International Research Journal of Natural and Applied Sciences
ISSN: (2349-4077)
Impact Factor 7.032 Volume 9, Issue 08, August 2022
Website- www.aarf.asia, Email : editor@aarf.asia , editoraarf@gmail.com

A STUDY ON SOCIO ECONOMIC BENEFITS OF BETTER MANAGEMENT PRACTICES BMPS IN *LITOPENAEUS VANNAMEI CULTURE*

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ABSTRACT

In India, Litopenaeus vannamei has been approved for commercial production, and as a result, approval has been granted for the development of strict biosecurity-mandated hatcheries for this foreign species. Vannamei shrimp are the largest cultivated shrimp in terms of output and productivity, and commercial farming of them has just begun. The largest vannamei farming region in India is in Andhra Pradesh, which also has the highest area dedicated to culture and production. In terms of total fish and shrimp output, the state of Andhra Pradesh (AP) is first, and it supplies more than 70% of the nation's farmed shrimp. The leading exporter of shrimp in the nation, AP contributed 1.18 percent of worldwide and around 21% of domestic seafood production in 2014–15. Aside from the problems with bifurcation, the L. vannamei aquaculture in the state of Andhra Pradesh is also dealing with a number of sustainability problems, such as disease outbreaks, a lack of good seed, high feed costs, unauthorised farming, fluctuations in international prices, a decline in domestic demand, and others. Sustainability is seen to be possible if farmers apply Better Management Practices (BMPs) and biosecurity in L. vannamei culture, supported by government policy initiatives. Many small-scale farmers still need to adopt BMPs in order to ensure the preservation of vannamei culture, even if many farmers in AP have been using them in their farming operations. The state government of Andhra Pradesh has thought about providing incentives and subsidies to promote aquaculture and its sustainability because the state has the potential to become an aquaculture hub in India. The present study, which was carried out in 2020–21 in a number of districts of the newly reorganised, was designed to examine the socio-economic and environmental advantages of BMPs in Litopenaeus vannamei culture.

KEY WORDS: Litopenaeus vannamei, commercial production, cultivated shrimp.

INTRODUCTION

India's fisheries and aquaculture industry is a significant part of the country's food production. It is rapidly contributing to the country's nutritional security, with overall production of 10.8 million metric tonnes in 2016-17, with approximately 65 percent coming from the inland sector and nearly the same coming from culture fisheries. The sector contributes 1.1 percent of GDP and 5.15 percent of agricultural GDP, accounting for around 6.3 percent of global fish production. Over time, there have been significant paradigm shifts in terms of rising contributions from the inland sector and, more recently, aquaculture (NFDB, 2016). In 2016-17, India exported 11, 34,948 MT of seafood worth an all-time high of Rs. 37, 870.90 crores (US $ 5.78 billion), up from 9,45,892 MT (US $ 4.69 billion) the year before, with the United States and South East Asia remaining the top importers while demand from the European Union (EU) increased significantly. This accounts for approximately 10% of the country's total exports and roughly 20% of agricultural exports. The export of vannamei shrimp, a popular seafood delicacy, increased by 28.46 percent from 2, 56,699 MT to 3,29,766 MT in 2016-17. In terms of value, the United States received 49.55 percent of total vannamei shrimp exports, followed by South East Asian countries with 23.28 percent, the European Union with 13.17 percent, Japan with 4.53 percent, the Middle East with 3.02 percent, and China with 1.35 percent (MPEDA, 2016).

