



# International Journal of Multidisciplinary Research and Growth Evaluation.

## Development Status and Management Countermeasures of Facility Fishery

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### Article Info

ISSN (online): 2582-7138

Volume: 06

Issue: 04

July - August 2025

Received: 11-05-2025

Accepted: 13-06-2025

Published: 05-07-2025

Page No: 601-603

### Abstract

To accelerate the transformation and upgrading of fishery production, Hubei has been actively developing land-based circular ponds, water-based circular ponds, and pond engineering facilities in recent years, aiming to promote high-quality development in the fishery sector. This article introduces the main models, current status, and existing issues of facility fishery in Hong'an County, and offers suggestions for its development. These recommendations aim to provide a scientific basis for the sustainable and healthy development of facility fishery in this region, thereby promoting the healthy development of facility fishery in Hubei Province.

DOI: <https://doi.org/10.54660/IJMRGE.2025.6.4.601-603>

**Keywords:** Facilities for Fisheries, Status of Development, Problems, Recommendations

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### 1. Introduction

Facility aquaculture is an intensive and high-density farming industry that emerged in the mid-20th century, integrating modern engineering, bioengineering, feed science, and other disciplines. This farming method places fishery production under artificial control, establishing aquaculture facilities through industrial technology and using scientific methods to regulate water quality, temperature, and light. It provides a suitable living environment for aquatic animals, achieving high yields and profits in the most economical production space.

Facility aquaculture is not restricted by space and can be conducted in specific locations such as water surfaces and land, using specialized farming equipment like boats, cages, and buckets to maximize the efficiency of water bodies. This approach not only reduces the use of land resources but also enables water recycling, conserving water resources and closely aligning with environmental protection efforts. Compared to traditional fish farming, it offers numerous advantages and plays a significant role in modern fisheries and rural revitalization.

### 2. Definition of facility fisheries

#### 2.1 Concept of facility fisheries

Facility aquaculture is an intensive and high-density farming industry that emerged in the mid-20th century. It integrates multiple disciplines such as modern engineering, electromechanics, biology, environmental protection, and feed science. By employing engineering techniques and industrial production methods, it constructs fish farming facilities. Using scientific and precise breeding techniques, it enables aquatic products to achieve the highest yield and optimal quality within the most economical growth space, generating maximum economic benefits while avoiding pollution issues associated with traditional fisheries. This is a highly efficient form of aquaculture.

#### 2.2 Characteristics of facility fisheries

Facility-based fisheries are knowledge-intensive, capital-intensive, environmentally friendly, and sustainable. In the modernization of aquaculture, both increased investment in technology and equipment upgrades require financial support. Advanced facilities are essential to minimize risks in aquaculture production, highlighting the capital-intensive nature of this sector. Facility-based fisheries can produce high-quality aquatic products from limited water resources while avoiding the pollution issues associated with traditional extensive farming or intensive practices, significantly reducing the impact on natural water bodies.

### 2.3 Classification of facility fisheries

**Pond engineering recirculating water farming:** This is one of the primary forms of facility-based aquaculture, commonly known as the track fish model or the push-water farming model. It builds upon existing ponds by transforming them into two distinct zones: a small water body for push-water farming and a large water body for ecological purification.

**Land-based Factory Farming:** The land-based circular pond recirculating aquaculture model includes a land-based circular pond farming area and a wastewater treatment area. The demonstration zone consists of several canvas land-based cylindrical tanks, each equipped with separate water intake and drainage systems as well as an oxygenation system. Wastewater from farming is purified through physical filtration, biological filtration, disinfection, and oxygenation before being reintroduced into the land-based circular ponds. This model offers advantages such as high stocking density, efficient feed utilization, short farming cycle, easy harvesting, land-saving and water conservation, ecological environmental protection, intensive efficiency, and stable quality.

**Factory-based recirculating aquaculture:** This model has evolved from traditional factory farming, utilizing wastewater treatment equipment to purify and reuse the water from aquaculture. It offers several advantages, including low water consumption, minimal land use, reduced environmental impact, high-quality and safe products, fewer diseases, higher stocking density, less environmental constraints, and high resource utilization.

