

Problems of developing an expert system for industrial fish farming under martial law conditions

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Abstract – The article addresses the main challenges faced by the industrial fish farming sector in Ukraine during wartime. Military actions negatively impact the infrastructure and personnel of fish farms, causing issues with supply chains, logistics, qualified personnel, and the environmental condition of water bodies. The author emphasizes the difficulties in maintaining stable operations of enterprises, particularly due to economic factors such as reduced investments, increased tax burden, and rising production costs. The article proposes steps to mitigate these challenges, including the creation of wintering ponds, the breeding of in-house stocking material, reducing the number of fish stock to maintain ecological balance, and focusing on herbivorous fish species and catfish that are less dependent on purchased feed.

Keywords: fish farming, cost, expert system, martial law.

Considerations in Developing an Expert System for Industrial Fish Farming under War Conditions

Military actions pose threats to infrastructure and personnel, complicating the stable operation of fish farms. Service intervals increase due to unstable feeding and the delayed administration of necessary medicinal and preventive treatments, affecting the quality and quantity of the final product. The loss of qualified workers due to mobilization or migration complicates the maintenance of a high level of expertise and efficiency. Hiring new workers without experience in the field and their training creates additional financial burdens on producers.

Disruption of logistical chains complicates the supply of feed, equipment, and other necessary resources. Border blockades and the reorientation of enterprises to other markets or products create additional financial burdens in the search for new suppliers.

Military actions may lead to water pollution, which negatively affects fish health and product quality. Unfortunately, the environmental problems associated with war cannot be solved with an expert system for industrial fish farming, as they are unpredictable.

Economic difficulties are perhaps the most critical factor caused by the war. The conflict impacts the economy, leading to reduced funding and investments in the fish industry. Reduced purchasing

power, increased tax burden on producers, and rising production costs may result in a negative financial balance for enterprises.

To address the economic challenges caused by military actions, we propose the following steps in developing an expert system for industrial fish farming:

The creation of wintering ponds will enable the sale of products over a longer period, as the supply increases significantly during the autumn fishing season, causing a drop in product prices.

Focusing the enterprise on breeding its own stocking material will reduce the cost of the final product.

Reducing the amount of stocking material will reduce the negative impact on the ecological condition of water bodies, which is caused by fish waste and feed decomposition. This, in turn, will lower costs for administering necessary medicinal and preventive treatments.

Focusing on herbivorous fish species such as white silver carp (*Hypophthalmichthys molitrix*), white amur (*Ctenopharyngodon idella*), carp (*Carassius*), and common or European catfish, whose food base consists of benthic invertebrates and amphibians. This will reduce financial costs for feed and, consequently, the production cost.

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