In addition to being able to cover its own internal fish needs, India has been able to significantly increase its foreign exchange profits by exporting fish and fishery-related goods. India overtook China as the second-largest fish producer in the world. Indian agriculture's significant subsector of fishing is reliant on the nation's abundant inland and marine water resources. For the comprehensive growth of the nation's fisheries industry, the "Blue Revolution" programme has been initiated with an investment of Rs 300 crore. In comparison to the previous three years, the total fish production has increased by about 18.86%, and the inland fisheries sector has increased by 26%. The overall fish production in the nation, including both capture and culture fisheries, was around 11.41 million tonnes in 2016–17. The country's 1.5 crore workers rely on the fishing industry for their living. The country's extensive aquatic resources offer additional chances and prospects for the fishing industry's future growth. India maintained its lead with an average annual growth rate of 14.8% during the previous ten years, when the average annual growth rate for fish and fish products was 7.5%. The human population consumes more than 100 million metric tonnes of fish annually as food, accounting for more than 25% of the world's protein diet. One of the food industries with the fastest global growth is aquaculture. Due to faster shrimp development, a short culture period, high export value, and market demand, shrimp culture has among the numerous areas of aquaculture experienced rapid global expansion. Shrimp culture has developed into a significant industry in east and south-east Asian emerging nations, accounting for the majority of exports in terms of both volume and value. India is a significant fish-producing nation in the globe through aquaculture. More than ten percent of the diversity of fish in the world is found in India. The proportion of inland fisheries and aquaculture in

overall fish production has increased from 46% in the 1980s to over 85% in recent years, making it the second-largest country in terms of aquaculture production. Aquaculture in the brackish water sector primarily involves the production of two types of shrimp: the native giant tiger prawn (Penaeus monodon) and the exotic white leg shrimp (Penaeus vannamei). Over the past three decades, aquaculture in India has developed into a viable commercial farming practise from the level of traditional backyard activity, with significant species and system diversification, and has been displaying an exceptional annual growth rate. The majority of shrimp produced in Southeast Asia and Latin America, or over 90% of all shrimp produced, are Litopenaeus vannamei. With 1,24 million Ha of brackish water area and 8,118 km of coastline, India is the second-largest producer of shrimp in the world, with Andhra Pradesh having the most vannamei farming land. The global market's availability of seeds that have been carefully bred to be Specific Pathogen Free (SPF) is mostly to blame for the expansion of the farming area for L. vannamei. India launched SPF Pacific white shrimp in 2009 primarily to revitalise the declining shrimp farming industry, which was having trouble as a result of regular black tiger shrimp crop failures brought on by the deadly white spot disease. Since its introduction, L. vannamei's cultivation area has grown significantly, from 283 ha in 2009–10 to 50,241 ha in 2014–15, and its production has climbed at a similar rate, from 1731 to 353,413 metric tonnes (MPEDA, 2015).

Aquaculture sector in India

Shrimp farming is synonymous with aquaculture in India in general, and brackish water aquaculture in particular, and is generally carried out by small scale farmers (less than 2 hectares). More than 14 million individuals in India participate in fishing and aquaculture activities (The Economic Times, 2017). Shrimp aquaculture has been established as a vehicle for rural development, food and nutritional security for the rural masses, due to its significant contribution to socio-economic development in terms of income and employment through the use of under-utilized resources in many parts of the country. It has been a bastion for India's seafood exports, since the country is one of the top producers of the species Penaeus monodon, which accounted for 21% of Indian seafood exports by volume and 44% by value in 2008-09. (MPEDA, 2010).

Shrimp Culturein India

Since initiating white leg shrimp culture in 2009, India has quickly risen to become a major player in the global shrimp market, with production jumping from 1,700 to over 250,000 MT in just five years. West Bengal, Tamil Nadu, Kerala, Karnataka, Maharastra, Gujarat, Odisha, and West Bengal account for 98 percent of national shrimp production among India's 29 states and 7 union territories. Of those eight states, West Bengal is by far the largest producer of farmed shrimp, accounting for 64 percent of all farmed shrimp produced in India.Between 1990 and 1994, the number

