

Shrimp farming in India: A Blue Finance opportunity

A strategic financing playbook for
sustainable aquaculture investment



Monterey Bay
Aquarium



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Cover image: Shrimp in hand, freshly harvested.
Photo by Biswa1992 via iStock.com.



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Acronyms

ASC	Aquaculture Stewardship Council
BAP	Best Aquaculture Practice
DFI	Development Finance Institution
GW	Gigawatt
M&E	Monitoring and Evaluation
MPEDA	Marine Products Export Development Authority
NBFC	Non-Banking Financial Company
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
PM-Surya Ghar	Pradhan Mantri Surya Ghar Muft Bijli Yojana
SDG	Sustainable Development Goal
UNEP FI	United Nations Environment Programme Finance Initiative

Introduction



Photo 1. Aerial view of an aquaculture pond surrounded by other bodies of water. Photo: ebin francis / iStock.com.

Market position and opportunity

The eastern states of Andhra Pradesh, Odisha, and West Bengal constitute India's shrimp farming powerhouse, contributing over 70% of national output (Statista, 2024). South Asia as a whole produces approximately 15% of total global aquaculture. India's position as the second-largest aquaculture producer provides it with an exceptional opportunity to introduce new and innovative sustainable management practices and influence change across the sector. Despite this production strength, the sector faces critical challenges: limited access to formal finance, environmental sustainability concerns, and supply chain inefficiencies that constrain smallholder participation and sector growth potential.

Strategic framework

This playbook outlines a systematic approach to address these challenges through Blue Finance principles,¹ multi-stakeholder engagement, and technology-enabled solutions. The strategic framework comprises four primary objectives:

- **Capital access enhancement:** expanding financial inclusion through innovative underwriting and risk assessment models
- **Institutional capacity building:** strengthening capabilities across the financial ecosystem
- **Sustainability integration:** embedding environmental stewardship into financing structures
- **Market development:** creating pathways to premium markets through certification and traceability

¹Blue Finance refers to sustainable financing mechanisms specifically designed to support ocean and coastal ecosystem health while generating positive economic and social returns. It encompasses financial instruments, investment approaches, and market mechanisms that channel capital toward activities contributing to ocean conservation, sustainable marine resource use, and coastal community resilience.



Investment thesis

The convergence of evolving financial regulatory requirements, increasing market demand for sustainable seafood, and rapid technological advancements presents a unique and transformative investment opportunity. The sector is poised to address critical structural barriers in the seafood industry, unlocking significant economic value while driving measurable environmental and social impact.

Governments and international bodies are tightening financial and environmental regulations to combat overfishing, reduce carbon emissions, and ensure traceability in global supply chains. These regulatory shifts create a fertile environment for innovative financial products that align with compliance requirements while incentivizing sustainable practices. Investors who act now can capitalize on these regulatory tailwinds, positioning themselves as leaders in a rapidly evolving market. The opportunities and benefits of this initiative lie in the following:

- 1. Rising market demand for sustainable seafood:** Consumer preferences are shifting toward sustainably sourced seafood, driven by growing awareness of overfishing, ocean health, and ethical supply chains. Retailers and food service providers are responding by prioritizing suppliers who meet sustainability certifications. This demand creates a premium market segment that is ripe for investment, offering both financial returns and the opportunity to support responsible industry practices.
- 2. Technological innovation as a catalyst:** Innovations address long-standing challenges such as bycatch reduction, habitat preservation, and fraud prevention. Strategic investment in these technologies can accelerate their adoption, creating scalable solutions.
- 3. Addressing structural barriers with targeted financial products:** Despite the clear opportunities, progress is hindered by structural barriers such as access to capital for small-scale fisheries and the high upfront costs of adopting new technologies. By designing targeted financial products, such as green/blue bonds, impact funds, or blended finance models, this initiative can bridge the gap, enabling stakeholders to transition to sustainable practices. These financial instruments not only mitigate risk but also attract a diverse pool of investors seeking both impact and returns.
- 4. Delivering triple-bottom-line impact:** This investment strategy aligns economic, environmental, and social objectives. By fostering sustainable seafood production, it contributes to global food security, supports coastal communities, and protects marine ecosystems. Measurable outcomes, ranging from reduced overfishing to improved livelihoods, enhance the initiative's appeal to impact-driven investors and stakeholders.

This is not just an investment in sustainable seafood—it is an investment in the future of our oceans, our communities, and our planet.

Section 1: Sector analysis of India's shrimp market

Regional production: the eastern powerhouse

East India has emerged as the driving force behind the nation's shrimp farming industry, consolidating India's position as one of the world's leading aquaculture producers. The transformation from traditional extensive farming techniques to a more advanced, intensive aquaculture model has been pivotal to the regional economy and to India's integration into global seafood value chains.

ANDHRA PRADESH: PRODUCTION LEADERSHIP

Andhra Pradesh stands at the pinnacle of this growth trajectory. In 2022–23, the state produced 815,745 metric tons of shrimp across 108,000 hectares under active cultivation. This achievement reflects a sophisticated integration of hatcheries, feed manufacturers, and processing units linked to state-of-the-art export infrastructure (Marine Products Export Development Authority [MPEDA], 2024).

The emphasis on whiteleg shrimp (*Litopenaeus vannamei*), which accounts for the majority of production, has capitalized on global consumption trends. Renewed interest in black tiger shrimp (*Penaeus monodon*) is driving diversification and value addition. Technological adoption, biosecurity improvements, and market responsiveness give Andhra Pradesh its competitive advantage.

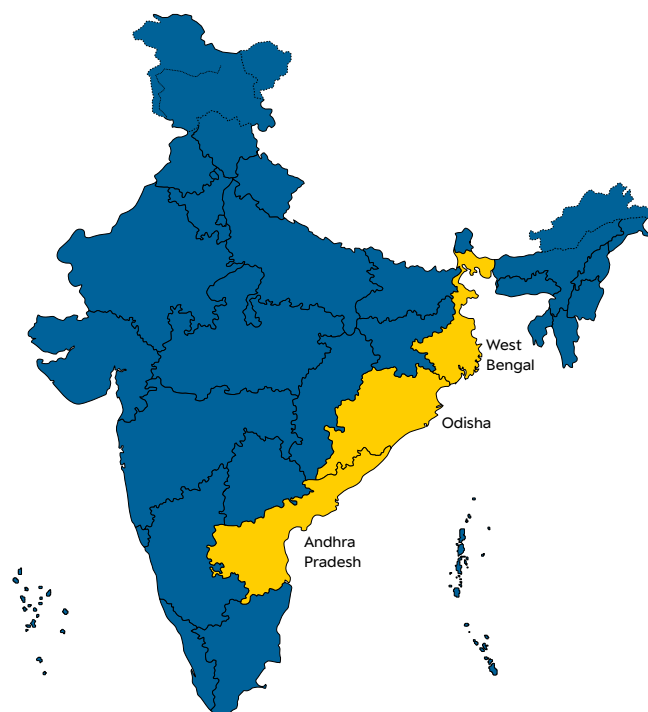


Figure 1. The “eastern powerhouse” driving India's shrimp production.



ODISHA AND WEST BENGAL: GROWING PRODUCTION MARKETS

Odisha and West Bengal, while smaller in absolute output, have demonstrated double-digit growth over two decades. Odisha's expansion from 6,000 to nearly 18,000 hectares has been matched by rising productivity and the proliferation of disease-resilient farming clusters (Cornell, 2024). The state is establishing leadership in sustainable aquaculture through pilot programs supporting traceability and international certifications.

West Bengal continues to leverage its heritage in extensive black tiger shrimp farming and remains India's leading state for black tiger shrimp production, serving buyers seeking organic and low intensity aquaculture products. Both Odisha and West Bengal have become focal points for government and private investment in innovation, skills development, and market access.

Export market dynamics

India's shrimp sector is fundamentally export-oriented, with international supply chains absorbing over 90% of farmed shrimp production (MPEDA, 2024). Export performance is central to the sector's growth, sustaining rural livelihoods and contributing significantly to national foreign exchange earnings.

Historically, the market was structured to serve U.S. demand, which accounted for 32–40% of India's total shrimp exports. This reliance has created a critical vulnerability. Since August 2025, the imposition of a combined 50% tariff by the United States on top of existing duties has raised the effective tariff rate to approximately 60%. This shift from prior duty-free access makes Indian shrimp markedly less competitive against other suppliers to the United States such as Ecuador (15% tariff), Vietnam (20%), and Thailand (19%).

The consequences are immediate and severe. Projections showed India's shrimp export volumes set to decline by 15–18% in fiscal year 2025, with some estimates warning of monthly declines by as much as 75% due to contracting processing capacity. In stark contrast, Ecuador has solidified its competitive position. Its shrimp exports grew 35% year-on-year to over 102,000 metric tons in early 2025, driven by expansion into new markets and technological modernization that has tripled yields per hectare. For India's export-dependent sector, this new competitive landscape makes market diversification beyond the United States imperative for survival and future growth.²

² The tariff data and export market projections are drawn from multiple industry sources reporting on India–U.S. trade relations and competitive shrimp export dynamics as of October 2025, including analyses from *The Wire* (2025), *The Economic Times* (2025), *Seafood Media* (2025), and *FZ Easy Seafood* (2025).



MARKET DIVERSIFICATION STRATEGY

The United States remains the dominant destination for shrimp from India, accounting for over one-third of revenues and creating sustained demand for value-added, ready-to-cook, and specialty products. China and the European Union have reinforced India's global market presence, presenting distinct regulatory landscapes and consumer profiles that shape compliance strategies and product development.

While historically smaller, Southeast Asian markets now represent a critical growth frontier for Indian shrimp producers. Rising demand in this region, particularly for processed and high-value products, presents a vital opportunity for strategic market diversification. Capitalizing on these expanding markets is essential for mitigating reliance on single regions and building a more resilient, globally competitive export footing for the future.

ENHANCING VALUE THROUGH PROCESSING

India's shrimp processing industry has demonstrated agility in delivering diverse product formats—peeled, deveined, seasoned, or cooked—to satisfy evolving global buyer preferences. Investment in sustainability certification and digital traceability increasingly opens access to premium segments while bolstering the country's reputation for quality and responsibility.

Competitive landscape analysis

India's principal competitors in the global shrimp industry include Ecuador, Vietnam, Indonesia, and Thailand. India differentiates itself through several critical advantages, including:

Integrated value chain strength: The nation's integrated value chain—from broodstock and feed through processing and cold storage—enables tighter quality control and rapid scaling in response to demand fluctuations. It is important to note that while farms are not directly integrated into this value chain, they are supported by a large, skilled, and entrepreneurial workforce operating across smallholder and commercial farms.

