

Unlocking India's Aquatic Potential: The Rise of Inland Cage Culture

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SUMMARY

India's aquaculture, or underwater agriculture, has grown dramatically, making it the world's third-largest fish-producing nation. Although conventional pond-based aquaculture is the most common method, cage culture in Indian reservoirs offers a viable alternative for inland fish production that is sustainable. Fish are cultivated in floating or submerged cages in natural water bodies through the process of cage culture, which has advantages over land-based systems in terms of resource usage and environmental effect. Cage culture, often regarded as a promising avenue for enhancing fish production, has garnered significant attention in India, particularly within reservoirs. Despite their vast expanse, reservoirs have historically been underutilized for fish farming, contributing a mere fraction to inland fish production.

INTRODUCTION

Indian reservoirs, often termed "sleeping giants," possess immense potential for cage culture, yet their contribution to inland fish production remains disproportionately low as freshwater aquaculture in India is largely a pond-based system. Culture of fish in enclosures such as cages installed in open water bodies offers scope for increasing production, obviating the need for more land-based fish farms. Among the new methods in the discipline of aquacultural engineering, the cage culture system is used for the commercial culture of aquatic species, particularly fish, in various aquatic habitats



What do you mean by aquaculture?

Aquaculture usually defined as farming of aquatic organisms such as fish, crustaceans, molluscs, and aquatic plants, under controlled conditions which involves the cultivation of both freshwater and marine species in various types of enclosures or facilities such as ponds, tanks, cages, and raceways. It is also known as "Underwater Agriculture"

India's position in aquaculture:

India's stance in aquaculture started from a meagre of 7.5 lakh tons in 1950–51, the country's overall fish production reached a record 162.48 lakh tons annually in 2021–22, growing by 10.34% from 2020–21. With an approximate 8% share of the world's fish production, India is currently the third-largest fish-producing nation. According to him, it is the nation that produces the most cultivated shrimp globally and ranks second in aquaculture

production. While in the case of inland fish production which was primarily driven by aquaculture had a startling 400 percent growth occurred in the inland fish production from just 28.23 lakh tons annually in 2000–01 to 121.21 lakh tons annually in 2021–22.

Country	Total production	2010 Cage production (thousand tonnes)	Contribution (%)	Total production	2015 Cage production (thousand tonnes)	Contribution (%)	Total production	2020 Cage production (thousand tonnes)	Contribution (%)
China	19913	1131	5.7	24642	1379	5.6	25684	321	1.2
Indonesia	1332	121	9.1	2955	191	6.5	3390	650	19.2
Bangladesh	1147	---	---	1831	2	0.1	2294	5	0.2
Egypt	920	160	17.4	1175	173	14.7	1592	201	12.6
Thailand	404	40	9.9	391	33	8.4	369	32	8.7
Philippines	308	103	33.3	303	95	31.2	285	74	26.0
Russian federation	115	25	21.6	138	30	21.6	189	59	31.2
Colombia	68	23	33.5	93	19	20.8	173	30	17.5
Turkey	79	---	---	101	70	69.0	128	100	78.0

What do you mean by Inland Cage culture?

Cage culture is a type of aquaculture where fish are cultured within floating or submerged cages placed in natural or man-made water bodies such as lakes, rivers, reservoirs. These cages are typically constructed using netting or mesh materials that allow water to flow freely while containing the fish. Cage culture provides a controlled environment for fish growth and production while utilizing existing water resources.

Cage aquaculture versus pond aquaculture:

Although the production method was similar as extensive, semi-intensive, or intensive which drives the majority of the demand for environmental products and services, cage and pond systems differ from one another by nature. Unlike pond aquaculture, inland water cage fish farms are typically located in multipurpose public water bodies and are not as closely interwoven with other facets of the ecological, economic, and social contexts. There is no doubt that cages have stronger ties to the ecosystem than other types of aquaculture systems, and overexploitation issues have arisen from a failure to acknowledge this.

Why inland cage culture is best in India?