of commercial hatcheries expanded dramatically, resulting in a massive rise in the area under shrimp farming. Demonstrations of semi-intensive farming technology with production levels of 4-6 tonnes/ha, together with loan services from commercial banks and government subsidies, aided the shrimp farming sector's growth. The production of farmed shrimp climbed from 40,000 tonnes in 1991-1992 to 1,15,000 tonnes in 2002-03. Out of the total area of 0.152 million ha currently used for shrimp farming in India, 91 percent of shrimp farmers own less than 2 ha of farmland, and 6 percent own less than 5 ha. The state of West Bengal alone provides 47 percent of the area and contributes 50 percent of national shrimp production (MPEDA, 2007).During the late 1980s and early 1990s, India was a leader in Penaeus monodon growing. In 1994, illness outbreaks of White Spot Syndrome Virus (WSSV) were caused by the intensification of culture systems and a lack of biosecurity. In the late 1990s, the Penaeus monodon (black tiger shrimp) culture was on the verge of extinction, thus the freshwater prawn Macrobrachium rosenbergii (scampi) was introduced as a replacement. The 'period of virus disease' was well-known in the 1990s. The horrible White Spot Syndrome Virus (WSSV), as well as Monodon Baculovirus (MBV) and other hazardous bacterial infections, wreaked havoc on the shrimp farming industry. Freshwater prawns suffered severe disease outbreaks in 2001-02, which had a considerable impact on the state's productivity. Due to their disease resistance and tolerance of high stocking densities, low salinity and temperature, as well as their high growth rate, the Litopenaeus vannamei (white legged shrimp) was offered as an alternate species.

Introduction of *Litopenaeusvannamei* farming practices in India

Because of the availability of Specific Pathogen Free (SPF) and Specific Pathogen Resistant (SPR) brood stock, most South East Asian countries, including as Thailand, Vietnam, and Indonesia, have converted to the culture of exotic White leg shrimp, Litopenaeus vannamei, since 2001-02. Litopenaeus vannamei is the most widely cultured shrimp in Latin America and Southeast Asia, accounting for more than 90% of total production. Because Litopenaeus vannamei had been shown to be a potentially cultivable species in the United States, and because SPF (Specific Pathogen Free) stocks were available, demand for this species grew steadily. Following that, the species was imported into a number of countries (Felix, 2011). The shrimp portion has been promoted all around the world with nutritional security in mind. At present time, the Indian government has approved the introduction of vannamei breeders by a few hatcheries.

India is the world's second largest shrimp producer, with 8,118 km of coastline and 1.24 million acres of brackish water area, and West Bengal is the country's major vannamei producing area. The importation of the Pacific white shrimp, Penaeus vannamei, now known as Litopeneaus vannamei, often known as vannamei, has been approved by the Indian government. The Indian government approved pilot-scale L. vannamei cultures in 2003, and these pilot experiments were carried out. Simultaneously, a risk study was conducted with the goal of determining the viability of

introducing this new species. The Coastal Aquaculture Authority (CAA) of India approved vannamei culture in 2009, through the import of Specific Pathogen Free (SPF) brood stock with strict regulatory guidelines, following experimental studies and constant pressure from growers and traders for its introduction due to its potential in the export market. To limit the possibility of negative consequences from the introduction of this exotic shrimp, the Ministry of Agriculture, Government of India, established an Aquatic Quarantine Facility (AQF) of L. vannamei, which is a state-of-the-art facility for quarantining L. vannamei bloodstock imported to India.There was just one type of L.vannamei brood stock available during the early stages of its introduction in India, and that was the SPF (Specific Pathogen Free) variety. As a result, this shrimp grew more quickly, and the first two years of its farming were extremely successful thanks to the deployment of bio-security measures. Other reasons that helped make aquaculture profitable included a drop in shrimp output in Thailand, Indonesia, and Vietnam, as well as a drop in their exports to China. P. monodon was the mainstay of Indian aquaculture for nearly 25 years, but after the introduction of L. vannamei in 2009, its production and culture area have gradually fallen while L. vannamei has expanded, with West Bengal state having the greatest vannamei farming area in India. West Bengal leads the way with roughly 64 percent of the overall shrimp output of 4.35 million tonnes in 2014-15, followed by West Bengal (13 percent) and Tamil Nadu & Pondicherry (11 percent) (8 percent). West Bengal has a total cultivable brackish water area of roughly 28,000 hectares, of which 57 percent is dedicated to shrimp farming, compared to the national average of 14 percent. As a result, there is still a lot of room for expansion. West Bengal saw a 10.67 percent increase in exports in 2014-15, compared to 7.33 percent in 2013-14. In 2014-15, the state's vannamei culture expanded by 31%, allowing it to maintain its position as the largest shrimp exporter (CARE Ratings, 2017).Using the right statistical techniques, the factual data used as empirical evidence was analyzed. The benefits of BMPs in Litopenaeus vannamei culture ponds in the study area were evaluated using the results from both primary data and laboratory data. Other researchers were informed of the study's findings and the conclusions were carefully examined as a result.