Innovation and compliance leadership: Innovation in disease management, species diversification, and environmental standards compliance helps India maintain its competitive advantage and exceed benchmarks set by regional peers.

The shrimp sector in India still faces challenges with keeping ponds clean, following environmental rules, and dealing with unpredictable prices in a competitive market. Keeping ponds in good sanitary condition is vital for running a successful business and gaining the trust of lenders. Disease outbreaks can ruin production and lower the value of assets used as collateral for loans, making it riskier for both farmers and financiers.



Section 2: Stakeholder ecosystem and partnership framework

Strategic stakeholder mapping

The success of Blue Finance implementation depends on collaborative engagement across a diverse stakeholder ecosystem. Each group contributes unique capabilities, resources, and perspectives that are essential for creating scalable and sustainable financial solutions.

PRIMARY PARTNERS: STRATEGIC CORE

Primary partners serve as co-architects of the Blue Finance system, providing specialized expertise in marine science, sustainable finance, and market dynamics. Academic partners contribute scientific research and marine conservation understanding, ensuring that financial models are grounded in ecological sustainability.

Strategic advisory firms provide critical expertise in inclusive finance and market-based solutions for developing economies. They bridge the gap between smallholder farmers and formal financial systems by designing innovative credit assessment tools, de-risking mechanisms, and commercially viable business models.

International bodies and multilateral organizations provide platforms for sharing knowledge, policy dialogue, and global best practice. These relationships connect local initiatives to broader regional and global trends in sustainable aquaculture.

GOVERNMENT RELATIONS: FRAMEWORK ENABLERS

Government entities create supportive and predictable environments for Blue Finance implementation. Regulatory agencies and policymakers, including MPEDA and the Department of Fisheries, establish standards for biosecurity, environmental compliance, and food safety.

Development institutions and government-backed financial bodies act as anchor investors, provide credit guarantees, and fund critical research and development. Their participation helps de-risk private investment and signals strong government backing, building confidence among financial sector players.



FINANCIAL SECTOR: CAPITAL PROVIDERS

Commercial banks and non-banking financial companies (NBFCs) represent the largest potential capital source. This initiative involves equipping them with the tools and insights needed to understand and price aquaculture risk accurately through alternative credit scoring models, sector-specific loan products, and sustainability performance assessment frameworks. NBFCs form a critical part of the financial ecosystem in India and South Asia by offering credit, investment, and specialized financing in areas that may not be adequately covered by banks. Regulated by the Reserve Bank of India,³ they provide essential services to small-scale farmers where accessing capital for operating expenses can directly impact operational performance and harvests. This innovative collaboration between farmers and NBFCs can create new solutions including unsecured lending solutions, asset-backed loans, and working capital financing.

Insurance providers are critical for addressing production risks, from disease outbreaks to extreme weather events, and are a pillar of the financial ecosystem. Collaboration with insurers on the development of tailored insurance products can protect farmers from catastrophic losses, improving bankability. Development finance institutions (DFIs) and impact investors play vital catalytic roles, entering markets and absorbing risks that commercial financiers will not initially accept.

SUPPLY CHAIN PARTNERS: MARKET CONNECTORS

Processors and export companies, often with highly integrated value chain relationships, are essential for promoting fair value capture and improving market access. Partnerships can encourage transparent pricing, timely payments, and support for farmers pursuing sustainability certification. Companies such as Thai Union (Asian Development Bank, 2025) and Omarsa (International Finance Corporation, 2023) have successfully partnered with DFIs to address their full value chain through securing blue loans and dedicated aquaculture funding to support improvements and scalability in the sector.

Feed dealers and input suppliers significantly influence farms' operational costs and success. These stakeholders often are the first point of interaction with farmers, providing advice and information directly to them. This collaboration facilitates the adoption of high-quality, sustainable inputs and provides channels for disseminating best practices.

Certification bodies and programs, such as the Aquaculture Stewardship Council (ASC) and Best Aquaculture Practices (BAP), can provide links to premium international markets demanding verifiable sustainability. The Monterey Bay Aquarium Seafood Watch program publishes a rating system that helps consumers make informed decisions on a sector and commodity's practices. As of September 2025, only 3% of Indian whiteleg shrimp production is certified (Figure 2).

³ Banks and NBFCs are different entities, subject to different statutory and regulatory requirements. However, NBFCs lend and make investments and hence their activities are akin to those of banks. The major differences between banks and NBFCs are: NBFCs cannot accept demand deposits; NBFCs do not form part of the payment and settlement system and cannot issue cheques drawn on themselves; and the deposit insurance facility of the Deposit Insurance and Credit Guarantee Corporation is not available to depositors of deposit taking NBFCs (Reserve Bank of India, 2025).

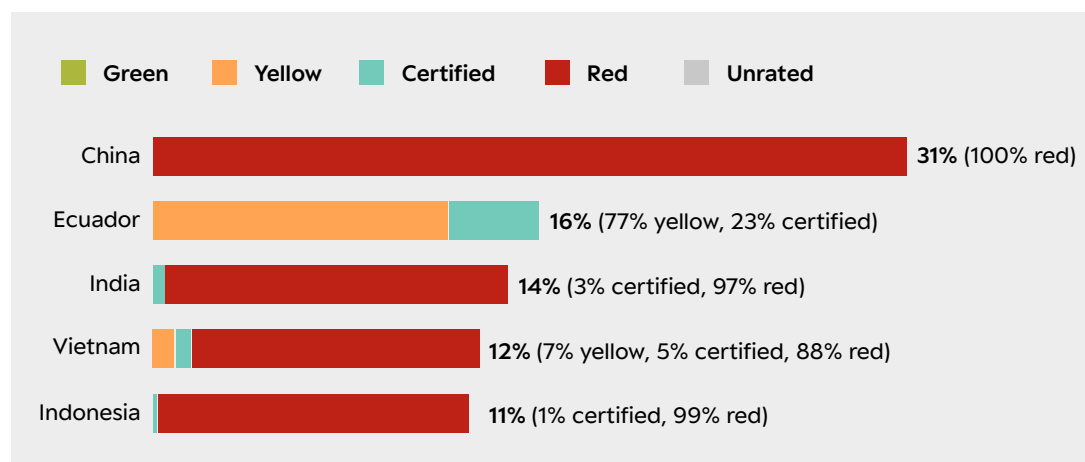


Figure 2. Top countries farming whiteleg shrimp (percent of global production) by Monterey Bay Aquarium Seafood Watch.

Transparency across the supply chain provides investors with additional confidence and information on key sustainability and human rights issues such as bonded and forced labor, working conditions, and overall sanitation and safety. A report by the Monterey Bay Aquarium (2024) states:

“Several indicators of forced labor in shrimp farming were reported by different sources in 2023 and 2024 including excessive working hours, the use of recruitment fees and potential for debt bondage, forced and unpaid overtime, physical violence and verbal abuse, sexual harassment, restriction of movement, and unsafe working and poor living conditions.”

Supply chain management is essential for ensuring sound labor practices, including addressing forced labor in the value chain, and protecting workers’ welfare.

Multi-stakeholder engagement

GOVERNMENT-LED POLICY ALIGNMENT

Close alignment with government agencies at every level is central to this initiative. Policy guidance and regulatory support from bodies such as MPEDA establish the enabling environment required for sector-wide improvements. Government leadership sets standards for environmental and social compliance while creating foundations for public–private partnerships.

BLENDED FINANCE ARCHITECTURE

Blended finance has emerged as a transformative mechanism to unlock capital for smallholder aquaculture and sustainable agriculture sectors in India. Traditional lending models often marginalize small-scale producers, citing high risks and informality. Blended finance bridges this gap by strategically combining public guarantees, concessional funding, and commercial investments, effectively lowering barriers to credit and mitigating risks for farmers (Akazawa et al., 2014; Blended Finance Taskforce and SYSTEMIQ, 2020).

Through a collaborative approach, blended finance leverages risk-sharing partnerships between



development banks, government credit schemes, and private financial institutions. This enables the extension of credit and insurance to previously underserved producers, fostering financial inclusion and sectoral growth (International Finance Corporation, 2024; Convergence, 2019). Government incentives, such as interest subsidies and sustainability-linked subsidies, further align programs with national development priorities, amplifying their impact (Blended Finance Taskforce and SYSTEMIQ, 2020; AQUADAPT, 2025).

India can harness the full potential of blended finance by integrating private and philanthropic capital with public-sector investments. This approach not only enhances financial resilience but also introduces innovative solutions like crop insurance and re-insurance to de-risk investments. These insurance products safeguard returns against sector-specific challenges, making blended finance structures highly attractive to a diverse range of investors (UBS, 2024). By fundamentally strengthening risk models and mitigation strategies, the sector can open itself up to more attractive and innovative financial instruments such as equity and venture capital.



Photo 2. Fresh shrimp displayed for buyers at a local fish market. Photo: Yamtono_Sardi / iStock.com.

SUPPLY CHAIN INTEGRATION

Integration of these strategies and instruments across the full aquaculture supply chain is essential for achieving scalable outcomes. This requires collaborative relationships between hatcheries, feed and input suppliers, farmers, processors, and exporters. Such integration produces benefits at every stage, with transparent and efficient contract farming models guaranteeing fair prices, partnership agreements requiring sustainable procurement, and collective marketing initiatives positioning Indian shrimp as competitive globally.



Section 3: Market opportunity and investment assessment

Structural market analysis

The Indian shrimp aquaculture sector presents a complex landscape of challenges that simultaneously offer compelling investment opportunities. Addressing structural barriers through strategic financial interventions can unlock significant economic value while improving livelihoods and building sustainable food systems.

BARRIERS TO FINANCIAL INCLUSION

For most small-scale shrimp farmers, accessing formal credit remains the primary obstacle to growth and stability. Traditional financial systems are ill-equipped to serve this sector, creating dependency cycles and limiting upward mobility.

Restrictive financing models rely heavily on tangible collateral, such as land titles, which many smallholder farmers—especially those operating on leased land—cannot provide. This immediately precludes a vast section of the farming community from accessing the capital needed for pond preparation, high-quality inputs, and operational expenses.

In the absence of formal financing, shrimp farmers frequently rely on informal credit sources such as feed dealers, a practice that brings significant operational and financial challenges. These arrangements often lack transparency, carrying high implicit interest rates and binding farmers to sell their harvests at predetermined, non-competitive prices. Such dependencies can undermine the financial stability of small-scale operations and restrict farmers' ability to seek better market opportunities.⁴

OPERATIONAL RISK FACTORS

Beyond financial constraints, farmers face significant operational hurdles that directly impact profitability and sustainability. Outbreaks of disease, such as White Spot Syndrome Virus and Early Mortality Syndrome, represent the greatest threat to farmer livelihoods. A single outbreak can eliminate the entire crop, leading to catastrophic financial losses.

