

The Global Shrimp Feed Industry: Current Status, Challenges, and Future Directions

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Abstract

The shrimp feed industry has emerged as one of the most dynamic segments of aquaculture, directly influencing the productivity, sustainability, and profitability of shrimp farming. With farmed shrimp accounting for a major share of global shrimp supply, specialized feeds now represent the largest production cost, typically 40–60% of total farming expenses. Over the last two decades, the industry has shifted from fishmeal-dependent formulations toward more diversified ingredients including plant proteins, animal by-products, insect meals, and single-cell proteins. In parallel, the use of functional feed additives probiotics, prebiotics, phytogenics, and immunostimulants has expanded to address disease management challenges such as white spot syndrome virus (WSSV) and early mortality syndrome (EMS). Technological advances in feed manufacturing, pellet stability, and nutritional optimization have reduced feed conversion ratios (FCRs) and improved water quality management. However, raw material price volatility, disease outbreaks, and environmental concerns remain persistent challenges. This review provides a comprehensive analysis of the global shrimp feed sector, focusing on market trends, nutritional requirements, ingredient innovation, manufacturing technologies, economic and environmental challenges, and future research directions. Emphasis is placed on India, one of the fastest-growing shrimp producers and feed markets.

Keywords: Shrimp feed, aquafeed, fishmeal replacement, aquaculture, sustainability, probiotics, India

1. Introduction

The majority of seafood consumed globally now comes from aquaculture rather than catch fisheries (FAO, 2022). Among the most lucrative aquaculture products are shrimp (*Penaeus vannamei* and *P. monodon*), which are particularly important to global trade and rural lives in Asia and Latin America. Nearly 55% of the world's shrimp output in 2021 came from farmed shrimp, with China, India, Vietnam, Thailand, and Ecuador being the main producers, according to FAO (2022).

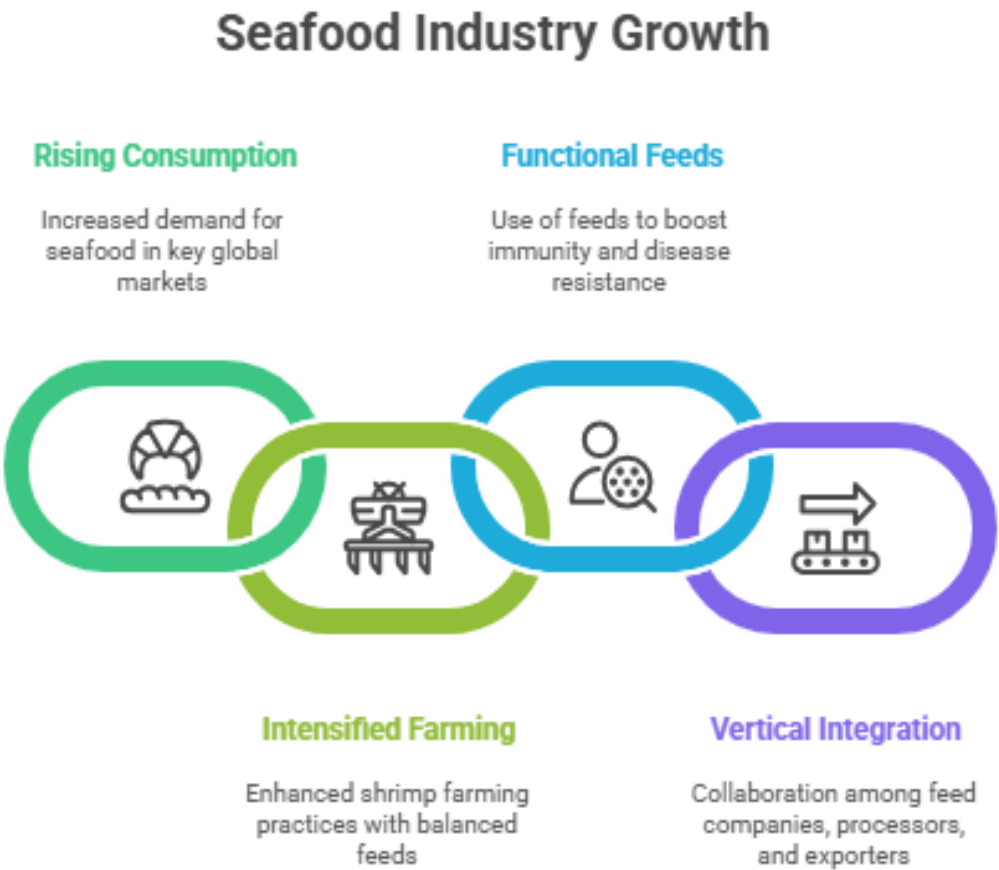
A key component of this manufacturing method is feed. The enormous stocking densities

