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A Case Study on Current Scenario and Ground Reality of Vannamei Shrimp Culture in a Small Block of N 24 Parganas and Factors That Impeded the Development of Vannamei Culture in that area.

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ABSTRACT:

Shrimp farming is an emerging sector globally, with India emerging as a key player, particularly in states like West Bengal where 7.47 lakh water bodies are present. This industry has significant potential to boost the economy, offering employment and increased farmer incomes. The shift from Penaeus monodon to Penaeus vannamei has dominated due to the latter's superior growth rate and feed efficiency. However, sustainability challenges such as environmental degradation, disease, and socioeconomic issues impede progress that compelled some farmers to discontinue farming. This study examines the major issues faced by shrimp farmers in Hasnabad, North 24 Parganas, highlighting the need for policy support, technological advancements, and capacity building to improve P. vannamei cultivation.

Keywords: Penaeus vannamei, Diseases,Shrimp, Pond management.

Introduction:

Shrimp farming stands as a highly favoured and lucrative aquaculture endeavour, boasting a remarkable surge in global expansion over recent years. India has emerged as a prominent hub for shrimp cultivation, offering manifold advantages to the nation's economy. Beyond the substantial economic gains, including foreign earnings and heightened income for farmers, shrimp farming also presents invaluable opportunities for employment, particularly for the youthful demographic. India's stature as the second-largest producer of farmed shrimp underscores its pivotal role in the global shrimp industry (Primavera, 1997; Umesh et ale., 2010; Salunke et al., 2020; Kumaran et al., 2021). Shrimp culture plays a significant role in India's total fisheries export.There are many states in India where potential for brackish water culture is huge as it has a coastal line of 7516.6Km. One of them is West Bengal, West Bengal has a brackish water area of 0.91lakh hector out of 34,560 hectares in North 24 Parganas possessing a huge potential for shrimp culture. Penaeus vannamei is currently counted as most favourable culture practice for farmers because of its faster growth rate, comparatively low feed conversion rate (FCR) and higher survival have been motivating the farmers towards culture of this species and faster growth rate is one of the main reasons that the trend shifted from Penaeus monodon to Penaeus vannamei. Culture of Penaeus vannamei species started in the year 2012 and presently the intensive and semi-intensive farming practice of the species cover around 90% of total shrimp culture in the district. Scientific culture of shrimp started in West Bengal during the mid-1980s and by 2010 it spread to more than 54,000 hectares. The current aquaculture production of shrimp in West Bengal has increased from 26,800 tons in 2001-2002 to 123589 tons in 2017-18 (Handbook of Fishery Statistics, 2017-18).

The first crop of Penaeus vannamei, in general, starts in February to March and ends in May to June. The second crop starts in August to September and ends in November to December. Typically, the first crop produces a much higher yield than the second crop (Suresh et al., 2007).

Shrimp aquaculture stands as a pivotal pillar in bolstering the world's seafood provision. Yet, its sustainability grapples with a myriad of intricate challenges. Environmental and socioeconomic factors intertwine, underscoring the industry's delicate balance. Ecological hurdles, including mangrove depletion, water quality decline, and disease proliferation, are compounded by socioeconomic complexities such as water allocation disputes and the commodification of natural assets (Sivaraman et al., 2019). The institutional framework and economic dynamics play pivotal roles in shaping the trajectory of shrimp aquaculture. Studies underscore that shrimp cultivators frequently encounter challenges in adhering to rigorous global benchmarks, potentially resulting in port refusals and erosion of buyer confidence. (Bush et al., 2013). The certification procedures required to meet these exacting standards prove to be both financially burdensome and intricate, frequently disenfranchising small-scale producers from engaging in the process (Vandergeest, 2007). Despite the considerable

accomplishments observed in white-leg shrimp farming, numerous hurdles impede the expansion of this sector within the district. Extensive studies conducted in West Bengal have highlighted various factors contributing to the decline of P. vannamei. Among these, disease emerges as the predominant issue, alongside deficiencies in effective marketing channels, scientific management practices, and exposure to natural hazards such as floods and cyclones

(Saha et al., 2019). To elevate P. vannamei culture, there is a pressing necessity for robust policy backing, technological innovations, and comprehensive capacity building initiatives among farmers (Joffre et al., 2018). Building upon these premises, a study was undertaken to assess the multifaceted constraints perceived by shrimp farmers in Hasnabad, a block within the North 24 Parganas district. In light of substantial losses experienced by farmers, leading some to cease operations entirely or discontinue P. vannamei cultivation, the investigation aims to elucidate the underlying challenges faced by the community.