The push for higher yields has led to over-reliance on manufactured feed and chemical inputs, including probiotics, antibiotics, and water quality treatments. This dependency drives up operational costs while posing environmental risks and potentially limiting access to markets.

⁴ Small-scale shrimp farmers borrow from informal moneylenders or family members rather than formal banks or financial institutions to cover seasonal crop production costs. Loans from these informal sources generally include clear payment terms, ensuring transparency, and farmers are not bound to lenders. However, small-scale farmers risk falling into debt cycles if they face multiple crop losses, as they need to borrow additional funds to finance the next crop preparation and do not have access to insurance or other mechanisms to lessen the impact of unprofitable production cycles. Most informal finance is working capital to cover crop-by-crop production costs, and small-scale farmers have limited financing available to cover capital costs, such as purchasing new equipment.



GOVERNANCE AND COMPLIANCE GAPS

Weak governance at the farm level introduces inefficiencies and risks, hindering access to premium markets and formal finance. Poor record-keeping and data gaps make it nearly impossible for farmers to perform accurate financial planning or demonstrate creditworthiness to formal lenders.

The growing demand in global markets for verifiable sustainability and proof of food safety has made traceability a critical requirement for market access. However, achieving this in the shrimp sector presents significant operational challenges. The industry's structure, characterized by fragmented small-scale farming and often inconsistent record-keeping, means there are inherent difficulties in tracking product origins. This complexity is magnified by standard procurement practices where products from numerous farms are aggregated to meet specific buyer orders, such as shrimp count per kilogram. As a result, tracing a single product back to its source is an intricate task.

Investment opportunity framework

TECHNOLOGY-ENABLED TRANSFORMATION

Technology is the critical enabler for de-risking the sector and making smallholder farmers bankable. Strategic investment in technology can solve long-standing problems related to data, monitoring, and transparency.

Digital platforms can facilitate cashless transactions, enable farmers to maintain digital operational records, and provide channels for disseminating best-practice information. Data collected through these platforms becomes the foundation for alternative credit scoring models, enabling financial institutions to assess risk more accurately.

Investment in accessible Internet of Things-based monitoring systems can transform farm management. Low-cost sensors providing real-time data on critical water quality parameters allow early detection of problems, reducing the risk of disease and crop loss.



Photo 3. Shrimp trading in action. Photo: Amey Bane / iStock.com.



SUSTAINABILITY AS A VALUE DRIVER

Sustainability is no longer a niche concern but a core driver of market value and long-term resilience. Investing in practices and technologies that enhance environmental stewardship and climate adaptation is both a moral and a financial imperative.

Global consumers and regulatory bodies are demanding higher environmental and social performance standards. Investing in initiatives that help farmers to achieve sustainability certifications opens high-value markets. Such initiatives include financing for improved water treatment, reduced chemical use, and sustainable feed adoption.

CLIMATE RESILIENCE INFRASTRUCTURE

As climate change intensifies, significant investment opportunities are emerging to support climate adaptation measures in the aquaculture sector. These include funding for stronger and more resilient pond infrastructure, promoting diversification into climate-resilient shrimp species, and developing parametric insurance products that provide automatic payouts in response to predefined weather triggers.

The impacts of climate change are already being felt in a sector where success hinges on reliable and consistent water access. Rising water temperatures, droughts, and extreme weather events such as flooding and cyclones are directly affecting the performance and income of shrimp farms. However, within this context, there are immense opportunities for improvement. By adopting clean energy solutions and implementing more sustainable farming practices, the sector can enhance its resilience to climate challenges while improving productivity and profitability.

India's energy market

India's energy landscape reflects a transitional economy striving to balance reliance on fossil fuels with an ambitious push toward renewable energy. Coal and thermal power still dominate the energy mix, contributing 55–58% of total installed capacity, or roughly 205–250 gigawatts (GW) of coal-based generation. However, the renewable energy sector has seen remarkable growth over the past decade, with wind, solar, and hydropower now accounting for approximately 200 GW as of FY2024. With a bold target of generating 500 GW of renewable energy by 2030, government initiatives like the National Green Hydrogen Mission, PM-KUSUM, PM-Surya Ghar, the Production-Linked Incentive scheme, and Green Energy Corridor projects are driving significant progress (Kulkarni and Shaikh, 2025).

Energy is critical for pond operations, yet securing affordable and sustainable power remains a challenge for India's shrimp industry. Pollution from nearby power plants and heavy industry can degrade water quality, harm crop health, and increase operational risks. For India's shrimp aquaculture sector, access to reliable and clean energy is not just a necessity—it's a game-changer.



By reducing energy costs and providing a reliable, sustainable power source, renewables can enhance climate resilience and operational predictability. This stability directly translates into higher productivity and improved incomes for farmers. Renewable energy solutions also open up new income streams, such as selling surplus energy back to the grid, while fostering better social outcomes. Community-based solar initiatives, for example, can eliminate upfront capital costs for lower-income farmers, modernize infrastructure, and improve overall well-being. Integrating renewable energy into the aquaculture value chain creates immediate short- and long-term benefits.⁵

GOVERNMENT GREEN ENERGY INITIATIVES

PM-KUSUM

Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) is a flagship initiative to promote solar energy adoption in agriculture. It aims to reduce reliance on diesel pumps and provide farmers with affordable, clean energy solutions. The scheme has three components:

1. Installation of 10,000 megawatts of decentralized solar power plants
2. Deployment of 1.75 million standalone solar pumps, with up to 60% subsidy for farmers
3. Solarization of 1 million grid-connected agricultural pumps, enabling farmers to sell surplus power to electricity distribution companies

As of 2025, the scheme has mitigated 6.6 million tons of carbon dioxide emissions and significantly reduced energy costs for farmers (Press Information Bureau, 2025; for more information see Daga, 2025).

The Pradhan Mantri Surya Ghar Muft Bijli Yojana (PM-Surya Ghar)

This initiative focuses on household solar energy adoption, with a total outlay of \$8.6 billion. It includes:

- Model solar villages: \$92 million allocated to establish one solar village per district, promoting community-based renewable energy solutions
- Subsidies for households: over 1.7 million households have benefited, with \$1.1 billion disbursed (Press Information Bureau, 2025)

Green energy corridor projects

These projects aim to strengthen India's renewable energy infrastructure by facilitating the transmission of renewable power from generation sites to demand centers. Key features include:

- Waivers on interstate transmission charges for renewable energy projects commissioned by 2025
- Development of open access systems for large consumers to directly purchase renewable energy (Press Information Bureau, 2025)

⁵ Clean and renewable energy helps small-scale farmers in India by lowering irrigation costs, improving energy reliability, and supporting climate-resilient farming practices. Benefits include increased crop yields, reduced dependence on fossil fuels, new income opportunities from selling surplus energy, and improved access to modern services such as milling and cold storage. These advances enable rural farmers to enhance productivity, limit environmental impacts, and strengthen food security.

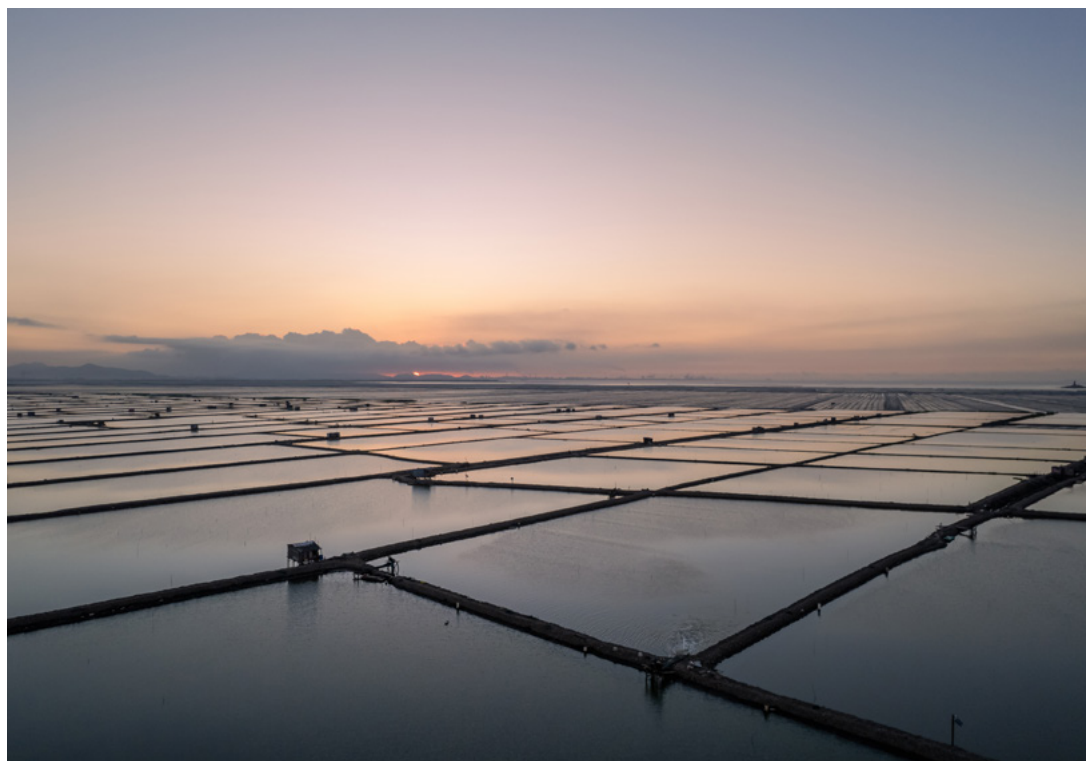


Photo 4. An aerial perspective shows coastal aquaculture ponds at sunrise. Photo: wen ya / iStock.com.

PRODUCTION-LINKED INCENTIVE SCHEME

The Production-Linked Incentive scheme incentivizes domestic manufacturing of renewable energy components, including solar modules and advanced battery storage systems. By reducing reliance on imports, the scheme supports India's goal of achieving 500 GW of renewable energy capacity by 2030 (Press Information Bureau, 2025).



Section 4: Strategic objectives and value creation

Capital access enhancement

The primary objective in supporting the sector is expanding financial inclusion for smallholder farmers, who form the backbone of India's shrimp industry. Their current inability to access formal credit creates dependency on informal lending, stifling growth and profitability.