RESEARCH METHODOLY

The current research was carried out at Litopeneaus vannamei farms in newly founded India in the years 2020-21. The study's materials and methodology were created with the main goal in mind: to assess the socioeconomic and environmental benefits of Better Management Practices (BMPs) in vannamei farming. The Indian government has been pushing the use of Better Management Practices (BMPs) in shrimp farms across the country, in accordance with FAO, CIBA, CAA, and ICAR recommendations. The goal of implementing and popularising BMPs in shrimp farm grow-out operations is to promote sustainable aquaculture practises and expand shrimp farms in rural regions while also creating extra rural jobs.

LOCALE OF THE STUDY

The present study was conducted during the year 2020-21 in the selected three districts of Balasore, Bhadrak and Kendrapara, which falls under Odisha state, represent the different agro-climatic zones. The study was conducted in Litopeneaus vannamei farmers (licensed and permitted by the Department of Fisheries, Govt. of Odisha) which were practicing BMP's in a phased manner.

RESEARCHDESIGN

The current study employed an ex-post-facto research design. Ex-post-facto designs, according to Robinson (1976), are any systematic empirical investigation in which the independent variables are not directly controlled because they have already occurred or are not inherently manipulable. The primary goal of this research was to determine the socioeconomic and environmental benefits of BMPs in Vannamei culture practises. It also consists of a goodnumberofshrimp/fishfeed. Prior to the major research, a pilot study was done to gain understanding and familiarity with the problem.

DEVELOPMENTOFINTERVIEWSCHEDULE

After reviewing the available literature on extension education and consulting with experts in the field of fisheries extension and related fields, an interview schedule is created based on the study's scope and objectives. When it came to establishing the interview schedule, the comments made were taken into account. As a result, the study's final interview schedule includes all necessary schedule elements for measuring the variables. The necessary revisions were integrated into the timetable after pre-testing. The interview schedule in its final form is included.

DATACOLLECTION

Primary and secondary data acquired in 2020-21 make up the data and information. The primary data was collected from 150 respondents who were chosen for the purpose of the study via interviews using a well-structured questionnaire.

POPULATIONANDSAMPLE

The study's target group is small–scale L.vannamei farmers (with less than 2 ha of land), with shrimp aquaculture being their primary source of income. In the state of Odisha, there was a lot of L.vannamei farming and a lot of production. The study's population includes L.vannamei agricultural farmers from Odisha's three districts. The sampling districts were chosen with care, based on data on the number of shrimp growers, farming area, production, and problem diversity.

RESULTS AND DISCUSSION

The following parts present the findings as well as the conversations that took place.

Profile Characteristics of *L.vannamei*farmers

In order to determine the socio-economic advantages of BMPs for particular vannamei culture ponds, the primary data (which includes various respondent profile characteristics) obtained through interview schedule (Plate 4.1 to 4.8) was analyzed using statistical tools like frequency, percentage, arithmetic mean, and standard deviation. The results obtained as a result of the usage of BMP in L. vannamei farms were ascribed to the following demographic parameters.

Personal Characteristics of *L.vannamei*farmers

The characteristics of L. vannamei shrimp farmers are shown in Table 4.1, including their age, education, family type, size, level of farming experience, occupation, and annual income.

Age

According to the data, the majority of L. vannamei farmers (53.30 percent) were in their middle years (between 31 and 45), while 31.66 percent were older (over 46 years), and 15% were younger (between 15-30 years). The mean (mean) age of the respondents was 41.30 years, and the standard deviation was 9.58.

Table.1Profilecharacteristicsof *L.vannamei*farmers

S. No	Independentvariables	Categories	Respondents(n=150)		Score
			Frequency(n)	Percentage(%)	Mean ±SD
A1	Age	Young (below30yrs)	22	14.66	41.30 ± 9.58
		Middle (31-45 yrs)	81	54.00	
		Old (46yrs&above)	47	31.33	

An important finding from the aforementioned study was that many of the vannamei farmers were in their forties and fifties. The aforementioned pattern may be explained by the fact that middle-aged farmers have more financial freedom and responsibility than younger farmers. They have the freedom to choose how to carry out their ideas. In addition, middle-aged farmers work more productively, with greater physical vigor and passion than older or younger farmers. The bulk of respondents may therefore be in the middle of their life as a result.