Methodology:

Research Design:

In order to comprehend the farming methods, difficulties, and viewpoints of 20 P. vannamei (white-leg shrimp) farmers in the Hasnabad block of the North 24 Parganas district, West Bengal, this study uses a descriptive research approach. In order to collect quantitative data and provide a thorough picture of the current situation of vannamei farming in this area, survey research was used in this study.

Sampling:

The sample consists of 20 P.vannamei farmers from the Hasnabad block, selected through purposive sampling.

Selection criteria included:

- Minimum of 3 years of shrimp farming experience.
- Farmers who have faced financial losses exceeding 10 lakhs INR.
- Farmers who have discontinued farming of Penaeus vannamei from this year due to significant losses.

Data Collection:

A standardised questionnaire was used to gather data, and it was given out in-person interviews over the course of a month (May 2024). Farmers were interviewed by trained professionals. The duration of each interview was about 25 to 35 minutes.

Geographical Context:

Hasnabad block is located in the North 24 Parganas district of West Bengal and situated beside Ichamoti river, which provides ideal conditions for shrimp farming. The region experiences a tropical climate, with significant monsoon rainfall impacting farming practices.

Fig:1 Study Area

Questionnaire Design:

The questionnaire was designed to cover the following key areas:

- Age of the Farmer: Capturing the demographic profile.
- Amount of Loss: Assessing the financial challenges faced.
- Area of Farm: Understanding the scale of farming operations.
- Challenges: Identifying various operational challenges.
- Diseases: Documenting prevalent diseases affecting shrimp.
- Symptoms: Documenting the symptoms that were observed by the farmers.
- Remedies Used: Recording the methods and treatments used to combat diseases.
- Scientific Farming Methods: Determining whether farmers employ scientific farming techniques.
- Seed Sources: Identifying the sources from which farmers buy seeds.
- Mortality Percentage: Calculating the mortality rate of the shrimp.
- Pricing: Understanding the market prices received for the shrimp.
- Seed Pricing: Capturing the costs associated with buying seeds.
- WFS/EHP Testing: Determining whether farmers conducted Enterocytozoon hepatopenaei (EHP) test.

The questionnaire was developed with input from aquaculture experts. It included closed-ended questions designed for quantitative analysis.

Data Management!

Data was recorded electronically and stored in a secure database with restricted access. Backup copies were made to prevent data loss. Personal identifiers were removed to maintain confidentiality.

Limitations:

The sample size of 20 limits the generalisability of the findings. Additionally, the purposive sampling method may introduce selection bias.

Results and discussion:

Table 1 - Reason for quitting the Culture of P.V given by 20 farmers.

valid	**Frequency**	**Percentage**
Natural Hazards	1	5%
Diseases	17	85%
Low Price	16	80%
Seed Quality	9	45%

1.1 Constraints that compelled farmers to discontinue P.V farming:

P. vannamei farmers identified a large number of constraints as major hindrances to the success of vannamei culture. The farmers were asked to identify the major obstacles on the way to successful P. vannamei culture, as presented in Table 1. The results showed that the farmers identified disease and low market prices as the main obstacles, followed by poor seed quality and natural hazards. The problem of diseases caused severe economic losses, and not getting desirable market prices also posed a significant challenge. Additionally, the lack of government subsidies, rising wages of labour, and reliance on traditional farming methods significantly increased the costs. Comparatively, the price of P. vannamei hasn't increased at the same pace. As a result, many farmers have discontinued farming vannamei and have engaged in different professions.The price of vannamei depends on many factors however, the monopoly of some local companies and market demands, transport plays a crucial role in it.

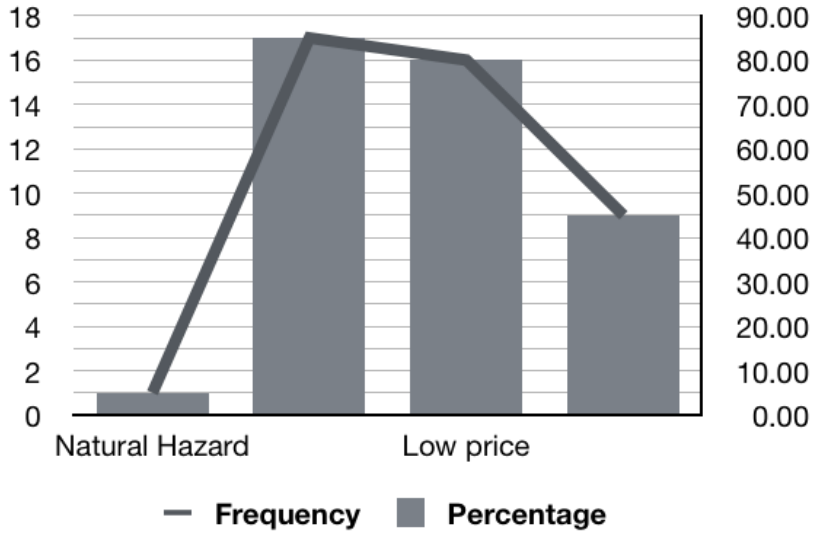

Fig: 2 Graph of factors that is responsible for quitting P.V culture and percentage