The Indian shrimp sector requires a modern lending approach that considers both capital and operational expenditures. This can be achieved by utilizing innovative underwriting models that assess creditworthiness based on operational data, projected cash flow, and demonstrated commitment to sustainable practices, moving away from traditional collateral-based lending (Secretan et al., 2007). By promoting capital expenditure investment in production efficiency, technology, renewable energy, and adequate biosecurity infrastructure, the market can scale more effectively and reduce disease risk in ponds and adjacent operations.⁶ Renewable energy, for example, can cut emissions from farm equipment and reduce energy prices, improving farms' long-term financial health.

Providing farmers with access to direct capital for pond preparation, high-quality inputs such as feed and seed, and operational expenses creates financial independence, with positive effects for both the individual farm and the wider community. Smallholders can access better inputs, maintain higher standards, and mitigate for disease and other environmental risks. Access to renewable energy, such as community solar installations, can reduce operational expenditure through lower energy bills, more reliable energy access, and new revenue opportunities. It can unlock a virtuous cycle of operational performance improvement, more predictable crop yields, and accurate annual planning. Lenders using data-driven, group-based underwriting models tied to operational compliance and cash flow can support more dynamic and responsive credit packages tailored to seasonal and community-specific needs.

ALTERNATIVE CREDIT ASSESSMENT MODELS

Cash-flow-based lending models focus on evaluating a farmer's projected profitability rather than relying on traditional land-based collateral. This approach is particularly beneficial for farmers operating on leased land—the majority of shrimp farmers in India—who often face barriers to accessing formal credit. Group-lending models, which leverage social collateral, provide an alternative mechanism for these farmers by fostering collective accountability and reducing default risks.

The integration of operational data through digital platforms further enhances the lending process. By incorporating metrics such as production history, environmental compliance, and market engagement patterns, lenders can develop comprehensive risk profiles which are material to the sector and scalable across clusters. This data-driven approach not only improves risk assessment but also builds trust between farmers and financial institutions.

⁶ Capital expenditure involves one-time or infrequent investment in the business to establish, maintain, or upgrade facilities and assets for shrimp farming. Operational expenditure involves the recurring expenses necessary for farming operations and crop cycles.



Group-lending models and the aggregation of demand into clusters also offer immediate advantages to the sector. By pooling farmers' credit needs, these models de-risk investments for financial institutions, creating more predictable returns. This, in turn, provides farmers with the operational capital needed to improve yields, maintain pond health, and achieve better community outcomes. Aggregation aligns with financial markets' preference for safer, scalable investments, making it a practical solution for driving growth in the aquaculture sector.

Institutional capacity building

Capital alone is insufficient; it must be paired with the knowledge to deploy it effectively—both for farmers who need capital and the financial institutions that provide it.

For farmers, comprehensive education and training programs focus on:

- Financial literacy and business planning
- Clusters and programs to leverage scale and efficiency
- Digital record-keeping and traceability systems
- Sustainable aquaculture techniques
- Market engagement and negotiation

Building the capacity of banks, NBFCs, and other financial institutions so they can confidently lend to the sector involves providing training and specialized knowledge in:

- Sector-specific risk assessment methodology and data-driven tools
- Aquaculture production cycle and risk profile
- Alternative underwriting models
- Portfolio management and monitoring systems
- Climate risk modeling and scenario analysis for insurance and re-insurance

Sustainability integration

Long-term value creation requires the holistic integration of environment and social best practices into every facet of the aquaculture value chain. This promotes responsible practices that enhance productivity, reduce risk, and protect the natural resources upon which the shrimp industry depends.

Linking access to preferential financing with farmers' adoption of sustainable practices creates powerful economic incentives for farmers to become better environmental stewards. This approach protects coastal ecosystems, ensures long-term farming environment health, and enhances the reputation of Indian shrimp in global markets. Sound social impact management leads to improvements in health, wellness and well-being, and increases the income and education levels of farms and communities.

Environmental performance incentives include:

- Preferential interest rates for certified sustainable operations
- Premium pricing access for certified producers
- Insurance premium reductions for farms implementing biosecurity protocols
- Technology financing for water treatment and waste management systems



Market development

Creating clear and reliable pathways for farmers to access premium export markets fundamentally reshapes how value is created and distributed within the sector. True market transformation occurs when sustainably produced shrimp consistently commands higher prices, and lucrative supply chain participation becomes accessible to all farmers.

OVERCOMING THE CERTIFICATION CHALLENGE: AN ALTERNATIVE PATH

Across the shrimp industry, internationally recognized sustainability certifications such as the ASC and BAP can help position Indian shrimp as a trusted product, contributing to access to premium buyers who require demonstrated responsible practices. However, industry data reveals that less than 25% of global shrimp production and less than 5% of Indian farmed shrimp is currently certified under such schemes—a gap that can largely be explained by the high costs, significant administrative burden, and extended timelines associated with certification. For India's more than 100,000 mostly small- and medium-scale shrimp farmers, certification is often an unrealistic goal due to resource constraints and the practical realities of maintaining compliance.

Recognizing this structural barrier, the sector is turning toward fit-for-purpose assurance and verification programs, which provide a more accessible and catalytic alternative to certification. Monterey Bay Aquarium operates a dedicated verification platform in India that allows smallholder farmers to track essential performance data—such as water quality, chemical use, and farm management—using direct, digital, and cost-effective methods. Verification platforms emphasize relevant and material sustainability indicators and use limited assurance methods involving periodic third-party or digital verification checks rather than exhaustive, costly audits. Crucially, the approach enables farmers to demonstrate their progress toward responsible standards, which can be just as credible to banks and buyers as formal certification and is far more practical and scalable for the sector.

For financial institutions, regularly verified operational and financial metrics (gathered with support from assurance platforms) provide clear, real-time evidence of farm management, productivity, and compliance readiness. This gives lenders the transparency needed for prudent risk assessment and credit allocation, even for farms that are not formally certified. For farmers, involvement in a structured verification or assurance program is a tangible way to build business credibility, gain access to finance, and signal compliance readiness to buyers worldwide, even as the sector works toward broader certification in the future.

Verification and limited assurance frameworks are designed specifically for the realities of India's shrimp industry. These systems are tailored for flexibility, allowing adoption by clusters, cooperatives, and smallholders who could never shoulder the cost or complexity of certification as individuals. Investment in technical training, compliance support, and financial assistance—delivered through these assurance and verification platforms—significantly lowers the barriers farmers face in upgrading their practices. Such platforms enable a stepwise, inclusive path to improved market access and sustainability outcomes for the majority of Indian producers.



AGGREGATION AND COLLECTIVE ACTION

Aggregation and collective action are essential strategies for transforming smallholder shrimp farming in India into a more bankable, insurable, and sustainable sector. When small farmers work in isolation, their limited scale and diverse risk profiles make it expensive and complex for banks and insurers to serve them, leading to widespread financial exclusion. However, when these producers aggregate through cooperatives, clusters, and formal producer organizations, they generate collective demand with sufficient scale and verifiable management practices to attract banks, insurance providers, and premium buyers (Secretan et al., 2007).

Banks and insurers require risk pooling and reliable information to efficiently deliver financial products. For individual shrimp farmers, high transaction costs and variable farm practices are barriers to accessing structured loans and insurance. Additionally, exposure to disease, natural catastrophes, and weather events can materially impact successful harvests and yields.

Aggregated farmer groups can collectively adopt standardized better management practices maintain consistent records, and act as single points of contact for service providers. This structure lowers due diligence costs and makes risk more predictable for institutions, allowing them to design affordable financial products and offer coverage that would previously have been considered unviable (Secretan et al., 2007).

Insurers, for instance, often view individual smallholders as high-risk clients, unable to generate the necessary premiums or provide adequate documentation. Group-based policies negotiated through cooperatives, producer companies, or mutual insurance structures distribute risk, reduce administrative expenses, and foster the adoption of risk management measures (Secretan et al., 2007). Similarly, banks can extend credit lines to farmer groups with assured market linkages, improving loan viability and supporting value-added investments across the cluster. Solutions such as parametric insurance can also help diversify and spread out risk profiles to further protect against insurance-related concerns.

COMMUNITY-LEVEL VERIFICATION AND MARKET ACCESS

Verification and certification systems should shift toward community- or landscape-level models, an approach which is being piloted by various organizations. This allows collective certification and compliance verification for entire farmer groups or aquaculture landscapes, dramatically reducing compliance costs per farmer and supporting entry into high-value markets (Secretan et al., 2007). Organizations like Monterey Bay Aquarium can strengthen these approaches by facilitating the development of area-based verification schemes and aggregating market demand to connect farmer collectives with buyers, banks, and insurers.

STRENGTHENING STRATEGIC OUTCOMES

Sustained success depends on creating well-governed, professional producer organizations—fish farmer producer organizations, producer companies, and specialized cooperatives—with robust traceability, group-level monitoring, and transparent record-keeping. Strategic partnership with financial and insurance sectors, alongside capacity building for farmer organizations, can increase access to capital and improve resilience against losses or shocks. These advances make smallholder aquaculture more investable, inclusive, and sustainable, aligning sector growth with broader food security and rural development goals (Secretan et al., 2007).



Section 5: Blue Finance performance framework

Comprehensive measurement architecture

The Blue Finance performance framework translates Blue Finance goals into comprehensive, measurable, and actionable metrics. Moving beyond traditional financial reporting, the framework builds holistic perspectives across production efficiency, environmental stewardship, social outcomes, and financial health.

Materiality assessment

In 2025, the Monterey Bay Aquarium conducted a sector-wide materiality assessment to identify which environmental, social, financial, and operational metrics have the greatest impact on business performance, risk management, and stakeholder value in aquaculture. The assessment surveyed approximately 50 diverse stakeholders drawn from the shrimp sector, academic institutions, financial industries, and non-governmental organizations. It examined not only operational factors but also broader stakeholder concerns, ensuring that the metrics prioritized are both decision-relevant for lenders, investors, and supply chain partners, and foundational to credible sustainability and assurance frameworks. By mapping these material issues—including resource efficiency, biosecurity, labor practices, and traceability—against sector growth and resilience, the assessment provides actionable guidance for channeling capital, improving disclosure, and aligning industry practice with global best standards for environmental and social performance. The findings are discussed below; for more details, see Appendix A.

Materiality assessment: key steps

- 1 Desk research**
Industry, region, and community analysis
- 2 Issue identification and consolidation**
Identify new and existing items material to the shrimp sector
- 3 Internal and external stakeholder review**
Engage key stakeholders and groups to identify issues of importance and levels of impact
- 4 Analysis and materiality matrix**
Data collected, analyzed, and plotted to determine key metrics and motivators

Figure 3. The key steps of the 2025 materiality assessment.



Materiality assessment

Key performance indicators ranked by key stakeholders across 46 critical sustainability dimensions



Ocean health emerges as the highest-impact metric, while true farmer income shows the strongest importance–impact balance for sustainable aquaculture operations.

