxidants, dyes, hormones, growth stimulants, GMOs), refusal to use waste from poultry farms as feed (it is considered a violation of the food chain, since it is not desirable to feed fish with poultry, and poultry with fish);
4. group certification, which will help reduce costs, including logistics;
5. transportation should exclude stress for animals;
6. processing in accordance with organic principles (restriction of E-additives);
7. social responsibility, which completes a comprehensive approach to the sustainability of aquaculture, includes a set of social measures for people who work and live at the place of work, that is, an organic aqua farm.

But, despite these problems, the organic aquaculture market needs to be further stabilized and developed. The period during which the aqua farm transforms from conventional to organic, passing the transition period, is from six months to a year or more for fish, up to six months for algae. The growing role of aquaculture in the formation of national agro-food systems and the growing impact on the environment testify to the relevance of the organic method of production of aquatic organisms.

Fish, fish products, molluscs and algae are a component of the agro-food system. Therefore, any recommendations regarding the development of aquaculture should be developed taking into account the factors which act as catalysts for the transformation of these systems and the achievement of FAO's global goals. At the same time, catalysts can be considered as the result of overcoming certain barriers, which will create prerequisites for the development of the organic sector in Ukraine.

The FAO Strategic Framework Program for 2022-2031, which aims to promote the implementation of the 2030 Agenda by transitioning to more efficient, inclusive, resilient to external factors and sustainable agro-food systems that ensure improved production, improved food quality (FAO. 2015). As part of the implementation of this framework program, on April 8, 2022, FAO officially announced the signing of a Memorandum of Understanding (MoU) with the Wageningen University and Research Center (WUR) in the Netherlands, aimed at the development and exchange of knowledge and the use of scientific knowledge, technology and innovation to transform agri-food systems On 8 April, FAO officially announced the signing of a new Memorandum of Understanding (MoU) with the Wageningen University and Research Center (WUR) in the Netherlands.

The new Agreement defines 8 areas of cooperation: improving the economy of the agro-food sector; sustainable animal husbandry and health; impact of climate change, biodiversity and environment; sustainable fisheries and aquaculture; improving food security and nutrition; strengthening agro-food systems and food safety; sustainable forestry; strengthening partnership.

The agreement marks FAO's first ever Science and Innovation Strategy, which will cover all sectors and areas of agri-food systems, from natural resource management to production, consumption, food loss and food waste. This strategy, as noted, will become a tool for the implementation of the Strategic Framework Program of the FAO during the next decade, reinforcing many of the Organization's advanced initiatives: "Hand in hand", "1000 digital villages", "One country - one priority product" and others.

The strategic framework program of the FAO emphasizes the characteristics of agro-food systems and the peculiarities of their functioning, the identification of all challenges that contribute to the launch of transformations of agro-food systems. The following characteristics and actions are the main ones:

1. all components of agro-food systems, primary production, processing, distribution, consumption, utilization, etc., in their interaction with socio-economic and ecological systems, have critically important aspects and weak points, the emergence of which is a manifestation of non-linear development of economic and ecological systems, and the result is the emergence of risks caused by the complex action of uncertainty factors in agro-food systems. Therefore, the task of identifying these factors that have a system-wide impact on agro-food systems, institutions and general management arises;
2. the need to define rules that take into account modern global development trends (climate change, environmental deterioration, conflicts and digitization processes) and flexible and effective institutional mechanisms for regulating the field of aquaculture, as well as general management methods at all stages of the functioning of agro-food systems;

3. the need to increase and use opportunities for consumer awareness of the types, quantity, and safety of consumed fish and fish products through the activation of targeted advertising, as well as the establishment of social responsibility of all subjects of the agro-food system, including consumers;

4. definition, application and management of innovative technologies in the field of aquaculture, including to restore the natural resource base in order to increase the productivity of food production and conduct production processes based on the principles of sustainability;

5. provision of more economically accessible food rations of the population and creation of "personalized" food products for the treatment of diseases for different age categories of the population;

6. determination of the directions of inter-branch coordination, general guidance and compliance with the established rules.

Any national strategic document regarding the development of the organic segment should outline the range of problems and a plan of specific actions (Table 2).

