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Popular Article

## Role of Aquaculture Insurance in Risk Mitigation: A Financial Safeguard for Managing Production Risks in Modern Shrimp

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### Abstract

Shrimp aquaculture faces significant production risks. Aquaculture insurance provides financial protection, supporting farmer resilience, sustainable farming practices, and sectoral stability.

### Introduction

Aquaculture has emerged as one of the fastest-growing sectors of global food production, contributing significantly to food security, employment generation, and economic development. In India, shrimp aquaculture has witnessed rapid expansion during the past two decades, largely driven by the adoption of the Pacific white shrimp (*Litopenaeus vannamei*) in coastal aquaculture systems. The sector has become an important contributor to India's seafood export economy and rural livelihoods.

India currently ranks among the leading producers and exporters of farmed shrimp globally. Coastal states such as Andhra Pradesh, Gujarat, Tamil Nadu, and Odisha have experienced substantial growth in shrimp farming activities due to favourable environmental conditions, improved hatchery technologies, availability of formulated feeds, and enhanced farm management practices.

Despite these advancements, shrimp aquaculture remains inherently vulnerable to a wide range of biological, environmental, and operational risks. Disease outbreaks, water quality deterioration, climatic variability, and management-related factors frequently lead to significant crop losses. Since shrimp farming involves considerable capital investment in seed, feed, pond infrastructure, aeration systems, and farm management inputs, production failures can result in severe financial distress for farmers.

In this context, aquaculture insurance has emerged as a critical financial risk



mitigation mechanism that can safeguard farmers against unforeseen production losses and enhance the resilience of the aquaculture sector. By transferring a portion of the production risk from farmers to insurance institutions, aquaculture insurance contributes to the sustainability and stability of shrimp farming enterprises.

### **Growth and Economic Significance of Shrimp Aquaculture**

The Indian shrimp aquaculture sector has undergone remarkable transformation with the introduction of *Litopenaeus vannamei*, which offers advantages such as faster growth rates, higher stocking densities, and improved feed conversion efficiency compared to traditional shrimp species.

The expansion of shrimp farming has been facilitated by several factors:

- Development of hatchery infrastructure and quality seed production
- Availability of nutritionally balanced commercial feeds
- Adoption of improved farm management and biosecurity practices
- Expansion of export-oriented seafood markets
- Institutional support from government agencies and research organizations

The sector supports a vast network of stakeholders including hatcheries, feed manufacturers, input suppliers, processing plants, exporters, and logistics providers. Consequently, shrimp aquaculture plays a vital role in strengthening coastal economies and generating employment opportunities.

However, the biological nature of aquaculture systems makes shrimp farming particularly susceptible to production uncertainties, necessitating effective risk management strategies.

### **Risk Profile of Shrimp Aquaculture Systems**

Shrimp farming is characterized by multiple risk factors that can adversely affect production outcomes. These risks can broadly be categorized into biological, environmental, and operational factors.

- 1. Disease Risks:** Disease outbreaks remain one of the most significant challenges in shrimp aquaculture. Viral pathogens such as White Spot Syndrome Virus (WSSV) have historically caused severe economic losses in shrimp farming regions across Asia.

In addition to viral diseases, bacterial infections and opportunistic pathogens may proliferate under stressful environmental conditions. Disease outbreaks can spread rapidly within culture systems, often resulting in mass mortality and significant economic losses.



## **2. Environmental Risks**

The success of shrimp culture depends on maintaining optimal pond ecological conditions. Critical environmental parameters such as temperature, salinity, dissolved oxygen, pH, and alkalinity influence shrimp health and growth.

Extreme climatic events such as heavy rainfall, cyclones, sudden temperature fluctuations, and salinity changes can destabilize pond ecosystems and adversely affect shrimp survival. Climate variability further intensifies these environmental risks.

## **3. Operational and Management Risks**

Farm management practices significantly influence production performance in shrimp aquaculture systems. Poor pond preparation, excessive stocking density, inadequate aeration, suboptimal feeding practices, and lapses in biosecurity can create stressful conditions that increase disease susceptibility.

Operational inefficiencies and management errors can therefore contribute to crop losses and reduced productivity.

## **Concept and Mechanism of Aquaculture Insurance**

Aquaculture insurance is designed to provide financial compensation to farmers in the event of crop losses arising from specified insured risks. Under an insurance arrangement, farmers pay a predetermined premium to an insurance provider in exchange for coverage against potential production losses.

The primary objective of aquaculture insurance is to reduce the financial vulnerability of farmers by distributing risk between producers and insurance institutions.