Figure 4. Materiality assessment with performance metrics ranked by stakeholders.



Core performance metrics

ECONOMIC PERFORMANCE INDICATORS

- **True farmer income:** captures actual net income received by farmers after all costs and debts, providing an authentic benchmark for economic performance
 - **Profitability improvement:** tracks net increases in farmer income resulting from higher yields, better prices, and lower costs, and shows tangible economic gains for the business
 - **Cost optimization:** measures reductions in key input costs, such as feed and energy, achieved through more efficient technologies and management practices
-

ENVIRONMENTAL STEWARDSHIP METRICS

- **Conservation of biodiversity and ecosystem protection:** assesses efforts to protect coastal and aquatic biodiversity through improved farm siting, buffer zones, and responsible input use
 - **Ocean health integration:** measures marine ecosystem integrity, including mangrove protection, reduction of chemical runoff, and alignment with ocean conservation goals
 - **Water quality maintenance and pollution minimization:** evaluates implementation of water quality monitoring, effluent management, and pollution control strategies
-

SOCIAL IMPACT INDICATORS

- **Labor standards compliance:** tracks active measures to prevent bonded, child, forced labor, and modern slavery, supporting ethical value chains and export credibility
 - **Gender inclusion programs:** measures women's participation in training programs, access to credit, and role in decision-making
 - **Community benefit distribution:** evaluates broader impacts, including investments in local infrastructure and economic multiplier effects
-

PRODUCTION EXCELLENCE METRICS

- **Survival rates and mortality reduction:** continuously tracks survival and loss rates as leading indicators of both animal welfare and economic performance
- **Good husbandry practices:** promotes adoption of evidence-based health, nutrition, and welfare protocols, minimizing stress and disease incidence
- **Environmental permit compliance:** tracks and verifies adherence to required permits, licenses, and evolving regulatory standards



Performance-to-bankability translation

The performance framework establishes clear connections between farmer operational practices and financial profiles through systematic risk assessment:

FINANCIAL HEALTH INDICATORS

- Strong “true farmer income” indicates operational ability to generate cash flow and service debt.
- High survival rates combined with positive income metrics point to well-managed, profitable enterprises.
- Consistent profitability demonstrates capacity to withstand market fluctuations.

OPERATIONAL RISK MITIGATION

- Adherence to good husbandry and water quality standards directly reduces the risk of disease outbreak and crop loss.
- Strong biosecurity practices create more predictable production cycles and lower loan default risk.
- Environmental compliance protects operations from legal action, fines, and reputational damage.

WORKER WELL-BEING AND COMMUNITY HEALTH

- Regular audits can assess workplace safety and adherence to local, national, and international labor standards.
- On-site inspections and third-party verification ensure positive labor practices.
- Community benefit projects and distribution of revenue through clusters positively impact the wider community.

LONG-TERM VIABILITY ASSESSMENT

- Focus on biodiversity conservation and ocean health demonstrate commitment to long-term viability of the enterprise.
- Environmental stewardship indicates strategic management and responsible borrower characteristics.
- Transparency through impact-management systems builds trust and partnership foundations.

Measuring performance in alignment with international standards

In order to access and catalyze this space, farmers and financial backers need to ensure that their efforts are aligned with international best practices and applicable international frameworks (Table 1). Within Asia and South Asia, the Indian government and other key players such as the Asian Development Bank, the International Finance Corporation, and the United Nations Environment Programme Finance Initiative (UNEP FI) have taken up this effort as a priority. Tying these objectives in closely with India’s national strategy and plan, and international objectives such as the United Nations SDGs can further improve outcomes for farmers.



Traditional investment in the sector now faces increasing physical and regulatory risks, and there is an opportunity for blended finance to enhance values and increase climate resilience and farm production. The foundation of existing market standards around green and sustainable finance can amplify the impact of investment in the sector and provide material additionality for partners.

Blue Finance eligible activities should contribute to either SDG 6 or SDG 14, with outputs and outcomes directly related to one or more of the goals' target indicators. The International Finance Corporation has endeavored to directly map blue economy activities to its Green Bond Principles and prioritizes sustainable water management, ocean protection, transport, and shipping. Aquaculture is also directly identified as contributing to a majority of Green Bond Principle categories.⁷

Success is not measured solely on revenues and cost models but rather on expanding financial inclusion by providing innovative underwriting and risk assessment models, strengthening capabilities across the financial ecosystem, integrating sustainability triggers, and continual market development to create access to new export markets and opportunities.

Table 1. Measuring performance and alignment with international standards

Metric/area	Evidence/ measurable sub-items	Creditworthiness context	ASC Farm Standard (May 2025) alignment	SDG alignment	UNEP FI Blue Finance Framework alignment
True farmer income	Net farm income (revenue minus costs/debt) Profit margin ratio Benchmark vs. regional averages	Direct indicator of financial health/ resilience	Principle 3: The aquaculture industry is committed to respecting and promoting human rights <i>Criterion 3.8: Wages</i>	SDG 1: No poverty SDG 8: Decent work and economic growth	Blue Finance core principle: Economic viability and job creation
Bonded, child, forced labor prevention	Presence of compliance certificates Labor incident records Audit results Worker interviews Supply chain monitoring	Legal and reputational risk mitigation	Principle 3: The aquaculture industry is committed to respecting and promoting human rights <i>Criterion 3.2: Forced Labour; Criterion 3.3: Child Labour</i>	SDG 8: Decent work and economic growth SDG 16: Peace, justice and strong institutions	Blue Finance environmental, social, and governance safeguards; International Finance Corporation performance standards compliance

⁷ The International Finance Corporation's Guidelines for Blue Finance 2.0 (International Finance Corporation, 2025) address pollution prevention and control, natural resource conservation, biodiversity conservation, and climate change adaptation.



Table 1 (continued)

Metric/area	Evidence/ measurable sub-items	Creditworthiness context	ASC Farm Standard (May 2025) alignment	SDG alignment	UNEP FI Blue Finance Framework alignment
Biodiversity and ecosystem impact minimization	% land with buffers/ conservation Biodiversity reports Impact assessment results Regulatory filings	Links to regulatory/ licensing stability	Principle 2: The aquaculture industry demonstrates environmental stewardship <i>Criterion 2.2: Ecologically Important Habitats; Criterion 2.3: Wildlife Interactions; Criterion 2.4: Escapes and Native Biodiversity</i>	SDG 14: Life below water SDG 15: Life on land	Blue Finance core principle: Substantial contribution to SDG 14 with biodiversity safeguards
Ocean health	Presence in protected areas Chemical runoff test results Effluents and water quality monitoring Conservation plan alignment Use of marine ingredients in feedstock Sustainable fisheries	High scores enhance sector credibility	Principle 2: The aquaculture industry demonstrates environmental stewardship <i>Criterion 2.5: Benthic Impact; Criterion 2.6: Water Quality</i>	SDG 14: Life below water SDG 6: Clean water and sanitation	Blue Finance primary focus: ocean and coastal ecosystem health
Water quality and pollution minimization	Frequency of monitoring Effluent/pollution data Incident reporting Adoption of control technologies	Supports operational reliability	Principle 2: The aquaculture industry demonstrates environmental stewardship <i>Criterion 2.6: Water Quality; Criterion 2.7: Salinisation; Criterion 2.8: Biosolids; Criterion 2.11: Material Use, Waste and Pollution Control</i>	SDG 6: Clean water and sanitation SDG 14: Life below water	Blue Finance eligible activity: sustainable water management and pollution prevention

Table 1 (continued)

Metric/area	Evidence/ measurable sub-items	Creditworthiness context	ASC Farm Standard (May 2025) alignment	SDG alignment	UNEP FI Blue Finance Framework alignment
Social and environmental impact management	Existence of impact plans Stakeholder consultation records Transparent reporting Corrective action documentation	Improves trust and oversight	Principle 1: The aquaculture industry ensures legal compliance and effective business management Principle 2: Environmental stewardship Principle 3: Human rights <i>Criterion 1.2: Management Systems; Criterion 2.1: Environmental Risk Assessment; Criterion 3.13: Community Engagement</i>	SDG 16: Peace, justice and strong institutions SDG 17: Partnerships for goals	Blue Finance Framework: impact reporting and stakeholder engagement
Environmental permit compliance	Permits/licenses acquired Inspection/audit results Legal infraction records	Required for project financing	Principle 1: The aquaculture industry ensures legal compliance and effective business management <i>Criterion 1.1: Legal Compliance</i>	SDG 16: Peace, justice and strong institutions	Blue Finance minimum requirement: compliance with applicable laws and regulations
Good husbandry and animal welfare standards	Welfare protocol adoption Audit results Disease/incident reports Biosecurity documentation	Lower risk to operations/finance	Principle 4: The aquaculture industry upholds responsible animal health and welfare practices <i>Criterion 4.2: Crustaceans</i>	SDG 2: Zero hunger (sustainable food systems) SDG 12: Responsible consumption	Blue Finance risk assessment: environmental and social risk management
Mortality/survival rates	Survival/loss rates per crop cycle Historical trend analysis Comparison vs. benchmarks	Direct measure of operational asset health	Principle 4: The aquaculture industry upholds responsible animal health and welfare practices <i>Criterion 4.2: Crustaceans⁸</i>	SDG 2: Zero hunger (sustainable aquaculture productivity)	Blue Finance performance: measurable outcomes above documented baseline

⁸ According to the ASC (2025) Farm Standard, Appendix 2: "Crustacean mortality limits are based on real percentage mortality and vary by pond management type: unfed and non-permanently aerated ponds should have ≤75% mortality, fed but non-permanently aerated ponds ≤55%, and fed and permanently aerated ponds ≤35%."



Importance of data collection and record-keeping

Effective record-keeping is fundamental to both farmers and financiers in building a sustainable and transparent aquaculture sector. Credit underwriters, lenders, and financial partners rely on accurate and comprehensive records to assess creditworthiness and facilitate access to finance. Key data points such as true farm income, revenue, farm size, species cultivated, and input costs (e.g. pond preparation, seed, feed, and equipment) are critical for informed decision-making.

In addition, documentation such as land ownership papers, lease agreements, or other contractual arrangements serves as proof of operations and enhances credibility. Maintaining accurate financial records is often a prerequisite for lenders to verify the absence of prior loan defaults, particularly with government or agricultural loan schemes. Farmers can further instill confidence in the market by presenting fishery registration certifications, farming licenses, and proof of expertise, including training certifications and internationally recognized aquaculture standards (e.g. ASC, BAP, and Global GAP/Good Agricultural Practice), if such documents are available.