**Table 2**

<table>
<thead>
<tr>
<th>Roadmap for the development of organic aquaculture in Ukraine</th>
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<tbody>
<tr>
<td><strong>Preventive measures</strong></td>
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<tr>
<td><strong>Environmental and economic requirements</strong></td>
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<td><strong>Treatment</strong></td>
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<td><strong>Processing</strong></td>
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<tr>
<td><strong>Certification and marking</strong></td>
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<tr>
<td><strong>Transportation</strong></td>
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Source: compiled by the author

First of all, we note that the transition to organic production is determined by the choice of the producer, because he has no other incentive to produce organic products than his own desire. In Ukraine, there are no strategies for the development of this niche segment of the fish market either at the level of the industry or at the level of the region, not to mention the national level. There are pan-European strategic guidelines for the development of organic aquaculture.

But this niche remains free and therefore attractive. Demand is a dynamic concept, and this fact has been proven by the market of organic agricultural products, so it is not far-sighted on the part of producers to ignore it. This is confirmed by the results of the Eurobarometer survey project (an international project of regular public opinion polls conducted under the auspices of the European Commission), which proved that the population of EU countries is aware of the benefits of organic products and that this indicator has doubled over the past five years. This is much more than knowing the Fairtrade mark - a registered certification mark licensed by Fairtrade International. Products with these trademarks meet the internationally agreed Fairtrade social, environmental and economic standards and indicate that products have been honestly produced and fairly sold, and that the product is fully traceable and kept separate from non-certified products throughout the farm-to-shelf chain.

Therefore, optimistic scenarios of both demand...
and supply will undoubtedly prevail in the future. As practice shows, the share of consumption of organic products remains stable in producing countries. Examples of this are Spain, France and Italy. The number of socially responsible farms that are trying to improve fishing and aquaculture methods is increasing. The seafood market is international. It brings together fishermen and fish farmers, processors, buyers, non-governmental organizations, governments, financial institutions, technology companies to develop a path to large-scale improvements in sustainability. This is the main principle of Seafood Watch - a market program aimed at increasing consumer awareness of ecologically clean seafood and influencing methods of cultivation and processing of artificially grown aquatic organisms. Seafood Watch works with all levels of the seafood supply chain - from small farmers to large producers, governments and buyers of seafood, taking into account the characteristics of individual industries and regions. And this significantly increased the consumption of seafood and prompted producers to improve farming methods in order to enter world markets.

But, despite all the initiatives from both commodity producers and leading organic aquaculture producer countries, there remain certain barriers related to legislative changes and standards, which have an extremely high level of restrictions that are almost impossible to fulfill.

At the same time, standards in fish farming have their own specificity and differences from the field of animal husbandry, and they must necessarily complement the principles of responsible fishing, be the so-called insurance against poor quality products reaching consumers.

Within the specified directions, we will consider a set of proposals and project proposals of legislative initiatives (Table 3). The following list of proposals is based on the strategic orientations defined in European documents and regulations, as well as the National Economic Strategy for the period until 2030, approved by Resolution No. 179 of the Cabinet of Ministers of Ukraine dated March 3, 2021. As you know, in Ukraine there is no Strategy for the development of the fishery complex, and there is no planning for this area. But within the framework of the Economic Strategy, directions for the development of organic aquaculture have been determined. Not all of the above measures are equal in complexity and time of implementation, but they reflect the future vision of the creation and functioning of the organic aquaculture sector at the national and regional levels and can be considered as components of relevant programs.

Along with this, it is advisable to determine the priority of measures, that is, to follow the scheme: "Creating conditions and sectors that support the development of fishing - Establishing sales - Waiting for the appearance of organic aquaculture - Motivating producers - creating economic conditions for their encouragement."

### Table 3

**Recommendations for the development of organic aquaculture in Ukraine in the context of global strategic guidelines and practices**