Table 2 - Diseases That were observed by 20 farmers respectively.

valid	Frequency	Percentage
WSSB	15	75%
WG	12	60%
WFS	13	65%
RMS	8	40%

1.2 Diseases and symptoms of diseases that was observed by farmers:

As being one of the main hindrance in the way of successful crop of P. Vannamei we tried to understand and dig deeper regarding the diseases, as the farmers already have discontinued the farming process it's impossible to conduct clinical tests so we asked them about the symptoms they observed and the results are presented in table 3. It showed that

more than 70 percent of the farmers encountered with the issue of White Spot Syndrome Virus followed by White Feces Syndrome and White Gut Disease also there was a number of cases of Running mortality Syndrome. Most likely reasons behind this result is mainly the water quality, lack of scientific knowledge, high stocking density, it also depends upon the seed quality. Diseases are one of the limiting factors for shrimp culture and one has become the most threatening issue for shrimp farming communities.

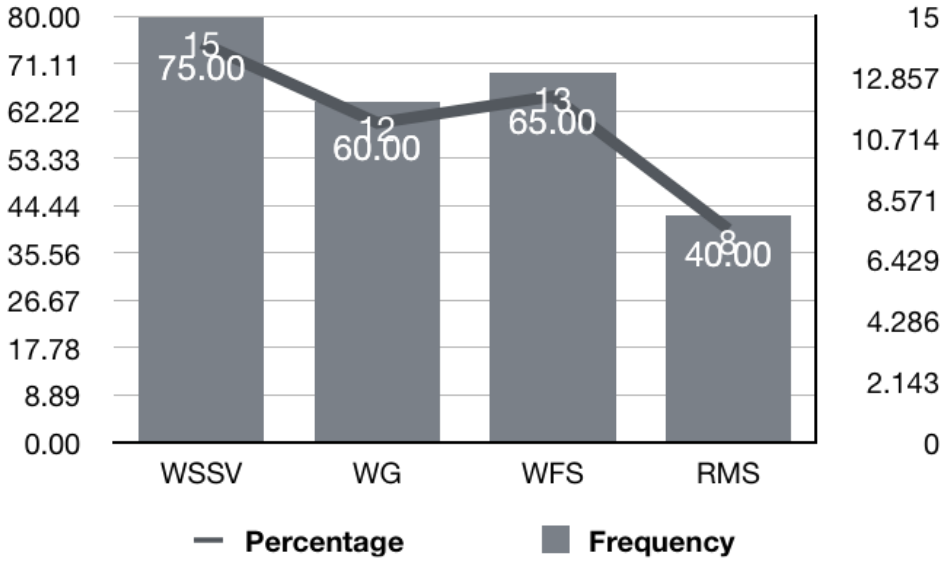

Fig: 3 Graph of diseases that was observed by the farmers and respective percentages.

Table 3 -The weight(gm)of shrimp when they encounter disease.

Valid (gm)	**Frequency**	**Percentage**
10-14	5	25%
14-18	9	45%
18-22	6	30%
Total	20	100%

Table 3 - Mortality percentage of shrimp that each farmer faced.

valid (%)	**Frequency**
0.00%	1
40%60%	5
60%-80%	5
80%-100%	9

1.3Mortality percentage and stage of encountering disease of shrimp:

The farmers were asked about what was the weight of the shrimp when they observed the initial symptoms of these diseases and it is furnished in table 2 that most of them witnessed the symptoms at the weight of 14 gm to 18 gm followed by 6 farmers observed this problem in the weight between 18gm to 22gm and 5 people in the weight between 10 gm to 14gm. Farmers who faced issues with diseases at a more matured stage were able to harvest and sell some percentage of shrimp. That data is also presented in Table no 4 that 5 farmers out of 20 were able to save 40 to 60 percent of their crop, only 9

people who lost crops of between 80 to 100 percent followed by 5 people who lost 60 to 80 percent of their crop. Surprisingly only ones who had the chance to save 100 percent.

