

Promoting farmed shrimp consumption in India's domestic market: A step towards sustainability

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Marketable-sized *Penaeus vannamei* in a farm in Purba Medinipur.

Economic importance of farmed shrimp

The brackishwater aquaculture industry plays a significant role in India's economy. Shrimp farming dominates this sector due to its high profitability. Initially, the industry was based on black tiger shrimp (*Penaeus monodon*). However, it has now shifted to white leg shrimp (*Penaeus vannamei*).

In West Bengal, *P. vannamei* is farmed commercially in the coastal districts of Purba Medinipur, South 24 Parganas, and North 24 Parganas. India is a major shrimp producer, with seafood exports worth ₹605.24 billion in 2023–2024. Frozen shrimp exports totaled 716,000 tonnes, contributing more than 66% (₹400.13 billion) of total seafood export earnings.

Penaeid shrimp are the main species in India's brackishwater aquaculture. In 2020–2021, India produced 852,000 tonnes of farmed shrimp, of which *P. vannamei* accounted for 816,000 tonnes (Courtesy: Dr D. De, Principal Scientist, ICAR, Government of India).

West Bengal has 59,490 hectares of brackishwater aquaculture. This includes 7,171 hectares in Purba Medinipur, 17,759 hectares in South 24 Parganas, and 34,560 hectares in North 24 Parganas. In 2024, shrimp production in the state

reached 70,366 tonnes. Scientific shrimp farming covers 4,500 hectares in Purba Medinipur, 770 hectares in South 24 Parganas, and 800 hectares in North 24 Parganas (Courtesy: Dr T. K. Ghoshal, Principal Scientist, ICAR, Government of India). In 2019, *P. vannamei* contributed nearly 72% of India's total shrimp export value.

With an estimated shrimp production of nearly 850,000 tonnes in 2023, India exported a similar volume. This accounted for more than 15% of the global shrimp trade (Courtesy: Yahira Piedrahita, Executive Director, National Chamber of Aquaculture).

In 2010, *P. vannamei* made up less than 5% of India's total shrimp production. By 2018, its share had risen to about 90%. According to M. M. Mondal, a progressive shrimp farmer in Purba Medinipur, farmers in West Bengal first adopted *P. vannamei* in 2013–2014. *P. monodon* was rarely preferred. *P. vannamei* has a smaller harvest size than *P. monodon*.

Approximately 30,000 shrimp farmers in West Bengal practice scientific farming. In 2018, the state's *P. vannamei* production reached about 85,000 tonnes, with a market value of ₹400 billion. In 2019, shrimp farming was affected by environmental hazards such as a super-cyclone. Despite this, production still reached 97,000 tonnes.

In Purba Medinipur, key *P. vannamei* farming sites include Vill. Bhuniapada, Vill. Thakurchak-Soula (under Junput Coastal PS, Contai-I CD Block), and Vill. Kalichak (under Contai-2 or Deshapran CD Block). The authors have visited these locations.

West Bengal is India's second-largest producer of farmed shrimp, after Andhra Pradesh.

Common diseases in shrimp farms in West Bengal

Shrimp diseases arise from four key factors: pathogens, the host, an unhealthy environment, and stressors or triggering factors. Low dissolved oxygen, poor water exchange, high stocking density, elevated water temperature, excessive turbidity, and overloading the pond's carrying capacity contribute to disease outbreaks.

White spot syndrome virus (WSSV) is a highly virulent, fast-replicating DNA virus. It has caused major losses in *P. monodon* aquaculture in West Bengal and other coastal states. WSSV leads to white spot disease in *P. monodon*, which begins with small white spots on the inner carapace and spreads across the body in advanced stages. The virus is



Healthy *P. monodon* harvested from ponds in South 24 Parganas (above) and Purba Medinipur (below).

more pathogenic at lower temperatures and spreads rapidly. During summer, infected *P. monodon* may survive without mortality.





Aerators in operation in four adjacent shrimp culture ponds.

In *P. vannamei*, WSSV infection is indicated by a whitish gut from day 25–30 of culture. A healthy shrimp has a blackish gut when the gastrointestinal tract is full. White faeces appear as floating strings in pond margins and corners, signalling white faeces Syndrome (WFS). Infected *P. vannamei* develop a pale gastrointestinal tract.