<table>
<thead>
<tr>
<th>Condition is a problem</th>
<th>Proposals and project directions of legislative initiatives</th>
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<tr>
<td><strong>INITIAL (ORGANIZATIONAL) MEASURES</strong></td>
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<tr>
<td>Determination of the species structure of molluscs, fish and algae that meet the conditions of the region and infrastructural provision of fish farming and other aquatic organisms.</td>
<td>1. Targeting herbivorous, not frugivorous, fish that require high-protein concentrated feeds (trout and salmon)</td>
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<td></td>
<td>2. Joining the AquaGRIS system - the global information system of the FAO in order to obtain information on the exploitation of cultivated species of aquatic organisms in the long term, which will allow to systematize work in the directions of the Global action plan in the field of water genetic resources, namely:</td>
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<td>- population accounting;</td>
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<td>- sustainable use of cultivated species and their wild relatives;</td>
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<td>- genetic improvement of species used for artificial cultivation;</td>
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<td>- creation of the management potential of these processes (FAO, 2019; FAO, 2021).</td>
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<td>3. The development of artificial cultivation of algae and molluscs (including in the marine environment), which, unlike fish farms, require much smaller investments in equipment and exclude feed costs (Lovatelli, A., Aguilar-Manjarrez, J. &amp; Soto, D., eds., 2013).</td>
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</table>
Certification of reservoirs that can be used to create aqua farms. As you know, aqua farms are a potential polluter of water bodies, and the technologies used do not contribute to achieving a good state of fresh and sea water, in accordance with the Framework Water Directive and the EU Marine Directive. This is mainly due to diffuse pollution with nutrients (nitrogen and phosphorus) and pesticides, water intake for irrigation and water drainage.

1. Passportization of reservoirs leased to commercial aquaculture producers, including organic with the provision of information regarding hydrochemical and hydrological state of the water body, possibilities of economic use, determination of the place and volume of cultivation, fisheries measures to ensure the ecological safety of the reservoir (Ministry of Ecology and Natural Resources of Ukraine, 2013).

2. Increase in interest water area suitable for organic production

Introduction of mandatory standardization and certification of aquaculture products by analogy with plant and animal products, because cultivation technologies must ensure the safety of consumption of such products and the safety of the environment. There has been talk of introducing fish certification since 2015, which would allow determining the origin of the fish, rather than the conditions of its cultivation. But this direction has not been implemented. At the same time, certification agencies already exist and operate in the EU, which conduct independent examinations on the compliance of fish farms with the principles of sustainable development, such as: Aquaculture Stewardship Council, Naturland, Food Alliance, Friends of the Sea, Global Aquaculture Alliance Best Aquaculture Practices.

Currently, the presence of significant technological differences in the cultivation of fins from molluscs is noted, which requires significant investments that are not compensated by the price of commercial products.

1. Simplification of the requirements of the fish farming standard

2. Search for cost optimization options

3. Growing fish simultaneously using organic and traditional technologies, in order to compensate for the losses of organic production, subject to the order of distribution of costs for products grown using different technologies

4. In relation to molluscs, it should be noted that organic molluscs and non-organic molluscs are grown almost according to the same scheme, therefore the process of their certification can be significantly simplified, and this in turn will become an impetus for the development of the organic sector (Example - Denmark, which certifies all grown molluscs as organic and France, which certifies only a part of the grown volume, which fall under the scheme of the Differentiation Strategy, which consists in the orientation of the producer on the creation of a unique product that is chosen by a sufficient number of consumers. A competitor has an advantage that allows setting a higher price for a product).

5. To introduce a system of measures for the traceability of organic products

6. Introduce a group certification system that will allow farms that meet certain criteria to form groups with other small farms to reduce inspection and certification costs in accordance with Regulation 2018/848 on organic production.

7. Create an organization of organic aquaculture product producers by analogy with the organization of organic land users

Involvement of Ukrainian commodity producers in the European system of organic aquaculture production

Introduction of a new fish trade system that excludes IUU fishing

1. Creation of registers of operators involved in the production, distribution and sale of organic aquaculture products in the EU, which will strengthen their influence on both national and European markets.

