

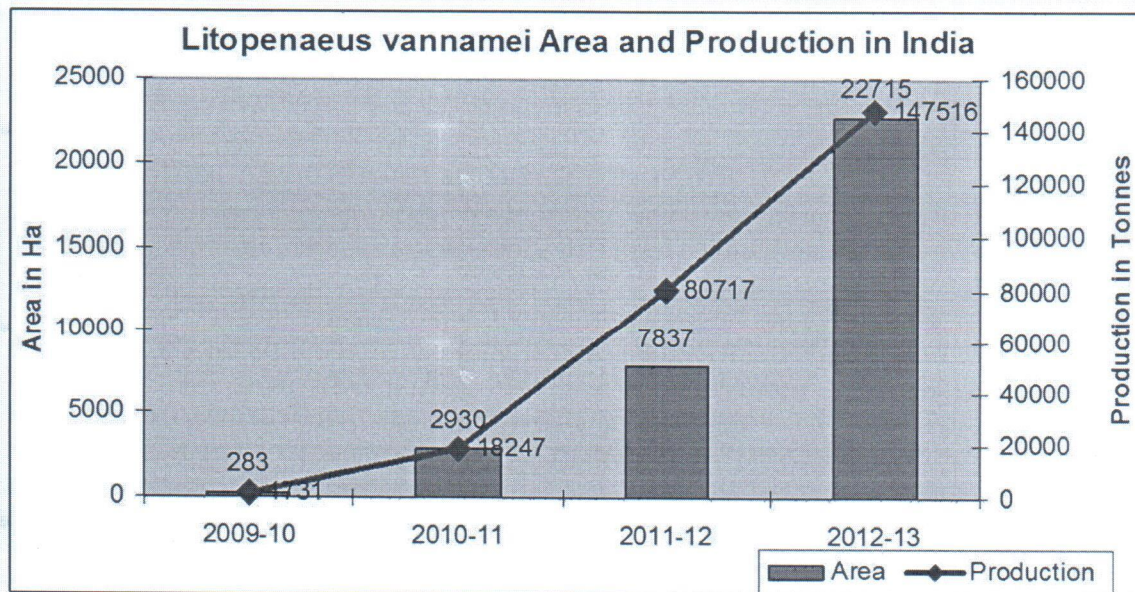
Risk assessment approach for developing Better Management Practices (BMPs) for *Litopenaeus vannamei* Farming

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Introduction

The Govt. of India has introduced pacific white shrimp *Litopenaeus vannamei* after a risk assessment inquiry to revive the shrimp farming in the country which was in doldrums due to disease caused crop failures. Availability of Specific Pathogen Free (SPF) seed, suitability of the species for high density culture in different salinity regimes and market access favoured the introduction of *L.vannamei*. Shrimp farmers have been showing keen interest in *L.vannamei* and it is being farmed in wide range of salinities and at different densities. Since its introduction *L.vannamei* farming area has been showing a steady increase from 283 ha in 2009-10 to 22715 ha in 2012-13. Similarly the production has increased from 1731 metric tonnes to 1,47,516 metric tonnes during the period (Fig-1). Andhra Pradesh (AP) topped the list with 89% of the total area and 90% of the total farmed *L.vannamei* shrimp production in the country. Tamil Nadu (TN) state ranked second with 1511 ha (6%) culture area and production of 8595 (6%) tonnes. Interestingly, Gujarat state topped in case of the productivity per ha with an average production of 9 t/ha. The productivity in AP was 6.6 t/ha and in TN was 5.7 t/ha might be due their different levels of stocking densities followed.



Source: SEAI and MPEDA

Fig-1. *L.vannamei* shrimp farming area and production (2009 to 2013)

It is a fact that *L.vannamei* has given a revival to shrimp aquaculture with a steep increase in the area under culture, many abandoned farms are reclaimed and new farmers entered in to farming. The shrimp production also has shown a quantum increase crossing 2 Lakh tonnes. On the other hand serious apprehensions have been raised about its sustainability due to inbred seed, lack of infrastructure and



Risk assessment for development of BMPs

Risk is a known danger where the probabilities are known unlike uncertainty though both terms are often used interchangeably. Risks in shrimp farming are of two kinds, "individualistic" wherein a particular farm alone is affected and the other is "compound risks" wherein the risk affect nearby farms too and transferable from one another. The risks in shrimp farming are of compounded nature where the mistake one farm might affect nearby farms. Identifying the potential risk factors, their probability of occurrences, symptoms, causes and their likely impact on the production is essential to develop an integrated approach for risk prevention and management. Based on the field investigations and interactions with stakeholders nine major risk factors viz., diseases, poor water quality parameters, operational, climate change, environment, policy/institutional food safety, market and social issues have been identified. Extent of exposure to these risk factors, perceived economic losses due to them and allocation of resources for preventing the same determine the severity of that risk factor. The major risk factors observed and expressed are presented in the Table-2 below.