employed in contemporary intensive culture methods mean that farmed shrimp, in contrast to filter-feeding fish, rely significantly on prepared feeds. Usually accounting for 40% to 60% of overall operational costs, feed expenditures are up the highest percentage of farming expenses (IMARC Group, 2024). Profitability, sustainability, and product quality are therefore directly impacted by feed composition, manufacturing quality, and feed management techniques.

This article reviews the current status of the shrimp feed industry with emphasis on nutritional foundations, ingredient trends, functional additives, manufacturing technology, and economic and environmental challenges. It also highlights the Indian shrimp feed industry as a regional case study and outlines future research and development directions.

2. Global Market Trends

The global shrimp feed market is valued at **USD 6.5–7.0 billion in 2024**, with projections to reach **USD 10 billion by 2032**, growing at a compound annual growth rate (CAGR) of 5–6% (IMARC Group, 2024; GMI Insights, 2025). This expansion is driven by:



Region	Key Countries	Market Share (%)	Notable Companies
Asia-Pacific	China, India, Vietnam, Thailand	65	CP Aquaculture, Avanti Feeds, Tongwei

Latin America	Ecuador, Brazil, Mexico	20	Skretting, Inve Aquaculture, Biomar
Others	Middle East, Africa, USA	15	Local/regional players

(Source: FAO, 2022; IMARC Group, 2024; GMI Insights, 2025)

Asia-Pacific dominates global shrimp feed production due to its farming intensity, with India and Vietnam showing the fastest growth. Ecuador leads in Latin America, exporting high-quality shrimp to Europe and the U.S.

3. Nutritional Foundations of Shrimp Feed

Shrimp have distinct nutritional requirements compared to finfish, and diets must be formulated accordingly:

- **Proteins & Amino Acids:** Shrimp feeds generally contain 30–45% crude protein. Essential amino acids such as methionine and lysine are critical for growth and immunity. Imbalanced protein leads to reduced feed efficiency and disease susceptibility (Li, 2024).
- **Lipids & Fatty Acids:** Lipid levels (6–10%) are optimized to provide energy and essential fatty acids (EPA, DHA, ARA). Deficiencies impair molting and growth.
- **Carbohydrates:** Although shrimp have limited carbohydrate utilization capacity, small amounts improve pellet binding and energy sparing.
- **Vitamins & Minerals:** Micronutrients such as vitamin C, E, selenium, and zinc enhance stress tolerance and disease resistance.
- **Feed Conversion Ratio (FCR):** Efficient feeds achieve FCR values between 1.3 and 1.6 in intensive systems.

4. Feed Ingredients and Formulation

4.1 Fishmeal Dependence

Fishmeal (FM) has long been considered the gold standard protein source for shrimp feed due to its digestibility and amino acid profile. However, limited supply and price fluctuations (USD 1,400–2,000/ton in recent years) make FM a costly ingredient (Serra, 2024).

4.2 Plant Proteins

Soybean meal (SBM), corn gluten meal, and pulses are widely used alternatives. Enzyme-treated soybean meal has shown improved digestibility and performance in *P. vannamei* (Shao, 2025). However, anti-nutritional factors such as trypsin inhibitors and

lectins require processing or supplementation.

4.3 Animal By-products

Poultry by-product meal and feather meal provide cost-effective protein sources with good amino acid balance. Their inclusion is limited by concerns over biosecurity and variable quality.