Essential financial documents for farmers:

- **Proof of identity:** government-issued ID for verification
- **Land or lease agreements:** ownership papers or lease contracts to validate operational legitimacy
- **Banking information:** bank account passbooks and statements to demonstrate financial activity
- **Income/financial statements:** tax returns and records of crop or farm sales to establish income stability
- **Business plans:** detailed plans for new farms to showcase feasibility and growth potential
- **Know Your Customer forms:** mandatory verification documentation for compliance with financial regulations
- **Local permits and licenses:** permissions required by law to ensure regulatory compliance

ACCESS TO TRADITIONAL FINANCIAL MARKETS

For small-scale farmers, accessing traditional financial markets is crucial, given the significantly lower interest rates (typically 7–10%) and longer repayment tenures offered by formal institutions.⁹ By contrast, reliance on informal lending often exposes farmers to exorbitant interest rates and predatory practices, which can trap them in cycles of debt. By maintaining robust records and meeting financial documentation requirements, farmers can unlock the benefits of formal financial systems, ensuring long-term sustainability and growth.

⁹ Recent rates published by major public sector banks and government-supported schemes reference agriculture lending rates of around 7–10% in 2025.



Monitoring and evaluation

A robust **monitoring and evaluation (M&E) system** is the operational backbone for collecting, analyzing, and acting upon performance data across the aquaculture value chain. In the context of Blue Finance, a well-designed M&E framework serves not only to track technical outcomes but also to enable financial flows by translating operational data into actionable insights for lenders, insurers, and investors. Through the systematic capture of variables such as water quality, input usage, survival rates, and compliance with sustainability protocols, M&E systems establish baselines and benchmark progress against both productivity and risk management goals. Importantly, embedding auditable, digital record-keeping processes enhances the credibility of farmer-reported data, creating the transparency necessary to underpin both assurance schemes and emerging impact finance models.

This record-keeping provides indispensable information to financial stakeholders—allowing them to assess real-time business performance, underwrite new loan products, and quantify price risk more accurately. Ultimately, robust M&E not only fulfills compliance requirements for sustainability standards and reporting, but drives a flywheel of improving operational practices and opening access to capital, thereby strengthening both sector resilience and bankability.

DATA COLLECTION ARCHITECTURE

Standardized digital record-keeping supported by simple mobile tools enables farmers to log key data points including feed inputs, water quality tests, stock mortality, and final sales figures. This creates detailed operational histories for each farm.

Traceability systems using unique identifiers track each batch of shrimp, linking it to specific farm performance data on sustainability and biosecurity. Regular compliance monitoring ensures adherence to environmental regulations and certification standards.

Satellite monitoring provides macro-level views for capturing land-use change monitoring, assessing surrounding ecosystem health, and identifying potential unregistered farm expansion.

ADAPTIVE MANAGEMENT PROCESSES

Regular performance reviews by project leaders and financial partners identify trends, highlight high-achieving farms, and pinpoint areas that require intervention. In response, strategies can be refined to address widespread issues or adjust financial product terms based on farmer feedback.

This adaptive management creates learning organizations, ensuring that the Blue Finance playbook continually evolves to meet dynamic challenges in the aquaculture sector.



Section 6: Financial instruments and risk mitigation

In India, the drive to make Blue Finance accessible for small-scale, leaseholder farmers reflects both the country's unique rural realities and ongoing financial innovation. These farmers, working without land deeds or traditional collateral, often fall outside the bounds of standard banking and credit systems. Yet they are central to the blue economy's growth in areas like aquaculture, coastal agriculture, and fisheries.

Financial institutions and policymakers have responded by shifting the focus from asset-based lending to more inclusive, activity-based approaches. Instead of requiring land as collateral, banks increasingly look at participation in farmer producer organizations, transaction records, or proof of ongoing production as evidence of creditworthiness. Group lending, social collateral, and digital credit histories become the new currency for trust and access. Leaseholders who were once shut out from loans can now access government-backed programs or microfinance specifically structured for their situation.

Supply chains are also playing a transformative role. As cooperatives, processors, and seafood exporters reach deeper into rural India, they are offering new ways for farmers to secure working capital. Instead of borrowing against property, a leaseholder gains a line of credit based on their production contract or committed sales. These arrangements help build a financial bridge between the local farmer and national or even global buyers, all without the need for land collateral.

At the same time, impact investors and DFIs—such as the Securities and Exchange Board of India, the National Bank for Agriculture and Rural Development, the Asian Development Bank, and the International Finance Corporation—are bringing blended finance models into play. These combine grants, subsidized loans, and risk guarantees to help both lenders and borrowers navigate the higher risks associated with smallholder and leaseholder financing. The participation of these institutions has opened the door to new debt products, such as blue bonds and sustainability-linked loans, that are specifically earmarked for sustainable rural and blue economy activities.

India's digital revolution further lowers barriers: mobile banking, electronic Know Your Customer, and digital payment histories make it easier for leaseholder farmers to verify their economic activity, build a credit profile, and obtain funds quickly. As this ecosystem matures, local banks and NBFCs collaborate closely with regulators and DFIs to expand outreach and design financial products that fit the blue economy's non-traditional actors.

Ultimately, the convergence of these trends means that India's small, leaseholding blue economy farmers are no longer peripheral to finance—they are becoming innovators at the center of new, more inclusive financial products. The country's top regulators, local lenders, development banks, and supply chain leaders are collectively reshaping the very definition of collateral and credit, making the blue economy genuinely accessible for those who need it most.



Financial product portfolio

The financial toolkit required for blue economy transformation combines accessible traditional banking products with specialized instruments designed to drive sustainability and resilience.

CORE DEBT INSTRUMENTS

- **Blue loans:** These are standard loans where the proceeds are explicitly designated for blue economy activities. For smallholders, this means financing for pond preparation, sustainable feed, or biosecurity upgrades. Terms can be linked to sustainability performance targets, creating direct incentives for responsible farming.
- **Sustainability-linked loans:** The interest rates or other terms of these loans are directly tied to borrowers achieving predefined sustainability metrics, such as reduction in greenhouse gas emissions, improved water quality, reduced chemical use, or higher survival rates. This aligns financial cost with environmental performance.
- **Trade finance solutions:** Short-term financing includes supply chain financing and receivables based lending for exporters. This is critical for maintaining cash flow in seasonal production cycles and enabling market access diversification.

RISK MANAGEMENT AND INSURANCE PRODUCTS

- **Parametric insurance:** This provides rapid, automatic payouts based on predefined triggers, such as cyclones of a certain intensity or specific drops in water quality. The approach helps farmers recover quickly from disasters without lengthy claims processes.
- **Crop insurance:** Traditional insurance products can be tailored to aquaculture production cycles, covering disease outbreaks, environmental disasters, and other production risks.
- **Credit guarantee schemes:** Government or DFI guarantees reduce lending risk for commercial banks, enabling broader financial inclusion.

BLENDED FINANCE VEHICLES

Blended finance is a partnership between public and private capital designed to accelerate investment in sectors—like the blue economy—that are vital but often seen as high-risk by traditional financiers. At its core, blended finance recognizes that the challenges of climate, oceans, and rural livelihoods cannot be solved by public funds alone, nor can they rely solely on commercial investment. Instead, blended finance strategically combines resources: governments and development banks supply patient, catalytic, or concessional funding that lowers the barriers for private investors, who bring scale, innovation, and efficiency.

The essential mechanism of blended finance is de-risking. Public or philanthropic funds might absorb the first losses, cover operating shortfalls, or provide credit guarantees. This makes investments—such as those in small-scale fisheries, rural aquaculture, or coastal protection—more attractive to banks, impact investors, and even mainstream pension funds. The result is that a much wider pool of capital flows into areas where market returns alone wouldn't justify the risk. This structure also has a powerful effect in diversifying investors and investment horizons.



Because risk is shared and mitigated, companies and projects benefit from the expertise and long-term commitment of DFIs, the agility of private sector investors, and the mission-driven approach of philanthropic organizations. Blended finance platforms can be tailored to target specific challenges—such as access to credit for leaseholder farmers, the growth of sustainable marine supply chains, or the scaling of fisheries technology.

Key strategies for blended finance



Blended finance for de-risking

Combine concessional funding with commercial investments to reduce risk for private capital, particularly for small-scale farmers and processors. Guarantees and risk-sharing agreements, inspired by successful archetypes, can fund infrastructure improvements and scale export-oriented facilities.



Local currency transactions

Mitigate foreign exchange risks for domestic stakeholders by encouraging local currency financing. Develop innovative financial products with local institutions, such as working capital loans and aquaculture insurance, to stabilize cash flows and foster long-term partnerships for small and medium-sized enterprises.



Sector-specific metrics

Establish performance tailored to the shrimp sector's dynamics, including yield improvements, export growth, and environmental sustainability indicators (e.g. water quality, biodiversity impact). Incorporate gender-responsive metrics to ensure inclusive growth and enhance social impact, building investor confidence.



Strategic use of proceeds

Direct capital towards critical bottlenecks such as infrastructure development (cold storage, logistics) to minimize post-harvest losses. Fund innovation in sustainable farming practices, including eco-friendly feed and disease management systems, maximizing both financial returns and developmental impact across the value chain.

Figure 5. Blended finance strategies.

In India and across Asia, blended finance is increasingly recognized as the strategic solution for “last mile” finance, bringing formal capital to the overlooked smallholder, rural, and blue economy segments. By forging partnerships between DFIs, local banks, public programs, and global investors, blended finance does not just close the funding gap—it changes the rules of engagement, making sustainable development and ocean conservation bankable for all.

Unlocking the capital required to scale this sector demands innovative financial strategies, targeted use of proceeds, and a focus on performance metrics that align with sector-specific needs. By leveraging blended finance, promoting local currency transactions, and prioritizing tailored metrics, stakeholders can build a robust deal pipeline to drive transformative impact.



EQUITY AND GROWTH CAPITAL

- **Venture capital:** Equity investments fund scalable companies solving major ocean challenges, including aquaculture technology start-ups, alternative feed companies, and digital platform developers.
- **Impact investment funds:** Specialized investment funds pool capital from various sources to invest exclusively in ocean-related companies or projects, diversifying risk while providing dedicated capital sources.

