A success story of freshwater prawn farming as an alternative livelihood for self-help and user groups in Mayurbanja District, Odisha, India

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Fisheries play a crucial role in livelihoods and provide food for over one billion people worldwide. In India, the population has grown rapidly over the past five decades. This has widened the gap between supply and demand for essential commodities such as food, clothing, shelter, and fuel.

Fisheries contribute significantly to the country's economy by providing food, employment, and foreign exchange. In India, 60–70% of the population lives in rural areas. Many do not have sufficient land or alternative job opportunities. Over 85% of rural income comes from agriculture and related activities.

A large number of people rely on subsistence fishing and fisheries-related activities. In India, fishing is one of the oldest subsistence practices. The country's economy and social development depend heavily on fisheries. This sector provides employment to many, supplies affordable protein-rich food, and contributes to foreign exchange earnings.

Fisheries and aquaculture are among the fastest-growing industries globally. They play a key role in economic development by supporting food and nutrition security, national income, and employment. The sector also generates significant foreign exchange, contributing about 10% of total export earnings. Most of these earnings come from shrimp and prawn, making fisheries the third most important export sector after garments and leather.

Odisha is one of India's leading fish-producing states, ranking fourth in total fish production after Andhra Pradesh, West Bengal, and Gujarat. In the fisheries sector, freshwater fish and giant freshwater prawn (*Macrobrachium rosenbergii*) are among the most important species in aquaculture. However, the earning potential of this sector remains underutilised.

Due to the relatively simple techniques involved, freshwater prawn farming has the potential to create significant employment opportunities in rural areas for both men and women. It can also generate additional income with minimal risk and requires less time.

The Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA) was launched in 2020–21 across 15 districts in Odisha. This World Bank-assisted project, with funding of $22 million, is a minor irrigation project (MIP)-based initiative. It aims to promote climate-smart agriculture in irrigation command areas covering about 56,400 hectares under 107 minor irrigation projects and approximately 70,000 hectares of rain-fed land influenced by these projects. The goal is to enhance farmers' capacity and income in the project area.

Farmers are catching freshwater prawn.

Under the OIIPCRA project in Mayurbanja district, Odisha, genetically improved freshwater fish and freshwater prawn farming were introduced. The project provided initial investment by supplying fingerlings, post-larval scampi, and other inputs.

User groups (UGs) and women-led self-help groups (SHGs) received training and participated in exposure visits organised by the Department of Fisheries, Government of Odisha. These efforts aimed to establish fish farming in minor irrigation projects MIPs.

This study examines the role of tribal men and women in promoting fish farming across different villages in Mayurbanja district. SHGs have played a key role in managing and expanding fish and prawn farming, as well as marketing, to improve livelihood security for rural tribal communities.

Capacity-building programs and field demonstrations have helped many men and women in Mayurbanja adopt improved pisciculture techniques, enhancing their knowledge and income opportunities.

Even in coastal and saline areas, freshwater prawn farming is becoming increasingly popular due to its low risk and low cost. The technology is simple and relies on freshwater, which can be sourced from rivers, canals, ponds, reservoirs, or MIPs.

The farming of giant freshwater prawn, commonly known as scampi, is gaining momentum in the global market. It is in high demand both domestically and internationally and is now considered an exportable commodity. However, production remains inadequate due to the limited availability of quality seed, feed, and technical knowledge.

Scampi farming is expanding rapidly due to advancements in culture techniques and its relatively high environmental sustainability compared to other crustaceans. The species is favored for its large size, tolerance to changing water conditions, resistance to handling stress, and ability to feed on unconventional diets (El-Sayed, 1997).

This case study focuses on freshwater prawn farming in villages of Karanjia under the Shyamakhunta block in Mayurbanja district, Odisha.

Approach

The impact of the OIIPCRA (IRDMS) project is evident in the significant increase in fish and prawn production, particularly in Karanjia village, Paikbasa Gram Panchayat (GP), under Shyamakhunta block (MIP1), and in Tato village, Tato GP, under Karanjia block (MIP2).

MIP1 was stocked with 30 kg of fish and 800 post-larvae (PL25) prawns. Similarly, MIP2 was stocked with 10,000 PL25 prawns and 100 kg (3,000 fingerlings) of genetically improved Indian major carps weighing over 50 g each.