Microsporidian infection caused by *Enterocytozoon hepatopenaei* (EHP) leads to slow growth, reduced appetite, and chronic mortality. It spreads directly from shrimp to shrimp. The infection weakens the hepatopancreas, reducing its ability to absorb nutrients. The hepatopancreas turns pale. EHP is strongly linked to WFS. Infected *P. vannamei* excrete white faeces and, after one month, develop a soft-shell abnormality unrelated to moulting.

WFS is fully correlated with EHP and also linked to *Vibrio* bacteria. EHP and *Vibrio* infections together result in WFS. White faeces indicate a highly infectious stage of EHP in *P. vannamei* monoculture ponds. Other issues shrimp farmers face in West Bengal include ammonia-related problems in pond water and bottom soil, as well as loose shell disease. In loose shell disease, affected shrimp develop spongy abdomens, and the hepatopancreas shrinks.

Running mortality syndrome, not caused by viruses, appears when *P. vannamei* reach 10–15 grams, around day 60 of culture. Another condition, resembling red gut disease, occurs

between days 30 and 40. Infected shrimp swim to the water surface even when aeration and dissolved oxygen levels are normal. They stop eating, and their faeces turn red. A red or pink gastrointestinal tract signals disease in *P. vannamei*.

In South 24 Parganas, some brackishwater farmers practise modified-extensive polyculture. They grow *Catla catla*, *Lates calcarifer* (in small numbers), *Mystus gulio*, *Metapenaeus brevicornis*, *Macrobrachium rosenbergii*, *Liza tade*, *L. macrolepis*, *P. monodon*, and *P. vannamei* in the same water body. They believe that if shrimp production declines due to disease, marketable-sized fish will compensate for the loss.

Emerging problems and concerns for *P. vannamei* farmers

Shrimp farmers in West Bengal have reported several challenges. These include low harvest yields, increased feed requirements, high feed conversion ratios (FCR), abnormal shrimp behaviour, weakness, slow growth, and poor feed consumption.

Farmers purchase *P. vannamei* seeds in oxygen-packed containers from hatcheries in Andhra Pradesh, Tamil Nadu (locally known as “Andhra” and “Chennai” seeds), Odisha, and international suppliers approved by the Government of

India. However, these seeds are not always tested using polymerase chain reaction (PCR) for major shrimp pathogens. As a result, farmers cannot be sure that the post-larvae they stock are resistant to specific diseases. Market prices for harvested *P. vannamei* also fluctuate unpredictably.

Only shrimp farms registered with the Coastal Aquaculture Authority's Farm Registration Section are authorised to receive specific pathogen-free (SPF) *P. vannamei* seeds. Many farmers in Purba Medinipur and other districts are not registered, making them ineligible for SPF seeds.

Shrimp farming is under threat, leading to a decline in production. Commercial shrimp culture has dropped by 30% compared to a decade ago. Many farmers in West Bengal have suffered heavy financial losses. Frustrated and discouraged, some are abandoning shrimp farming.

A significant number of shrimp farmers are shifting to other forms of aquaculture. These include brackishwater polyculture with *P. monodon* and mullets (*L. tade*, *L. parsia*, *L. macrolepis*), *M. gulis* monoculture, monosex tilapia culture, mud crab farming and fattening in brackishwater ponds, and Indian major carp farming in freshwater ponds.

The decline in shrimp farming is driven by several factors. These include poor-quality *P. vannamei* seed, disease outbreaks, improper farm management, and environmental hazards. Most shrimp farmers in Purba Medinipur struggle to obtain high-quality seeds.

Apart from these issues, other critical factors affecting shrimp farming include rising production costs. The increasing expenses for shrimp seed, feed, medicine, and fuel for aerators and other farm operations have pushed many farmers into financial crisis. The cost of shrimp production in West Bengal is higher than in other coastal states.

To maintain adequate dissolved oxygen levels in farm ponds, farmers rely on diesel generators, which increases costs. Most farms do not have an electricity connection registered in the farmer's name. Diesel pumps are also used to draw canal and creek water into *P. vannamei* ponds during high tide. With rising fuel prices, these costs continue to escalate.