Table 2. Key financial instruments driving the blue economy

Product	Type	Description/relevance
Blue loans	Debt	Core instrument for farmers: Standard loans where the proceeds are explicitly designated for blue economy activities. For a smallholder, this means financing for pond preparation, sustainable feed, or biosecurity upgrades. The terms can be linked to sustainability performance targets, creating a direct incentive for responsible farming.
Corporate or project bonds	Debt	For large-scale projects: Issued by governments or large corporations, these bonds raise capital for significant projects like developing sustainable fishing fleets, building marine protected areas, or funding large-scale aquaculture infrastructure with clear environmental benefits. Similar to green bonds (International Capital Market Association, 2025).
Trade finance (supply chain, receivables)	Debt	Essential for market flow: Short-term financing that lubricates the supply chain. This includes financing for exporters based on receivables from sustainable seafood sales or providing working capital to processors who commit to sourcing from certified farms. It is a critical, high-volume tool.
Sustainability-linked loans/ bonds	Debt	Performance-based financing: A powerful evolution of standard debt. The interest rate or other terms are directly tied to the borrower achieving predefined sustainability metrics, such as improved water quality, reduced chemical use, or higher survival rates. This aligns financial cost with environmental performance.
Revolving credit facilities/ working capital lines	Debt	Flexible working-capital backstop: A committed or uncommitted revolving line that borrowers can draw, repay, and redraw to manage seasonal cash flow needs and input purchases. For aquaculture and fisheries value chains, this can finance feed and seed, fuel, ice/cold chain costs, payroll, and short-term capital expenditure maintenance, and can be structured with use-of-proceeds controls and/or sustainability-linked pricing to incentivize improved practices.
Social loans/ bonds and other debt securities	Debt	Performance-based financing: Social bonds refer to debt securities issued to raise funds, as per Securities and Exchange Board of India (Issue and Listing of Non-Convertible Securities) Regulations, 2021, Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015, and 2024 Circular. These funds must be used for social projects aimed at addressing specific social issues or achieving positive social outcomes, particularly for target populations (Securities and Exchange Board of India, 2025; Agarwal, 2025).
Debt-for-nature swaps	Debt	Sovereign-level tool: An agreement where a portion of a country's foreign debt is forgiven in exchange for government investment in marine conservation. This can create national funding streams for policies and programs that support the entire blue economy.
Blended Finance vehicles	Other	Catalytic capital: These structures are crucial for de-risking investment. They combine public or philanthropic funds (which can absorb initial losses) with private capital. This “blend” makes investments in smallholder aquaculture more attractive to commercial banks and private investors.



Table 2 (continued)

Product	Type	Description/relevance
Venture capital/ private equity	Equity	Funding for innovation: Equity investments from venture capital or private equity funds into scalable companies that are solving major ocean challenges. This includes start-ups in aquaculture technology, alternative feeds, or plastic removal solutions that can transform the industry.
Equity in start-ups	Equity	Growth capital for new ideas: Direct equity investments into emerging companies. For the aquaculture sector, this could be a tech firm developing low-cost water quality sensors or a platform that connects certified farmers directly to premium buyers.
Specialized investment funds	Other	Pooled investment: Specialized investment funds that pool capital from various sources to invest exclusively in a portfolio of ocean-related companies or projects. This diversifies risk for investors and provides a dedicated capital source for the blue economy.
Philanthropic grants	Other	Foundational funding: Grant capital, typically from philanthropic foundations or development agencies, is essential for foundational work. This includes funding for capacity-building workshops, scientific research, and pilot projects that prove new models before they are scaled with private capital.
Resilience/ parametric insurance	Other	Risk management shield: Insurance products designed to protect marine assets. Parametric insurance is particularly relevant, as it provides a rapid, automatic payout based on a predefined trigger, such as a cyclone of a certain intensity or a specific drop in water quality, helping farmers recover quickly from disasters.
Payment for ecosystem services	Other	Rewarding stewardship: A system where farmers or communities are paid for generating verified environmental benefits. For example, a group of farmers could receive payments for protecting a mangrove forest that sequesters carbon and acts as a fish nursery, creating a new revenue stream from conservation.



Section 7: Blue Finance sustainable use of proceeds

This section seeks to define **eligible activities** which can be considered as “sustainable” and “blue” under the UNEP FI Blue Finance Framework. Any issuance in this framework should be aligned with international principles such as the International Capital Market Association Green Bond Principles and Green Loan Principles (International Capital Market Association, 2025). Proceeds should contribute to the SDGs and clearly define the key performance indicators which can transparently measure outcomes. These indicators should be measurable and auditable, and included in loan and financial agreements where appropriate.

Dedicated purpose of finance

- **Renewable energy:** investment in solar, wind, or other clean energy technologies to power pond operations and reduce greenhouse gas emissions (e.g. via the PM-KUSUM scheme)
- **Operational efficiency measures:** reduction in greenhouse gas emissions, improved water quality, and reduced chemical use
- **Technology investment:** technology adoption to provide current and reliable information, improve operational transparency, and facilitate data-driven access to credit and verification. Cold chain and storage, sensors, test kits
- **Community benefit infrastructure and upgrades:** capital for advanced water treatment, disease prevention protocols, hatchery hygiene, and controlled access to minimize disease outbreaks and improve animal and human health
- **Farmer training and capacity building:** programs focused on financial literacy, adoption of better management practices, and social impact standards—including labor rights, community benefit, and gender inclusion

General purpose of finance

Financial arrangements such as general corporate lending, deposits, trade finance, and other general investment instruments can be eligible based on the company’s core business activities, i.e. sustainable aquaculture.

- **Terrestrial and aquatic biodiversity conservation:** activities that preserve or restore local ecosystems, such as mangrove reforestation, establishing buffer zones, and practices minimizing ecosystem disruption
- **Pollution control and prevention:** investments in effluent treatment systems, pollution minimization equipment, and protocols to measurably reduce waste and chemical runoff into natural water bodies
- **Climate change adaptation:** infrastructure strengthening (e.g. flood-resistant pond embankments), diversification into climate-resilient species, water management, and disaster preparedness



- **Verification and assurance infrastructure:** landscape and community-level verification approaches for clustering and verifying better management practices
- **Sustainable inputs and feed:** financing for the purchase of certified, environmentally responsible seeds, post-larvae, and feeds that reduce dependence on wild stocks and lower environmental footprint

Comprehensive risk assessment framework

PHYSICAL CLIMATE RISKS

Extreme weather events pose acute physical risks to shrimp farming. Cyclones, floods, and storm surges can cause catastrophic damage, destroying pond structures, eliminating crops, and damaging critical equipment.

Gradual impacts of climate change present persistent challenges. Rising sea levels threaten to permanently inundate low-lying farm areas. Increasing water temperatures stress shrimp populations, increasing disease susceptibility and reducing growth rates.

Mitigation strategies: Investment in climate-resilient infrastructure, including reinforced pond embankments and water management systems handling floods and droughts. Parametric insurance providing rapid post-disaster payouts enables quick recovery.

OPERATIONAL AND BIOLOGICAL RISKS

Disease represents the greatest operational threat to shrimp farmers. Pathogens like White Spot Syndrome Virus and Early Mortality Syndrome can lead to complete stock loss. Poor biosecurity practices create pathways for pathogen entry.

Environmental management and pollution control are critical for operational sustainability. Untreated discharge contains high levels of nitrogen, phosphorus, and organic matter, potentially causing localized pollution and degrading water quality.

Mitigation strategies: Financing linked to robust biosecurity protocol adoption, including water treatment systems, certified disease-free post-larvae sourcing, and real-time mortality and water quality monitoring. Investment in effluent management systems and sustainable feed with better conversion ratios.

MARKET AND FINANCIAL RISKS

Price volatility in global shrimp markets can drastically reduce farmer income, especially when bargaining power with processors is limited. Dependency on single buyers or informal credit arrangements increases vulnerability to market manipulation.

Regulatory compliance risks emerge as global markets increasingly demand verifiable sustainability and food safety standards. Non-compliance can result in loss of market access and reduced profitability.

Mitigation strategies: Market diversification through direct buyer connections, certification program or verification/assurance platform support enabling access to premium markets, and financial product development reducing dependency on informal credit sources.



Long-term vision and sustainability

This Blue Finance playbook establishes the foundation for transforming India's aquaculture sector into a global model of sustainable and inclusive development. By addressing structural barriers through innovative financing, building institutional capacity, and embedding sustainability into economic incentives, this initiative creates lasting value for farmers, communities, and the broader marine ecosystem.

The ultimate success measure is not just improved farmer incomes or enhanced environmental performance, but the creation of a self-sustaining ecosystem where responsible practices are rewarded with market premiums, where smallholder farmers have reliable access to capital and markets, and where the long-term health of coastal ecosystems is protected through economically viable conservation strategies.

Through systematic implementation of this framework, India's shrimp aquaculture sector can serve as a blueprint for blue economy development globally, demonstrating that environmental stewardship, social inclusion, and economic prosperity are not competing objectives but mutually reinforcing elements of sustainable development.



Glossary of terms

Aquaculture Stewardship Council (ASC): An international nonprofit organization that manages certification and labeling programs for responsibly farmed seafood. ASC certification provides market access to premium buyers demanding verifiable environmental and social standards.

Bankability: The degree to which a borrower or project meets the criteria necessary to secure financing from formal financial institutions. In aquaculture, this encompasses a creditworthiness assessment based on operational performance, financial health, and risk mitigation practices.

Biosecurity: Preventive measures designed to reduce the risk of disease transmission in aquaculture facilities. These include protocols for water treatment, stock sourcing, equipment sanitation, and farm access control to protect against pathogens.

Black tiger shrimp (*Penaeus monodon*): A species of penaeid shrimp native to the Indo-Pacific region, traditionally farmed in extensive systems. Known for its premium market position and suitability for organic and low-intensity aquaculture production.

Blended finance: A financial structuring approach that combines concessional public or philanthropic capital with commercial investment to de-risk projects and attract private sector participation in development initiatives.

Blue bond: Fixed-income securities issued to raise capital specifically for projects with positive ocean and marine ecosystem outcomes. These instruments finance large-scale sustainable aquaculture infrastructure and marine conservation initiatives.

Blue economy: Economic activities that depend on healthy oceans and coastal zones while promoting environmental sustainability, social inclusion, and long-term resource stewardship. The blue economy encompasses fisheries, aquaculture, maritime transport, and marine conservation.

Blue Finance: Financial mechanisms and investment strategies that support sustainable ocean-based economic development while protecting marine ecosystems. These include specialized debt instruments, equity investments, insurance products, and blended finance vehicles.

Blue loans: Credit facilities where loan proceeds are explicitly earmarked for blue economy activities that generate environmental benefits, such as sustainable aquaculture operations, marine conservation projects, and ocean-positive infrastructure.

Cash-flow-based lending: A credit assessment methodology that evaluates a borrower's ability to service debt based on projected operational cash flows rather than traditional collateral requirements such as land ownership.

Certification: Third-party verification that aquaculture operations meet defined environmental, social, and food safety standards. Certification schemes provide market differentiation and access to premium buyers who are willing to pay higher prices for verified sustainable products.