It was discovered that age had a favorable impact on the adoption of BMPs in vannamei farming. Since young people's technical application habits are essential to raising aquaculture output, their increased involvement in aquaculture management is advantageous to the industry. A deeper comprehension of how age affects levels of economic and social participation may be essential for customizing interventions. This demonstrates that elderly and middle-aged people are more involved in vannamei farming in the research area. As a result, it's probable that younger generations are becoming more interested in vannamei agricultural practices. The fact that middle-aged farmers have the freedom to choose whether or not to actively engage in vannamei farming may be the cause of the aforementioned tendency. Furthermore, compared to younger or older farmers, middle-aged farmers are more energized and effective.Compared to older farmers, young and middle-aged farmers were more forceful, energetic, and keen to adopt new technology like BMPs. Similar to the findings of Kanokwan Tammaroopa et al. (2016), older farmers were conservative, risk averse, and reluctant to try new things. They were also largely agricultural Between the ages of 41 and 55, over half of the shrimp growers fell.Ogunmefun and Achike (2017) found that respondents aged 35 to 40 made up the bulk of farmers (54.4 percent), while those aged 41 to 44 made up 31.33% of respondents. The results of the present study are in agreement with those of Baruwa et al. (2012), D. Srinivas and Ch. Venkatrayalu (2016), Pandey and Upadhayay (2012), Riski et al. (2012), and Obaiah (2012). (2004). 59.33 percent of farmers were under the age of 40, while 44 percent were beyond the age of 40, according to Vadher and Kapila Manoj (2014). 47.50 percent of shrimp growers were between the ages of 45 and 55, according to Swathi Lekshmi et al. (2005).The present results are similar to those of Dona et al. (2016), who discovered that 72.5 percent of the participants were old and the remaining participants were middle-aged. The younger generation might have been looking for employment in industries other than shrimp farming. The bulk of the farmers (96 percent)

were relatively young (young and middle-aged groups), and they were also the most active farmers, according to Manus Peter and Singas Susan's (2014) study.

Farming Experience

All of the respondents had prior agricultural experience, with the majority (54.00) having 0 to 2 years of experience, followed by 46.00 percent who had 3-6 years of experience, according to the findings. The data also showed that no respondents (100%) had experience of more than seven years. With a standard deviation of 0.05, the respondents' average (mean) farming experience was 1.4 years.

S. No	Independentvariables	Categories	Respondents(n=150)		Score
			Frequency(n)	Percentage(%)	Mean ±SD
A5	Vannamei farming Experience	Low (0to2 year) Medium(3-6yrs) High(7yrs&above)	69	46.00	1.40 ±
			81	54.00	0.05
			00	00	

CONCLUSION

Age, economic conditions, and farming interest all affect the number of years of vannamei agricultural experience. Since tiger prawn aquaculture is the main source of revenue for vannamei farmers, their extensive experience in the field can be attributed to this development.

All of the P.monodon shrimp farmers analyzed had more than five years of experience, according to Kumaran et al2003 .'s research. Similar findings were made by Thailand's Kanokwan Tammaroopa (2016), who discovered that white shrimp farmers often have 5 to 15 years of experience in the industry.

Similar results have been found by Baruwa et al. (2012), Riski et al. (2012), and Natarajan (2012). (2004). While Manus Peter and Singas Susan (2014) discovered that a higher percentage of the farmers (70 percent) had a medium degree of exposure to shrimp farming, Srinivas and Venkatrayalu (2016) observed that the majority of the farmers (96.9 percent) had more than five years of farming experience. Despite the fact that they all have between one and six years of experience, the farmers still seem to be learning.

The bulk of farmers surveyed (74 percent) had less than five years of experience, while only 26% had more, according to Vadher and Kapila Manoj (2014). Sahu et al. (2013) found that 18% of shrimp farmers had 7-8 years of experience, compared to 33% who have 4–7 years, 32% who have 2-4 years, and 6% who have just one or two years.

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