1. Introduction of fish auction trade

2. Creation of wholesale fish markets equipped with modern infrastructure

3. Activation of an educational campaign aimed at expanding the consumer market and demand
Continuation of table 3

**MANUFACTURING MEASURES:**

<table>
<thead>
<tr>
<th>Breeding, genetics and stocking</th>
<th>1. Introduction of breeding programs and integration of genetics methods into breeding programs</th>
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<tbody>
<tr>
<td>The organic regulation requires the stocking of the reservoir with &quot;organic&quot; certified young fish, regulation of the stocking density.</td>
<td>2. Development of long-term programs for selective breeding of aquatic organisms</td>
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<td>Types of fins grown in aquaculture are characterized by species diversity and high reproduction capacity, which is the basis for breeding work. But it is precisely in the field of aquaculture that this work lags far behind agriculture, which already uses a large number of genetically improved breeds and varieties.</td>
<td>3. Creation of national selection centers based on the use of the RAS system for incubators and nurseries or facilities for the production of species that are used for the production of organic fodder (possible if there is a demand for juveniles of organic origin). This approach is not prohibited. In addition, it is necessary to clearly define RAS. These systems, despite their ecological advantages, require external energy for their operation, high planting density to achieve efficiency, equipment for wastewater treatment and oxygen production, and the use of UV radiation. Given this specificity and the lack of connection with the external water environment, it is considered that RAS does not meet the principles of organic production, and farms that have chosen this technology are not considered organic.</td>
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<td>The impossibility for farms using recirculation systems for fattening fish to switch to organic aquaculture technologies, as they are prohibited by European Regulations. Yes, by contacting the European Commission in October 2021. The Federation of European Aquaculture Producers (FEAP) reported different interpretations of Regulation (EU) 2018/848 between Member States and certification bodies: the definition of &quot;closed recirculating aquaculture facility&quot; (which is prohibited for cultivation purposes in the EU organic Regulations), the definition of young and the use of certain products in feed. Many types of aquatic organisms are considered vulnerable to invasive organisms (almost a fifth of all vulnerable species are already threatened with extinction in the EU). These risks will continue to grow.</td>
<td>4. Introduction of recirculation systems in spatial development plans, including coastal</td>
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<td>Environmental requirements</td>
<td>5. Introduction of a system of control and legislative support to prevent the penetration and naturalization of alien invasive species in the natural environment with the aim of preserving vulnerable wild species that support the primary state of water bodies.</td>
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<td>Organic aquaculture should prevent the development of such processes as:</td>
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<td>- pollution of technological reservoirs;</td>
<td>1. Digitization of complex monitoring:</td>
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<tr>
<td>- spread of diseases;</td>
<td>- hydrochemical indicators of reservoirs;</td>
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<tr>
<td>- interspecies crossing;</td>
<td>- ichthyopathological;</td>
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<td>- The current trend in the development of aquaculture is the development of systems that, as a result, combine in one technological cycle the cultivation of various aquatic organisms that share the joint use of feed in such a way that one of the species feeds on the remains of feed intended for another species, which significantly reduces the impact on the quality of water and bottom organisms. These are extensive cultivation systems. Another direction is the combination of aquaculture with livestock or poultry farming. Regarding the application of this approach in organic production, the focus should be on finding compatible species that will occupy different niches in the same aquatic ecosystem and provide additional income.</td>
<td>- genetic.</td>
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<tr>
<td>2. Implementation of integrated multitrophic systems of organic aquaculture in order to optimize the use of organic and inorganic feed residues that cause water pollution (reutilization of unused nutrients).</td>
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</table>
Feeding
The development of aquaculture is associated with the use of feed, since the species of aquatic organisms that need them are mainly grown. Feed costs are a significant item of total costs. They are made (mainly fishmeal) from wild pelagic fish, which play a significant role in ensuring food security. Provided further growth of the aquaculture sector, including organic, the need for feed will increase, which makes further use of fish impossible and actualizes the search for new feed sources. Therefore, organic feed is both a requirement and a barrier, since it is a requirement of the standard, but there is no actual production at all, especially for all age groups of fish and other aquatic organisms.

1. Development of innovative types of nutritious and cheap feeds and feeding methods (plant production by-products, various types of algae, insects, fish and livestock processing waste, unicellular, yeast, food waste, etc.), which meet the criteria of nutrition, easy digestibility, sufficiency, continuity of receipt, easy to store and transport
2. Development of new methods of feeding aquatic organisms, taking into account their age needs and digitalization of the feeding process, which allows introducing feed dosing and timely termination of their supply.
3. To involve producers of feed for fish and other aquatic organisms grown in aquaculture conditions in the Marin Trust feed certification programs.

Disease prevention and treatment measures
Aquatic fish populations are still unprotected. This situation requires a change in approaches to ensuring the biological safety of aquatic organisms. The best way to solve this problem is to turn to the global experience of solving the problem of biosecurity in aquaculture, taking into account the limited use of veterinary drugs and antibiotics

1. Creation of a national biosafety system.
2. Introduction of a regional strategy for biological safety in the aquaculture sector.
3. Introduction of a system of biological and sanitary monitoring.
4. Introduction of the biological risk management standard in the "pathogen-pathogen transmission-disease spread in the population" system.