4.4 Novel Proteins

- **Insect Meals:** Black soldier fly (*Hermetia illucens*) larvae meal is highly digestible and sustainable.
- **Algal & Single-cell Proteins:** Offer omega-3 fatty acids and pigments (e.g., astaxanthin).
- **Fermented Plant Proteins:** Reduce anti-nutritional factors and improve gut health.

5. Additives and Functional Feeds

Modern shrimp feed increasingly includes additives to improve performance:

- **Probiotics & Prebiotics:** Enhance gut health and immunity (Hoa, 2023).
- **Immunostimulants:** Compounds such as beta-glucans and nucleotides improve disease resistance.
- **Phytogenics:** Plant extracts (e.g., garlic, oregano oils) act as antimicrobials and antioxidants.
- **Enzymes:** Phytase and proteases enhance nutrient digestibility.

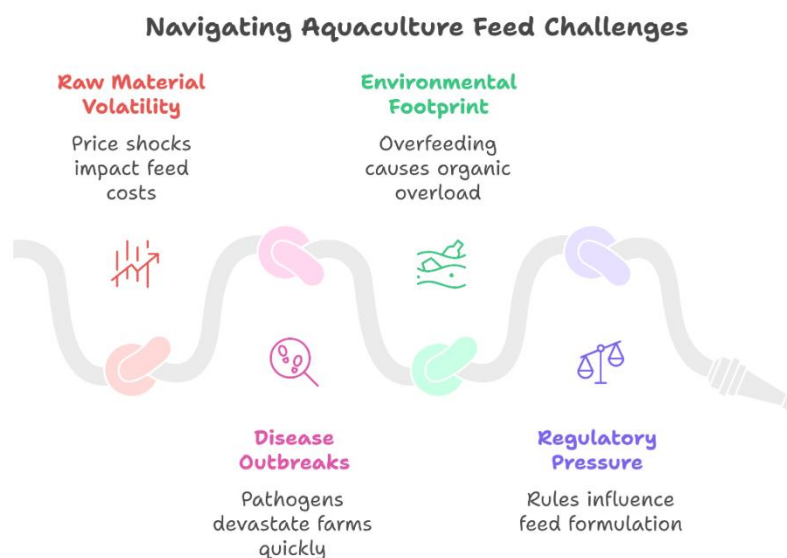
These additives not only improve growth but also serve as **biosecurity tools** against pathogens.

6. Manufacturing and Pellet Technology

Feed pellet quality is critical in shrimp farming because shrimp are **slow feeders**. Key factors include:

- **Water stability:** Pellets must remain intact for 2–3 hours to minimize nutrient leaching.
- **Extrusion technology:** Produces uniform, water-stable pellets with better digestibility.
- **Life-stage feeds:** Micro-pellets and crumbles for larvae and post-larvae, specialized broodstock diets enriched with HUFA and vitamins.

7. Economic and Environmental Challenges



8. Regional Case Study: India

India is currently the **largest exporter of farmed shrimp**, with production exceeding 0.9 million metric tons in 2023. Feed manufacturing is led by companies such as:

- **Avanti Feeds Ltd.** (market leader, ~45% share).
- **CP Aquaculture India.**
- **Growel Feeds.**

Avanti Feeds' annual report (2024) highlights continuous investment in feed R&D, capacity expansion (1.75 MMT feed capacity), and farmer support programs. India's feed industry is transitioning toward sustainable proteins and functional feeds, with government initiatives encouraging reduced fishmeal dependence.

9. Future Prospects and Research Directions



10. Conclusion

The shrimp feed industry has entered a transformative phase, moving from fishmeal reliance toward diversified, sustainable, and functional feed formulations. Technological innovations in manufacturing and the inclusion of probiotics and immunostimulants are reshaping the landscape. However, persistent challenges raw material volatility, disease, and environmental impacts necessitate coordinated industry, policy, and research efforts. For countries like India, feed innovation is central to sustaining global competitiveness and farmer profitability.

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