Typical insurance coverage in shrimp aquaculture may include losses caused by:

- Disease outbreaks
- Environmental stress conditions
- Natural calamities such as floods or cyclones

Insurance coverage generally applies during the culture period, from stocking to harvest.

## **Importance of Insurance in Aquaculture Risk Management**

Aquaculture insurance provides several benefits that contribute to the sustainability of shrimp farming operations.

### **1. Financial Risk Protection**

Insurance acts as a financial safety mechanism that protects farmers against catastrophic crop losses. Compensation received through insurance claims helps farmers recover a portion of their investment and reduces economic hardship.



## **2. Stabilization of Farming Operations**

Crop failures often disrupt production cycles and limit farmers' ability to initiate subsequent crops. Insurance support facilitates quicker recovery and enables farmers to resume farming activities.

## **3. Promotion of Investment in Aquaculture**

The availability of insurance mechanisms encourages farmers to invest in improved farming technologies, infrastructure, and management practices. Reduced financial risk promotes long-term sectoral development.

## **4. Improved Access to Institutional Credit**

Financial institutions are more inclined to provide credit to aquaculture enterprises when crops are insured. Insurance coverage enhances the creditworthiness of farmers and strengthens financial linkages within the sector.

## **Challenges in Aquaculture Insurance Implementation**

Despite its potential benefits, aquaculture insurance faces several operational challenges.

### **1. High Production Risk**

The inherently high-risk nature of shrimp farming increases the probability of insurance claims. This can pose challenges for insurance providers in designing sustainable insurance products.

### **2. Complexity of Loss Assessment**

Determining the exact cause of shrimp mortality requires detailed evaluation of pond ecology, water quality parameters, farm management practices, and disease symptoms. Accurate diagnosis is essential for fair claim settlement.

### **3. Limited Awareness Among Farmers**

Many aquaculture farmers have limited knowledge of insurance schemes and their operational procedures. Enhancing awareness is necessary to improve adoption rates.

### **4. Lack of Reliable Farm-Level Data**

Reliable data on production performance, disease incidence, and environmental parameters are often limited, which complicates risk assessment and insurance policy design.

## **Role of Scientific Assessment in Claim Settlement**

Although loss assessment under aquaculture insurance policies must be carried out by an IRDAI-licensed surveyor, scientific and technical expertise remains essential for accurate evaluation of shrimp crop losses. Shrimp aquaculture systems involve complex ecological interactions influenced by water quality dynamics, disease prevalence, pond



management practices, and environmental conditions. Therefore, proper assessment of crop performance and determination of the probable cause of mortality require specialized knowledge in aquaculture science and pond ecosystem management. Technical experts trained in fisheries and aquaculture sciences can evaluate several parameters including:

- Pond preparation and management practices
- Water quality conditions
- Stocking density and feeding strategies
- Disease symptoms and mortality patterns
- Environmental influences on shrimp health

Such technical evaluation helps determine the probable cause of crop losses and ensures transparency in claim settlement processes.

Scientific assessment not only improves the credibility of insurance mechanisms but also prevents potential misuse of insurance schemes.

### **Strengthening Aquaculture Insurance Systems in India**

Enhancing the effectiveness of aquaculture insurance requires coordinated efforts from multiple stakeholders.

Key measures include:

- Increasing farmer awareness through training and extension programs
- Strengthening collaboration between insurance providers, hatcheries, feed companies, and farmer organizations
- Adoption of digital monitoring tools for farm management and environmental monitoring
- Development of improved risk assessment models based on scientific data

Research institutions such as the Central Institute of Brackishwater Aquaculture play an important role in developing improved culture technologies, disease management strategies, and training programs for farmers.

Similarly, the Marine Products Export Development Authority contributes to strengthening the shrimp aquaculture sector through quality standards, export promotion initiatives, and capacity-building programs.

### **Conclusion**

Shrimp aquaculture represents a vital component of India's fisheries economy, contributing significantly to export earnings, employment generation, and rural livelihoods. However, the sector is exposed to numerous biological, environmental, and operational risks that can lead to substantial crop losses.



Aquaculture insurance serves as an essential financial risk management tool that protects farmers against unforeseen production failures. By transferring a portion of production risk to insurance institutions, insurance mechanisms enhance the resilience and sustainability of shrimp farming operations.

Strengthening aquaculture insurance systems through improved farmer awareness, scientific assessment, and institutional collaboration will play a crucial role in ensuring the long-term stability and growth of the shrimp aquaculture sector in India.

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