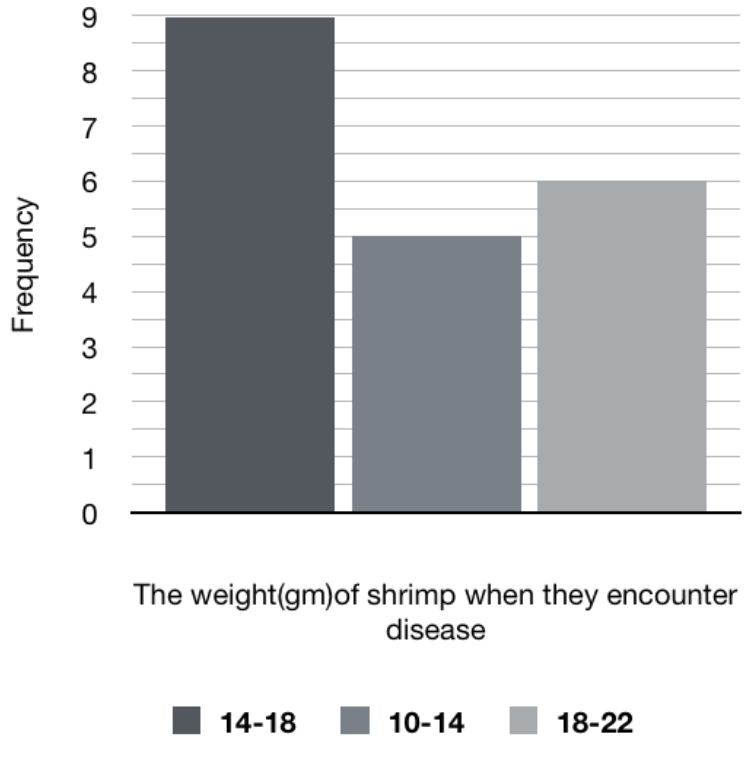

Fig:4 graph of frequency and the weight of the shrimp when they started to shrimp symptoms

Table 3 - EHP testing

Valid	**Frequency**	**Percentage**
Yes	3	15%
No	17	85%
Total	20	100%

Table 3 - Energy Source

Valid	**Frequency**	**Percentage**
Fossil Fuel	18	90%
Green Energy	0	0%
Electricity	2	10%

1.4 Application of scientific culture techniques:

Coming to the topic culture with scientific farming techniques that's the main challenge for the farmers they still the main power source of the farmers is Fossil fuel as they run their aeration system generate power through diesel and other fossil fuels and there is no sufficient supply of electricity as furnitured

in table 5 only 10 percent of farmers who has access to electricity in there field and 90 percent of them run their system on fossil fuels. There's also a lack of initiatives from the government's side. According to the farmer they have also sought subsidies from the government. This cost of fuel consisted of a major part of their expenses.Table No 5 portrays there are only 2 farmers out of 20 who did tests for EHP and different diseases although farmers hired technicians for their culture but that didn't result well. Because of this method of farming it increased the cost of production and as the market wasn't going as expected it became one of the main factors to discontinue the farming of P. vannamei.

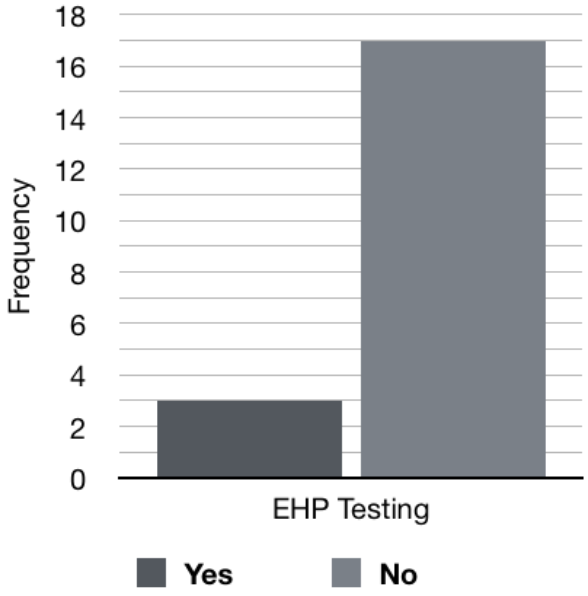

Fig:5 Graph for number of farmers did scientific tests to identify upcoming threats.

Conclusion:

This study shows despite having exponential potential in P vannamei culture this sector is facing severe setbacks due to several issues and resulted in economic losses for some farmers. The problems of diseases and price related issues are serious threat to sustainability of L. vannamei culture. Farmers need to alert and educated about these issues. Also government's involvement is necessary to regulate the price of shrimp and ensure that the shrimp farmers make profit. Subsidies through loans and on electricity price so that it can help them to make the production cost lower. Also lack of good quality seeds availability. Lack of financial support, lack of market facilities, lack of labour availability and higher production cost these issues need to be addressed and work on accordingly and also considering the potential government needs to encourage farmers, needs to run campaigns about Best Management Practices (BMP) and about HACCP principles, they also need to promote culture in scientific method.

Acknowledgement:

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