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Development of Pond Fish Farming and Aquaculture in Uzbekistan: Rational Use of Water and Land Resources

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Abstract. The article considers the problems of the development of pond fish farming and aquaculture in Uzbekistan, based on the experience of using the extensive technology of pond fish farming during the planned economy. The authors point out the need to conduct applied research in the field of aquaculture, analyze the results achieved and develop theoretical foundations for the further development of fish farming. The article deals with the problem of rational use of water and land resources in pond farms and offers recommendations for optimizing the technology of growing fish in polyculture. The factors influencing the choice of fish species for rearing are analyzed and the advantages of pond fish farming compared to intensive aquaculture are discussed. The authors come to the conclusion that pond fish farming and intensive aquaculture are complementary sectors, and in order to provide the market with fish products, it is necessary to develop both directions, taking into account the characteristics of the region and the needs of consumers. The results of the study can be used to form an effective strategy for the development of fish farming in Uzbekistan.
Key words: pond fish farming, aquaculture, development, water resources, land resources, rational use, polyculture.

The world's oceans are not an exhaustible reservoir with unlimited supplies of marine fish. In the bowels of the ocean, there are vast sea areas, which are actually turning into water deserts, where there are no favorable conditions for a significant number of marine organisms to live. Water temperature, bottom nature, depths and sea currents affect the required amount of food suitable for feeding marine fauna, which directly determines their ability to reproduce, and therefore, in many water areas, the number of fish and other marine organisms is limited.

Most fish live in the waters of the continental shelf - an underwater plateau that surrounds the land of all continents. The shelf is usually considered a plateau of the continental shelf, extending to a depth of about 180 meters [1].

It is known that representatives of the herring family make up a significant part of the world's fish catch. Herring is a schooling fish that forms large aggregations that provide a convenient source of inexpensive food and technical products. The herring catch has always been the main share in the fisheries of Iceland, the Netherlands, Poland, the Scandinavian countries and Russia. Other fish species of primary economic importance include the anchovy, sardine, and menhaden . The annual catch of fish of the herring family around the world is about 15 million tons.

Among the fish of the greatest economic value, cod should be singled out, the catch of which

has been the basis for intensive fishing in the North Atlantic since ancient times. At one time, the annual catch of cod only in the area of the Great Newfoundland Bank (in the northwestern part of the Atlantic Ocean) reached 1 million tons, but already in the early 1990s it decreased by more than 70%. Cod makes up a significant part of the catch of the British and Icelandic fishing fleets; its catches were essential for the former USSR, and are still important for Norway [2].

Among migratory fish that do not return to spawn in rivers, salmon is of particular economic importance. The main salmon catch is carried out in the states of Washington, Oregon, Alaska and California, as well as in British Columbia, the Russian Far East and Japan. Salmon is also caught in Chile, Australia and New Zealand, where some species of this fish were once imported. The development of marine aquaculture has increased the production of salmon, and its products have become an important element in international trade. In 1936, a record was set for the production of canned salmon - 9 million boxes with a total weight of 238 thousand tons. With the development of the market for fish products, more non-traditional products from fish of the perch and carp orders began to appear. Fishing for tuna in the Mediterranean and off the coast of Japan has a long history. However, favorable conditions for the development of the production of products based on such fish were created only at the beginning of the 20th century in connection with the development of canning tuna meat and the emergence of a new market for these fish on a global scale [3].

In the global economy, aquaculture (fish farming) is the fastest growing food supply sector. Originating in the 1950s, aquaculture has since the mid-2000s become the main supplier of animal protein for human consumption, surpassing livestock and poultry in this respect.

In our country, fish farming is one of the most promising sectors of the economy of Uzbekistan. However, despite the presence of vast water resources in the form of ponds, reservoirs, lakes, rivers, canals, etc., the development of fisheries and the introduction of scientific research in the field of fish farming occurred at a slow pace [4].

In order to improve the organization of fish farming, increase the volume of industrial production of fish products, rational use of water resources and taking into account the importance of the fishing industry for providing the population with food rich in proteins, a number of legislative acts were adopted in the country. Among them are the Decree of the President of the Republic of Uzbekistan No. PP-2939 of May 1, 2017 “On measures to improve the management system of the fish industry” and No. PP-4005 of November 6, 2018 “On additional measures for the further development of the fish industry” [5].

As a result, there has been a significant increase in the number of farmers who decide to grow fish. The first stages of the recovery of the fish sector in Uzbekistan can be characterized as a semi-intensive development of pond fish farming. Fish farms that have existed since the days of the planned economy have been restored, and a significant number of new small fish farms (more than 2000) have been established. As a result, fish production in the republic has increased from several thousand tons in 2006 to 94 thousand tons per year in recent years (from 83.9 thousand tons in 2017, 201 thousand tons are predicted in 2019) [6].