Programme overview

The experimental farming case study showed good growth and survival rates in both MIP1 and MIP2 despite challenges such as erratic rainfall, cyclonic weather, and disruptions in the feeding system. Factors like feed consumption, light, and temperature fluctuations affected the farming process. However, the overall results were promising.

MIP2, with a water area of 1.25 hectares, performed better than MIP1 in both yield and quality. It produced higher-grade prawns with uniform size and greater mean weight, even though both MIPs followed a polyculture system. Among Indian major carps, catla dominated in both size and weight compared to rohu and mrigal in both sites. MIP2 achieved better fish and prawn production due to its biculture system, a perennial water source, and proximity to the main market in Baripada.

Economic analysis is essential to assess the feasibility of aquaculture investments. This study considered the cost of seed, feed, operations, and infrastructure in relation to marketable yield. Both MIP1 and MIP2 met the necessary cultural norms and proved to be economically viable.

The study confirmed that freshwater prawn farming, when combined with modern technology, is profitable and sustainable. The future of scampi farming looks promising due to its palatable taste, high nutritional value, and strong export potential. To prevent inbreeding, genetically improved seed from wild broodstock should be sourced from RGCA, Chennai, as Odisha currently lacks this facility.

Scampi has a strong position in the international market due to its quality and demand, comparable to tiger and white-leg shrimp.

Breeding and culture

During the monsoon, healthy wild berried females and males were collected from rivers, canals, culture ponds, and MIPs for hatchery breeding. After acclimatisation, they were disinfected with 25–30 ppm formalin for 10–15 minutes before being transferred to maturation tanks. They were fed at 5% of their body weight with snail meat, clam meat, crab meat, pelletised feed, and *Artemia* nauplii. These feeds provided protein, carbohydrates, ash, moisture, and fat essential for broodstock and larvae.

Males and females were kept together at a 1:4 ratio for mating. Segregation was based on color changes from pink to grey and then deep grey. Mating occurred within 8–10 hours, followed by spawning. The fertilised eggs were deposited on the ventral side of the female's abdomen and were held firmly by the pleopods. In captivity, females mature 2–3 times per season, with an interval of 20–30 days between successive puberty molts. A 50–60 g female prawn can lay 20,000–30,000 eggs, though fecundity decreases with each cycle.

In fibre-reinforced plastic tanks, 3–4 berried females were stocked at a water temperature of 26–28°C and salinity of 5–6 ppt to optimise hatching. The incubation period lasted 18–20 days, during which the female ventilated the eggs using pleopod movements. Prawns carrying grey eggs were transferred to separate tanks, one per tank. Hatching occurred on the second night and continued for 2–3 days from a single mother prawn. The female dispersed the newly hatched larvae using pleopods.

Spent females were moved to separate tanks to prevent them from consuming unhatched eggs and larvae. Scampi larvae undergo 11 distinct stages before metamorphosing into post-larvae, each with unique morphological traits. Larval rearing is a critical phase, highly susceptible to disease, requiring continuous monitoring of water quality, temperature, feed, and climatic conditions. Under optimal conditions, it takes 35–40 days for the larvae to develop into juveniles ready for sale to entrepreneurs.

Feeding

In this experiment, both MIPs were fed pelletised feed of different grades based on growth stages—starter, grower, and finisher. Additional feed sources included rice bran and groundnut oil cake. Since scampi are cannibalistic and scavenging by nature, they also consumed natural feed such as aquatic insects, algal blooms, mollusks, crustaceans, and small larvae.

Water quality monitoring

Water quality parameters, including pH, dissolved oxygen (DO), biological oxygen demand (BOD), hardness, alkalinity, nitrate (NO_3), and nitrite (NO_2), were monitored at least twice a month in both MIPs. Testing was conducted by the Fishery Facilitator (Assistant Fishery Officer or Fishery Technician) using a testing kit provided by OIIPCRA through the District Fisheries Officer (DFO).

Morphometric study and health monitoring

Fish and prawn samples from both MIPs were analysed for length and weight, and their health was assessed at the district laboratory under a zoom microscope. Common diseases observed during the experiment included fungal, bacterial, and protozoan infections. Medications such as Cifax, nitrite treatments, formalin, Butox or Lysetik, and fluconazole were used for disease management.