P. vannamei farming is now highly dependent on commercial aquaculture products marketed by private companies. It also requires more formulated feed than *P. monodon*. To cover initial input costs, many farmers take large loans from village moneylenders (Mahajans), Gram Panchayats, or fish feed dealers from private companies. These loans carry high interest rates, reducing overall profits.



First author observing growth of *P. vannamei*.



Close view of a aerator in operation in shrimp pond.

Many *P. vannamei* farmers in the three coastal districts of West Bengal struggle to repay loans due to lower-than-expected shrimp production and profits. Healthy, marketable shrimp fetch high prices in international markets, but farmers receive only a small fraction of the value. Buyers and middlemen dictate the selling price, often depriving farmers of fair earnings. This discourages shrimp producers and negatively impacts their livelihood.

Recently, the *P. vannamei* farming industry has faced setbacks due to price fluctuations, despite strong market demand. Rapidly increasing shrimp production has led to market price declines. Farmers sell their shrimp directly to exporters or middlemen but lack access to real-time market information, pricing trends, and export potential. Middlemen buy shrimp at low prices and sell them to exporters at higher rates, earning commissions while farmers bear financial losses. Many shrimp farmers do not receive a fair price for their harvest, affecting their economic stability.

In addition to disease outbreaks, declining profit margins, and rising costs, unpredictable weather conditions present a major challenge. The West Bengal coast is prone to cyclones, which cause high shrimp mortality. Severe cyclonic storms such as Aila (25 May 2009), Amphan (19–20 May 2020), Bulbul (9–10 November 2019), and Yaas (25–26 May 2021) coincided with spring tides, leading to floods and coastal inundation.

These disasters have caused severe damage to commercial *P. vannamei* farming in semi-intensive and intensive systems across the three coastal districts in recent years.

Steps to address these challenges

To ensure the long-term sustainability of shrimp farming in West Bengal, several strategic measures must be taken.

The first step is to establish cold storage facilities in key shrimp farming areas. Many farmers are forced to harvest prematurely when their farms are at risk of disease outbreaks. This results in smaller shrimp being sold urgently (emergency harvest), often at very low prices set by buyers and exporters. Since shrimp is highly perishable, farmers have no choice but to sell at these rates. Cold storage facilities would extend the shelf life of harvested *P. vannamei*, preventing distress sales. Ice plants and processing units should also be set up near farming regions to ensure harvested shrimp remain in good condition.

The West Bengal Fisheries Department should organise more training programmes at the block level. These programmes would provide shrimp farmers and underemployed rural youths with knowledge of the latest developments in shrimp farming science and technology.



A shrimp farm in Purba Medinipur.

Considering the coastal geography of West Bengal, authorities should review the *Coastal Regulation Zone Act* to allow sustainable shrimp farming without unnecessary legal obstacles. Regulations could be modified in specific areas to ensure uninterrupted farming.

Private sector companies supplying shrimp feed and farm inputs should address farmers' concerns and needs. The rising cost of shrimp feed, medicines, and pond treatment products makes farming less viable. These products should be made available at reasonable prices.

If shrimp farmers can maintain their livelihoods, the entire shrimp trade and related industries will remain active. Farmers should be made aware of the opportunities in brackishwater aquaculture and provided with the necessary support. Subsidies for seed, feed, and electricity supply could help reduce production costs.

Garlic, a commonly available natural remedy, is known to enhance disease resistance in *P. monodon* and *P. vannamei*. Its use in shrimp farming should be promoted as a low-cost method to improve shrimp health.

Health benefits of eating shrimp

P. vannamei, *P. monodon*, and *P. indicus* contain the carotenoid nutrient astaxanthin, which helps strengthen arteries and reduces the risk of heart attacks. Shrimp contains no trans fats.

According to a study published in the *International Journal of Fisheries and Aquaculture* (July 2013) by scientists from CAS in Marine Biology, Faculty of Marine Sciences, Annamalai University, *P. vannamei* is a good source of omega-3 long-chain fatty acids and protein. It provides high-quality protein, calcium, essential minerals, and bioactive compounds, while being low in calories and fat. Shrimp is also beneficial for brain health and thyroid function. It contains essential nutrients such as vitamin B12, selenium, zinc, and phosphorus.