Aquaculture has several significant advantages over livestock and poultry production. In aquaculture, there is a variety of technologies that are suitable for different types of water bodies, as well as the possibility of cultivating more than 100 species of fish. Based on experience, the development of aquaculture in Uzbekistan should be carried out in this direction. An important task for the qualitative development of aquaculture is the analysis of the results achieved and the development of theoretical foundations for further development. In this case, one should take into

account such objective prerequisites as: 1) a variety of technologies and objects of fisheries; 2) shortage of water and land resources in Uzbekistan [7].

Fish ponds are artificial reservoirs created specifically for fish farming. In all other types of water bodies, fish production is an ancillary activity, and no changes are made to the functioning of water bodies for this. Thus, fish ponds are of particular value for aquaculture, since they create optimal conditions for fish breeding [8].

The peculiarity of the ponds is that they are filled at the beginning of spring, stocking with fish is carried out, during the entire growing season the ponds are fertilized, the fish are fed and the water level is constantly maintained. In autumn, the fish are completely caught and the ponds are drained. In other words, the water is held in the ponds throughout the growing season and released in the autumn. It should be noted that in our republic, where the fishing industry previously occupied the second place in the USSR, in the presence of a number of scientific developments, the rational use of natural resources did not receive due attention before.

Currently, the number of fish ponds in Uzbekistan is significantly and constantly increasing, the total area is more than 20 thousand hectares. At the same time, their technological level varies both in the quality of construction and arrangement, and in the technology of fish breeding. In some farms, the construction of ponds is primitive, which does not allow efficient filling and drying. In other farms, fish farmers use outdated and inefficient fish breeding technology.

However, despite these shortcomings, farmers are making profits, albeit small, and they are satisfied with this level. As a result, productivity in many fish farms is very low - 5-7 centners per hectare. Despite these shortcomings, in Uzbekistan, where irrigated land is used to grow valuable crops such as cotton, rice, wheat, etc., land is provided for fish farming to farmers. Therefore, at present, the country's fish farming is faced with the task of rational use of available water and land resources in pond farms. This task has two important aspects: 1) it is desirable to develop pond fish farming technology, taking into account different levels of intensification, in order to get more production from ponds; 2) the state needs to establish a minimum level of fish productivity for different regions of the republic and provide for a progressive tax for farms whose productivity is below the established norm, in accordance with the experience of the PRC.

Both of these tasks require special applied research. In Uzbekistan, in the 1970s-1990s, an extensive technology of pond fish farming was used, in which the fish fed on the organisms of the natural food base of the fish reservoir, and fish farmers could use fertilizers to stimulate the development of this base.

However, this technology was created for the planned economy, especially for the conditions for lending and subsidizing state-owned fish farms. The established standard was 27 centners per hectare, but on average in Uzbekistan they reached 23 centners per hectare with the planning of the appropriate amount of fertilizers and feed. Carp accounted for almost 50-60% of the total harvest. Carp is a more valuable fish than silver carp and grass carp. However, the cultivation of carp requires the purchase of expensive compound feed, and at the same time its sale may turn out to be unprofitable. This is especially true for fish farms with a well-organized production structure. Under the conditions of a planned economy, the sale of carp was not a problem for fish farms, since specialized enterprises were engaged in this [8].

Thus, the fish farms made a profit thanks to the cultivation of silver carp and grass carp, which compensated for the losses from the cultivation of carp. Growing herbivorous silver carp and grass carp is highly profitable, as only young fish and fertilizers are required to stimulate the development

of the food base. In the transition to market relations, the cultivation of carp using large volumes of compound feed became risky and even unprofitable, which led to a natural refusal of fish farms from carp. At the same time, the development of a natural food base also makes it possible to grow cheaply a small amount of carp without the use of feed, but the share of carp in the total mass is sharply reduced. The main object is the silver carp, the proportion of which increases to 75-85% [9].

Increasing fish production and government attention to the development of fish farming is causing increased competition between fish farms and reinforcing the trend towards an increase in the share of more valuable fish species, including carp. Therefore, some fish farms begin to use additional feeding, which increases the share of carp to 10-15% [10]. In addition, local consumers require larger herbivorous fish by weight. All this requires the provision of farms with larger fish stock, the development of theoretical and economic foundations for the technology of growing fish in polyculture [11].

This becomes a limiting factor in the development of aquaculture from 2013-2018. At the moment, there are fish farms in Uzbekistan with different levels of intensification of pond polyculture, so it is necessary to develop recommendations for determining the biological norms for growing fish stock and commercial fish in pond farms of various levels [12].

It should be noted that the relevance of this topic will not change even with a significant development of intensive aquaculture. The reason is that for intensive aquaculture, a natural food base is not required, as the fish are completely fed with artificial food. However, this applies mainly to predatory fish species, which are expensive. Any country's market requires a variety of fish products, including more affordable species such as silver carp, grass carp and carp, which are grown exclusively in pond farms.

Thus, pond fish farming and intensive aquaculture do not intersect in terms of objects, but complement each other, which allows for the rational use of water and land resources.

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