TRANSPORTATION AND PROCESSING
Ensuring the well-being of aquatic organisms by analogy with the well-being of animals

1. Optimization of the logistics of organic products in order to optimize the path to the consumer
2. Search for cost optimization in production and sales chains.

Organic production develops mainly at the primary level of production, while organic processing is less developed and regulated

1. Support quality and safety in organic production and sales chains.
2. Introduction of a system for establishing critical control points in the production and sales chain
3. Creation of new processing and packaging technologies
4. Informing the consumer sector in order to orientate it towards the consumption of organic aquaculture.

SUPPORT OF PRODUCT MANUFACTURERS
Cost optimization of organic aqua farms.
There is a problem of the organic sector - it is the high costs of product manufacturers, which are caused by the requirements of technology. In a situation where there is no support, it is difficult to comply with all the necessary requirements inherent in the organic aquaculture sector.

1. Diversification of funding sources for the innovative development of organic aquaculture and involvement in the European Innovation Partnership (AGRI) and the Agricultural Knowledge and Innovation System (AKIS) in order to promote the overall growth of organic production, supporting innovation in organic production
2. Support for producers through guaranteed purchases of products from organic aquafarms for further use for baby food and age groups of the population.
3. Introduce economic incentives for the introduction of sustainable production systems.
4. Ensuring the access of aquaculture producers, including organic to infrastructure facilities and services.
The use of the potential of organic farms in order to increase the specific weight of organic aquaculture in the GDP created by the national economy and through the impact on other sectors, as well as the realization of the sector's opportunities for the responsible use of the natural resource base in Ukraine is not considered.

Regulation mechanisms of the aquaculture sector, including organic
The absence of the sector in the structure of the national economy does not contribute to the development of regulatory mechanisms for this sector. In general, the existing aquaculture sector uses approaches of organic land use, fishing, and water resources.

Digitization in the aquaculture sector
The digitalization process covers almost all spheres of the economy. He did not bypass the aquaculture sector, moreover, he ensures high efficiency of the production process.

Implementation of knowledge exchange programs
The current state of development of Ukrainian aquaculture as a whole and the absence of its organic sector in the country indicate:
- unsatisfactory state of personnel potential, including management bodies;
- lack of experience of product manufacturers;
- detachment from global achievements in this field;
- lack of digitization and skills of using these opportunities by manufacturers;
- lack of access to the Internet;
- weak use of domestic and foreign scientific developments;
- unavailability of knowledge exchange programs.

Source: author's development
The recommendations for the development of organic aquaculture, given in the table, combine innovative developments that are implemented in the leading countries in the production of organic aquaculture.

In the creation and development of new sectors of the economy, the main role is assigned to the state.

The task of the state is not only to initiate, but also create conditions for the development of any direction. A comparison of national legislative initiatives and world developments in the field of organic aquaculture shows the stagnation of this direction. The first steps have been taken, but this is not enough to use the natural resource potential of the Ukrainian Black Sea regions and, in particular, the Odessa region. The development of this sector in the world continues, science offers new solutions for its further innovative development on the basis of sustainability. Support for European initiatives should be extended and supported.

Conclusions and perspectives of further research. All Strategic tasks related to the sustainable development of aquaculture in the EU continue to promote the development of organic aquaculture. That is why the European Commission recommends that all member states take this direction into account in their National Strategic Plans. It also states that the European Maritime, Fisheries and Aquaculture Fund (EMFAF) should be used to promote sustainable aquaculture practices such as organic production.

Ukraine should be included in these processes, implement the implementation of the main directions of the European action plan through the creation of an appropriate transparent environment that will provide encouragement and support to producers of goods for the development of this market segment, the formation of a traceability system and simplification of the conditions of economic activity in the specified direction.

Despite the significant resource potential of the fishery complex of the Ukrainian Black Sea (the largest in Ukraine), the presence of undeveloped lakes and estuaries, reservoir rates remains too high. Aquaculture farms can take advantage of financial support provided through the Ukrainian State Farm Support Fund on a competitive basis on a revolving basis. But organic aqua farms, even if they are available, are not given an advantage in obtaining them.

Ukrainian legislation in the field of production of organic aquaculture products provides the primary legislative framework for the creation of organic aqua farms, but does not correspond to European trends in the innovative development of such farms. The basis of the development of this field should be the state support of business entities that carry out the specified type of activity and the assessment of the compliance of the obtained products with the regulations of its production, which will create a basis for entering the European markets and activate the national market, replenishing it with protein products.

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