Collateral: Assets pledged by a borrower to secure a loan, which the lender may seize in case of default. Traditional collateral requirements often exclude smallholder farmers who operate on leased land or lack formal property titles.

Credit guarantee scheme: Risk-sharing arrangements where government agencies or development finance institutions provide partial guarantees to commercial lenders, reducing default risk and encouraging lending to underserved sectors.

Debt-for-nature swap: A sovereign-level financial transaction in which a portion of a country's external debt is forgiven in exchange for government commitments to invest in environmental conservation and natural resource management.

Development finance institution (DFI): A specialized financial entity, typically government-backed, that provides capital and technical assistance for economic development projects in emerging markets. DFIs often take catalytic first-loss positions that enable subsequent commercial investment.

Early Mortality Syndrome: A bacterial disease affecting farmed shrimp, causing acute hepatopancreatic necrosis and high mortality rates in early production stages. Early Mortality Syndrome outbreaks represent significant financial risks for aquaculture operations.

Effluen: Wastewater discharged from aquaculture facilities containing elevated levels of nitrogen, phosphorus, organic matter, and other substances that can impact receiving water bodies and coastal ecosystems.

Financial inclusion: The process of ensuring access to appropriate financial services and products for underserved populations, particularly smallholder producers traditionally excluded from formal banking systems.

Financial literacy: The knowledge and skills necessary to make informed financial decisions, including understanding credit terms, managing cash flow, budgeting, and evaluating investment opportunities.

Group lending: A microfinance approach where small groups of borrowers collectively guarantee each other's loans, creating social collateral and enabling access to credit for individuals lacking traditional collateral.

Hatchery: A facility where shrimp larvae are produced under controlled conditions from broodstock. Hatcheries supply post-larvae to grow-out farms and play a critical role in biosecurity through provision of disease-free seed stock.

Impact investment: Investment made with the intention of generating measurable positive social or environmental outcomes alongside financial returns. Impact investors in aquaculture prioritize sustainability metrics and development objectives.

Informal credit: Financing obtained outside the formal banking system, typically from input suppliers, processors, or private moneylenders. Informal credit often involves opaque terms, high implicit interest rates, and contractual obligations that limit farmer autonomy.



Internet of Things: Network of physical devices embedded with sensors, software, and connectivity that enable data collection and exchange. In aquaculture, Internet of Things sensors monitor water quality parameters in real time.

Marine Products Export Development Authority: India's government agency responsible for promotion and development of the seafood processing and export industry, including establishment of quality standards and regulatory oversight.

Materiality assessment: A systematic process for identifying and prioritizing the environmental, social, and governance issues that are most significant to an organization's, sector's, or entity's operations and stakeholders. Used to focus reporting and management efforts.

Metric ton: A unit of mass equal to 1,000 kilograms, commonly used to measure aquaculture production volumes and trade quantities in international seafood markets.

Non-banking financial company (NBFC): A financial institution that provides banking services without holding a banking license. NBFCs offer loans, credit facilities, and other financial products, often serving markets that are underserved by traditional banks.

Parametric insurance: A type of insurance that provides automatic payouts based on predefined triggers (such as cyclone intensity or rainfall levels) rather than actual loss assessment. This enables rapid disaster response without lengthy claims processes.

Payment for ecosystem services: A market-based mechanism that compensates resource managers for generating verified environmental benefits, such as carbon sequestration, biodiversity conservation, or water quality maintenance.

Post-larvae: Juvenile shrimp at the developmental stage when they are transferred from hatcheries to grow-out ponds. Quality and disease status of post-larvae critically impact production outcomes.

Small-scale farms: The Food and Agriculture Organization defines small-scale fisheries as traditional or artisanal fisheries primarily involving fishing households rather than commercial companies, using relatively small amounts of capital and energy, and typically utilizing smaller fishing vessels, if any, to make short fishing trips close to shore. These fisheries are usually aimed at local consumption and can be for both subsistence and small-scale commercial purposes.

Sustainability-linked loan: A credit facility where the interest rate or other loan terms are adjusted based on the borrower's achievement of predefined sustainability performance targets, aligning financial incentives with environmental outcomes.

Traceability: The ability to track a product's history, location, and custody throughout the supply chain from production to consumption. Digital traceability systems are increasingly required for market access and sustainability verification.

Trade finance: Short-term credit instruments that facilitate international commerce, including supply chain financing, letters of credit, and receivables-based lending. Essential for managing cash flow in seasonal production cycles.



Underwriting: The process by which financial institutions assess the creditworthiness and risk profile of potential borrowers to determine loan terms, interest rates, and approval decisions.

Value chain: The full range of activities required to bring a product from conception through production and delivery to end consumers. In aquaculture, this includes broodstock, feed production, farming, processing, and export.

Vertical integration: A business strategy where a company controls multiple stages of the supply chain. In aquaculture, vertically integrated firms may own hatcheries, feed mills, farms, processing facilities, and export operations.

Whiteleg shrimp (*Litopenaeus vannamei*): An exotic shrimp species introduced to Asia from Latin America, which now dominates global aquaculture production due to faster growth rates, disease resistance, and market acceptance.

White Spot Syndrome Virus: A highly contagious viral pathogen causing white spot disease in shrimp, characterized by rapid onset and high mortality rates. White Spot Syndrome Virus represents one of the most devastating diseases in global shrimp aquaculture.



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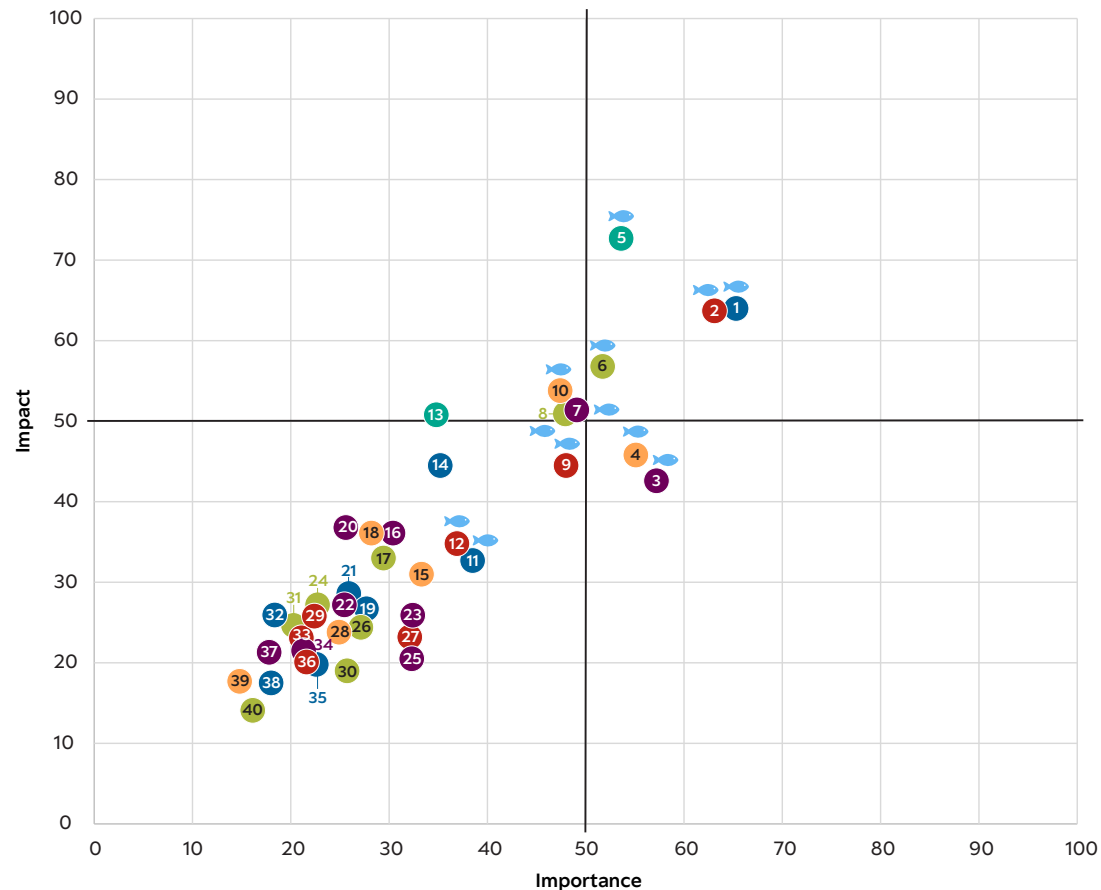
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Appendix A: Materiality assessment matrix



- Cross-cutting items
- Economic metrics
- Environmental metrics
- Farm health & animal welfare
- Management metrics
- Social metrics
- 🐟 Top 12 priority metrics

- True farmer income
- Labor rights and modern slavery prevention
- Environmental permit compliance
- Mortality and survival rates
- Ocean health
- Biodiversity conservation and ecosystem protection
- Social and environmental impact
- Water quality and effluent management
- Worker safety and fair conditions
- Animal welfare and husbandry practices
- Production costs
- Labor protection compliance
- Renewable energy access
- Farm financial returns
- Disease prevention protocols
- Full traceability systems
- Chemical and antibiotic usage
- Biosecurity protocol compliance
- Financial system access
- Certification standards (ASC/BAP)
- Yield and productivity metrics
- Smallholder certification
- Food safety
- Energy consumption
- Food safety certification maintenance
- Nitrogen/phosphorous discharge
- Safety incident rates
- Feed storage and handling losses
- Access to reliable electricity
- Responsible sourcing and use of feed and other inputs to reduce environmental footprint
- Prevention of escapes
- Production efficiency
- Women's workforce participation
- Confirmation of verification
- Feed Conversion Ratio (FCR)
- Support for freedom of association and positive engagement with local communities
- Stakeholder engagement effectiveness
- Market premiums for certified products
- Technology adoption rate
- Carbon footprint

Materiality of metrics

Metric	Importance	Impact
True farmer income	65	64
Labor rights and modern slavery prevention	63	64
Environmental permit compliance	57	43
Mortality and survival rates	55	46
Ocean health	54	73
Biodiversity conservation and ecosystem protection	52	57
Social and environmental impact	49	51
Water quality and effluent management	48	51
Worker safety and fair conditions	48	45
Animal welfare and husbandry practices	47	54
Production costs	39	33
Labor protection compliance	37	35
Renewable energy access	35	51
Farm financial returns	35	45
Disease prevention protocols	33	31
Full traceability systems	30	36
Chemical and antibiotic usage	30	33
Biosecurity protocol compliance	28	36
Financial system access	28	27
Certification standards (ASC/BAP)	26	37
Yield and productivity metrics	26	29
Smallholder certification	26	28
Energy consumption	23	27