Marketing & economics

The culture period lasted six months (180 days), with a single harvest conducted in both MIPs. However, some fish and prawns remained, particularly in MIP2. Growth variation was observed among species, with prawns reaching 250–300 g and carp species growing as follows:

Above, below: Length and weight measurement.

- Catla: ~1 kg
- Rohu: ~600 g
- Mrigal: ~700 g
- Grass Carp: ~2 kg
- Jayanti Rohu: ~1.5 kg
- Amur Carp: ~1.5 kg

Since this was an experimental single-batch culture, harvesting was carried out using drag nets, cast nets, and hand-picking after draining the ponds. Both MIPs recorded good harvests.

To support fishers, OIIPCRA is providing three-wheelers and four-wheelers equipped with ice boxes. This initiative helps stakeholders transport larger harvests and sell their stock at better prices in nearby markets.

Needs of user groups and self-help groups

To successfully establish fish and prawn farming, self-help groups require:

- Training in fish and prawn breeding techniques.
- More on-field training and demonstrations.

- Exposure visits.
- Technical support from authorities for efficient production and propagation.
- Improved marketing facilities.

Factors contributing to success

- Technical support and cooperation from government departments.
- Timely supply of inputs and regular guidance and motivation.
- Strong coordination and commitment among UG/SHG members.
- Availability of suitable water sources.
- Increasing demand for aquaculture products in urban areas.

Lessons learned

The fish and prawn farming initiative has provided a vital livelihood opportunity for economically disadvantaged tribal communities. It has contributed to capacity building and income generation for marginalised groups, including women's self-help groups, producer groups, and water user groups within the irrigated areas of MIPs. The skills gained ensure self-employment and financial security for these communities.

Future strategies and way forward

Efforts are underway to build farmers' capacity for technological improvements in seed production. Successful farmers are receiving technical support to scale up fish and freshwater prawn seed production by establishing prawn nursery rearing systems. New farmers are also being encouraged to adopt these technologies through horizontal expansion under the OIIPCRA programme.

To enhance sustainability, farmers are being linked to existing government schemes and institutions such as State and Central Fisheries, ATMA, KVK, OCTMC, and IRDMS. These partnerships provide improved support and increased income opportunities. Additionally, better market linkages with aquashops in both local and distant towns are being developed. A buyback trade system with local traders has already proven profitable. Furthermore, a fish feed production training programme has been introduced to help farmers generate additional income.

Moving forward, sustainable and eco-friendly utilisation of aquatic resources will be prioritised. The introduction and upgrading of genetically improved freshwater species such as pangasius, tilapia, Jayanti rohu, and grass carp will support aquaculture development. Rainwater harvesting for pisciculture is also being explored to maximise water resource utilisation.

Community involvement will play a key role, integrating local people into three livelihood tiers—eco-friendly aquaculture practices, fish feed production, and marketing. This approach is expected to improve the economic conditions of the villagers. Scientific methods will be applied to ensure sustainable fish farming, with a focus on improving aquatic health through monitoring of physicochemical parameters and fish health management. New technologies suited to local conditions will be introduced, ultimately contributing to better livelihoods for the local population.

Conclusion

Aquaculture has the potential to be adopted across Odisha as a means of enhancing livelihood opportunities. The state has already established itself as a major fish producer in India. Freshwater prawn farming, in particular, offers a viable option for commercial small-scale operations. It can be carried out in limited space under varying environmental conditions, including extreme temperatures, with relatively low investment. However, further efforts are needed to maximise its potential.

To increase fish production, underutilised water bodies must be explored and managed sustainably. Both the central and state governments are prioritising prawn farming through various user groups and self-help groups as an alternative livelihood strategy. This study highlights the role of self-help groups as a process-driven initiative that organises rural communities, builds capacity, and facilitates exposure visits, enabling them to become self-managed entities.

More opportunities should be created, particularly for women, through better information sharing and technology transfer across different districts and states. Addressing the socio-economic challenges faced by farmers, improving aquaculture infrastructure, and adopting modern, robust management systems are essential for sustainable development.

Although freshwater prawn farming offers significant social and economic benefits, concerns remain about its long-term sustainability. High production costs, limited financial resources, scarcity and high cost of post-larvae, lack of technical knowledge, weak institutional support, and inadequate extension services pose challenges to expansion. If more areas were brought under prawn culture, Odisha could significantly increase its foreign exchange earnings through exports.

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