### 3. Problems exist

#### 3.1 Insufficient funds for the construction of aquaculture facilities

First, the construction costs of facilities are high, including breeding tanks, temperature control systems, and tailwater treatment systems, all of which require significant investment. Second, after the initial investment, the ongoing expenses are substantial, such as equipment maintenance, operational costs, and staff salaries. Third, obtaining bank loans is challenging due to the high risks and unstable income in the fishing industry. The key assets in the fishing industry are biological resources and production materials, which are difficult to value, and operators often lack effective collateral. Currently, only a few banks offer loans, and most of these loans are granted to large-scale industrial leaders, with very few available for small enterprises and individual farmers.

#### 3.2 The facility breeding technology is not perfect, and there is a lack of professional technical personnel

Currently, facility aquaculture in our country is still in its infancy. The development plans and technical summaries for facility aquaculture are not yet complete, and the requirements for high-quality aquatic product farming are relatively high. For example, some land-based barrel farmers lack sufficient knowledge about species selection, stocking density, disease prevention, and other technical aspects. Their daily management is often lax, leading to a high incidence of diseases, which affects both production and efficiency to some extent. There is a need to further enhance the intensity of technical training and guidance services.

#### 3.3 The model is immature and lacks overall planning

Facility aquaculture is still in its infancy. For the same type of farming model, there are differences among different farmers, requiring effective scientific validation and guidance from specialized technical personnel. Take the land-based cylindrical tanks as an example; they are high-density intensive farming systems that require less space and yield

higher output, making them very popular among farmers. However, the core technology must include corresponding wastewater treatment and recirculation facilities along with supporting technologies. Some farmers proceed without scientific validation, blindly launching projects by building only the cylindrical tanks while neglecting wastewater treatment and recirculation facilities, leading to failure in normal operation after construction.

### 4. Countermeasures and suggestions

#### 4.1 Strengthen scientific planning

It is recommended that enterprises and farmers interested in facility aquaculture projects communicate with local agricultural authorities in advance to verify and confirm the nature of land use and file it. At the same time, they should consult with various levels of aquatic technology promotion departments to understand the feasibility of development techniques. For example, land-based circular pond recirculating water farming, although it has advantages such as small footprint, high yield, and good returns, requires advanced breeding techniques and management skills, and poses significant risks due to high-density farming. Guide breeding enterprises to invest rationally and develop prudently, avoiding blind expansion which could lead to losses.

#### 4.2 Increase government support to empower facility fisheries

Sufficient funding and policy support can alleviate the burden on enterprises and farmers, promoting the rapid development of facility fisheries. In areas with good natural conditions for farming, increased or higher-level fiscal investment can be applied for to establish a special fund for the development of facility fisheries, which will support facility construction, technology research and development, talent cultivation, etc.; at the same time, relevant policies such as tax incentives and land use policies should be introduced to create a favorable policy environment for the development of facility fisheries.

#### 4.3 Strengthen technical guidance

Aquatic technology extension departments at all levels should comprehensively strengthen technical guidance and intensify the promotion and training of high-quality aquatic products breeding techniques; they should timely organize special breeding technical training, especially focusing on the selection of suitable breeding varieties, stocking density, disease prevention and control and daily management.

#### 4.4 Explore new models of facility fisheries and develop smart fisheries

We will explore new models of facility fisheries development, such as land-based circular ponds+ponds, land-based circular ponds+paddy fields and factory-based recirculating aquaculture, and combine them with the development of smart fisheries to improve the digitalization, intelligence and modernization of fisheries.

#### 4.5 Promote the extension of industrial chain and accelerate market information services

The extension of the industrial chain can increase the economic benefits of industries, boost the income of enterprises and farmers, and promote the healthy development of facility fisheries. At all levels, municipal aquatic departments can organize learning tours to observe advanced aquatic product processing enterprises from other regions or attract investment to introduce advanced processing enterprises; encourage farmers to develop links in

aquatic product processing, distribution, and sales, extend the industrial chain, and enhance product value-added. Establish market information services to provide accurate market information for enterprises and farmers.

### 5. Funding

This work was supported by Hubei Province Facility Fisheries Experimental Demonstration Project (2024SSWE003), Huanggang City Pond Aquaculture Intensive Cultivation Technology Research (HG2024008).

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