With India's abundance and diversity of open water resources, including its lakes, wetlands in floodplains, and reservoirs, there is a great deal of potential to boost output through enclosure aquaculture. Large and medium reservoirs can contribute a significant number of fish to the overall inland fish production basket by using a small portion of their surface area. Because culture-based capture fisheries (CBCF) govern small, shallow ponds and lakes, advance fingerlings must be stocked in sufficient numbers to achieve the targeted production level. According to one estimate, >3,000 million fingerlings of size 80-100 mm are required annually to stock reservoirs alone in India. Despite India's aquatic abundance, cage culture in reservoirs remains largely untapped. With over 3.15 million hectares of reservoirs offering immense production potential, the adoption of cage culture could revolutionize fish farming in India. By harnessing just, a fraction of these resources, India aims to elevate its fish production to new heights.

Challenges and Opportunities:

Encouraging cage culture has its own set of difficulties, including obstacles related to regulations and environmental issues. To address these challenges, nevertheless, programs such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY) are being implemented. Cage culture activities that are sustainable are being made possible by government subsidies, awareness campaigns, and research and development initiatives.

Advantages of cage culture:

Utilization of Open Water Bodies: Cage aquaculture utilizes open water bodies such as lakes, rivers, or coastal areas, allowing for the efficient use of natural water resources without the need for land-based infrastructure.

Reduced Environmental Footprint: Compared to land-based aquaculture systems, cage culture often has a lower environmental footprint as it minimizes habitat modification and reduces nutrient discharge into surrounding ecosystems.

Flexibility and Scalability: Cage systems can be easily scaled up or down to match production needs. They are also relatively flexible in terms of location, allowing for deployment in a wide range of water bodies.

Improved Water Quality Management: Cage aquaculture enables better control and management of water quality parameters such as dissolved oxygen, temperature, and waste accumulation, leading to improved fish health and productivity.

Reduced Risk of Predation: The elevated position of cages above the water bottom can reduce the risk of predation from ground-dwelling predators, providing a safer environment for cultured organisms.

Reduce Unwanted Pressure: Cage culture helps in reducing the pressure on land resources especially country like India where due to population pressure and demand for protein is increasing day by day and it also increases the possibility of making maximum use with the greatest economy of all the available water resources and combining several types of culture within one water-body

Disadvantages of cage culture:

Requires Proper feeding: Pond fish can make use of naturally occurring food, while cage grown fish only have a limited access natural food since they cannot forage on their own. Cage grown fish therefore needs to be fed by the farmer to a much higher extent. The food that is given to the cage grown fish also has to be nutritionally complete, e.g. contain proper amounts of all necessary vitamins and minerals.

High stocking density: When fish grown in cages instead of ponds, most farmers opt for a high stocking density. A high stocking density creates a stressful environment for the fish and stress damages the immune system. The risk of disease is therefore high. The risks will be increased further if the farmer fails to provide the fish with optimal water conditions and a satisfactory diet. Cage culture can introduce or disrupt disease and parasite cycles, change the aquatic flora and fauna and alter the behaviour and distribution of local fauna.

Poaching: Poaching is easy because fish are confined in a small area which can be easily theft

Fouling: Inland cages face problems like fouling and repairing them also more expensive.

Predators: Predators can be attracted to the cages and for that additional protection has to be provided such as predator nets

The Road Ahead:

Stakeholders want to fully utilize cage culture in Indian reservoirs, and they plan to do so by setting high goals and implementing coordinated tactics. India uses cage culture to provide livelihood possibilities, environmental sustainability, and food security by addressing issues and encouraging cooperation among stakeholders.

CONCLUSION:

In India's pursuit of sustainable aquaculture methods, cage culture is a ray of hope. India can significantly increase food security, boost economic growth, and transform its inland fish production by utilizing the enormous potential of reservoirs and cutting-edge cage culture techniques. Initiatives like the Pradhan Mantri Matsya Sampada Yojana demonstrate a commitment to overcoming barriers and advancing ethical aquaculture practices, even in the face of difficulties like environmental concerns and regulatory barriers. The nation's "sleeping giants" will awaken to realize their full potential and pave the way for prosperity and sustainability in India's aquatic domain as the country embraces innovation, collaboration, and responsible stewardship. This will herald the beginning of a new era in aquaculture.

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