Table-2. Major risks affecting *L. vannamei* shrimp farming

Farmers' perception on the major risks associated with *L. vannamei* farming

Major categories of risk	Examples
Diseases	WSSV, IHHNV, RMS/CIM, Gill choke, Vibriosis, White muscle
Water quality deficiency	Low pH, low dissolved oxygen levels, algal blooms, nutrient
Operational risks	Lack of electricity, use of pond reared stocks, poor bio-security and infrastructure
Climate change cyclone	Seasonal changes, diurnal temperature variations, flood,
Environmental	Lack of ETP, indiscriminate usage of drugs
Food safety antioxidants	Presence of antibiotic residues, biological pathogens,
Market credit,	High input cost, low sale price, middlemen, lack of institutional
	lack of domestic consumption
Social	Inadequate skilled manpower, competition for water, lack of regulation, access
Policy/institutional risks	Un-registered farms, lack of regulation in the low saline area, lack of institutional credit and insurance for aquaculture.

Extensive primary data collection on the perceptions of the farmers and technical personnel on the likelihood of potential risk factors, their impact on the production and economics are need of the hour. A detailed methodology for identifying the risks, assessing their probability and impact to prioritise the risks has been developed. The perceptions of the farmers on the risk factors associated with *L. vannamei* farming have shown that the emerging diseases and market price are the major threats to shrimp farming (Table-3). The exposure and impact of these risks are respectively high and extremely negative to disastrous to the tune of 50 to 100% loss in the production or in economics. These risks are unbearable and hence, they need to be addressed on a priority basis at the farmer (individually), farm cluster (collectively) and policy (third party) levels to minimise the negative



impacts. The exposure to climate change related risks, water quality issues and operational risks are likely to affect *L. vannamei* culture and impact moderately negative with 20-30% of additional expenses or similar level of loss in production. However, the food safety, institutional, environmental and social risks are perceived to be of low risk category since they seldom affect the production or incur considerable loss.

Table-3. Perceived risks associated with *L. vannamei* farming

Development of risk specific Better Management Practices

A detailed exposure and impact matrix for every identified risk has to be worked out to assess the

Impact Likelihood	Disastrous (5)	Extremely Negative (4)	Moderately Negative (3)	Minor Negative (2)	Little Negative(1)
Very High		Market (Cost and prices)			
High (4) Likely (3)	Diseases		Poor soil and water quality/ Climate Change/ Operational risks		
Low (2)				Food safety risks/policy institutional	Social risks/ Environmental risks
Very low (1)					

severity of the individual problem. Subsequently the causes for occurrence of each risk are identified and appropriate risk prevention and management measures need to be developed in consultation with the subject matter specialists. The risk management measures identified need to be discussed with stakeholders for their validation and site specific modifications. The risk management measures are either *preventive form intended to eliminate the risks* or *management nature deals with coping mechanisms at the individual, group and state level to minimise impacts*.

The risk factors identified in the *L. vannamei* farming and the preventive and management measures suggested and other measures are indicated in the Table-4.

Table 4. Provisional Better Management Practices (BMPs) and other measures for *L. vannamei* farming

Conclusion

The introduction of *L. vannamei* has given impetus to shrimp farming with a record production. However, serious risks and apprehensions have been observed and expressed which are threatening its sustainability. It is high time that the risks are properly studied to develop appropriate risk reduction and management measures. Better management practices for risk reduction, management and mitigation need to be adopted at different levels to tackle the issues and ensure sustainability. At the same time, culture systems and farming protocols are to be fine tuned according to the salinity regimes and infrastructure available. The stakeholders need to be adequately sensitized about the risks so that adequate efforts are to be implemented at each level to facilitate the sustainable *L. vannamei* farming in the country.