Dr. P. Bandyopadhyay, in his article *Future of Indian Shrimp Industry and Expectation in 2020* (Bengal Aqua Expo Souvenir, February 2020), highlighted several health benefits of farmed shrimp consumption. These include weight loss, anti-aging properties, improved bone health, and reduced risk of cardiovascular diseases. Shrimp can help lower blood pressure and reduce the chances of heart disease.

Researchers Dr. D. Das, Dr. J. Islam, and Dr. A. Shinn have also identified shrimp as a nutritious food, rich in digestible protein and highly unsaturated fatty acids (EPA and DHA). It also has cholesterol-lowering properties, making it a healthy dietary choice.

Promoting farmed shrimp consumption in India's domestic market

Mr. Y. Piedrahita, Executive Director of the National Chamber of Aquaculture, highlighted this issue in his article *Shrimp Producers in India Are Betting on the Local Market to Keep the Industry Afloat*, published in the April 2024 issue of *AQUACULTURA*. Given the significant health benefits of farmed shrimp, promoting domestic consumption is one of the key strategies proposed to support the shrimp farming industry in India.

Dr. D. Das, Dr. J. Islam, and Dr. A. Shinn, in their article *Now Is the Time for India to Increase Its Consumption of Locally Produced Shrimp* (*Aquaculture Spectrum*, June 2020), argued that raising awareness of shrimp's health benefits will boost domestic demand. They emphasised the need to develop strategies for popularising shrimp and shrimp-based products in India. The dietary preferences of India's affluent middle class and urban consumers are shifting towards "safe food," creating an opportunity to supply high-value, ready-to-eat shrimp products.

To achieve this, strategic marketing initiatives are necessary. These include attractive packaging, clear shrimp nutrition labels, and best management practices (BMP) and Hazard Analysis and Critical Control Points (HACCP) certifications. Mass media campaigns—through social media, television, and print media—should also be used to promote shrimp consumption.

Below: Shrimp farm in South 24 Parganas.

Mr. Piedrahita further noted that as India's population grows, so does its awareness of health and nutrition. This presents a promising opportunity to promote fish and seafood consumption. To expand domestic shrimp sales, shrimp must be readily available, affordable, and recognised as a desirable protein source. Encouraging a shift in consumer dietary preferences is essential.

Large-scale information campaigns are needed to highlight the benefits of eating shrimp. Leading companies like Falcon Marine Exports in Bhubaneswar, Odisha, and Zhingalala, a shrimp-specialty restaurant in Surat, Gujarat, have already started initiatives to boost local shrimp demand. The Prawn Farmers Federation of India (PFFI) has submitted an action plan to the Indian government to develop the domestic shrimp market. PFFI aims to establish efficient distribution networks, ensure a steady supply of high-quality shrimp at reasonable prices, and meet consumer demand nationwide.

Mr. V. Balasubramaniam, Secretary General of PFFI, believes this approach will help stabilise shrimp prices for farmers while benefiting households, hotels, and the food industry. He sees this as an ideal time to promote shrimp consumption, particularly smaller shrimp sizes, which are preferred in Indian cuisine. Expanding local sales would ensure fair prices for consumers while maintaining profits for producers.

Dr. M. Krishnan and Dr. S. Chandra Babu, in their article *COVID-19 Opens Up the Domestic Market for Indian Shrimp* (*Aquaculture*, March 2022), highlighted how India's shrimp industry adapted to local demand when exports collapsed during the COVID-19 lockdowns. Since 15 March 2020, Indian shrimp farmers have realised the potential of the domestic market. The authors presented two case studies, one at the farm level and one at the industry level, demonstrating how the global shrimp market disruptions created new domestic demand.

Organisations such as the Marine Products Export Development Authority (MPEDA), the National Fisheries Development Board (NFDB), and the Andhra Pradesh Aquaculture Authority are now actively working to develop and promote the domestic shrimp market. The All-India Shrimp Farmers Association is also leading efforts to organise shrimp production and sales through e-commerce and retail store networks.

