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Comparative analysis of constraints and suggestions between NaCSA and Non-NaCSA of black tiger prawn (*Penaeous monodon*) farmers of southern Andhra Pradesh: A case study

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Abstract: Aquaculture production in general and black tiger prawn (*Penaeous monodon)* **(**commonly called as shrimp) in particular, plays a pivotal role in developing the economy of India. The aquaculture sector has got enough capability to help increase the social and economic welfare by nourishing ever growing populations, make available new job opportunities and source of revenue, produce financial benefits that lessons paucity and receive foreign exchange. Among the maritime states, Andhra Pradesh is the largest producer of shrimp production in the country (15,925 area ha). The incidence of WSSV and other diseases during early 1990's had exposed the vulnerability of shrimp farming to different constraints and made the shrimp growers to fetch huge economic losses and since then received severe setback. In view of this backdrop, the present study was aimed to analyze the constraints and suggestions provided by shrimp growers of holding < 2 ha culture area. A case study was conducted at three districts *viz* Guntur, Krishna and Nellore districts of Andhra Pradesh, during the first crop of 2016. The study area was selected purposively and the respondents were identified using simple random technique. The sample size for the current investigation was 210 and the proportionate sampling technique was employed for selection of respondents for each district. The interview schedule was conducted with the aid of well-structured and pre-tested questionnaire containing 12 items of constraints such as seed constraints, feed constraints, disease constraints, management constraints, input constraints, harvest constraints, post-harvest constraints, labour constraints, extension constraints, infrastructure constraints, marketing constraints, miscellaneous constraints. The farmers were also asked to suggest appropriate remedies/suggestions for improving better yields in shrimp farming. The data were analyzed using '*Garett* method of ranking' for all the listed constraints and suggestions. The results followed that out of the total respondents surveyed 50 percent of the respondents NaCSA farmers and remaining 50 percent respondents Non-NaCSA farmers. The results showed that NaCSA farmers rankings such as seed constraint (rank-1) was opted as the major constraint, followed by other constraints such as disease constraint (rank-2), feed constraint (rank-3), labour constraint (rank-4), management constraint (rank- 5), input constraint (rank-6), harvest constraint (rank-7), post-harvest constraint (rank-8), extension constraint (ranking-9), infrastructure constraint (rank-10) marketing constraint (rank-11) and miscellaneous constraint (rank-12). Non- NaCSA farmers rankings such as seed constraint (rank-1), disease constraint (rank-2), management constraint (rank-3), feed constraint (rank-4), input constraint (rank-5), harvest constraint (rank-6), labour constraint (rank-7), post-harvest constraint (rank-8), extension constraint (ranking-9), infrastructure constraint (rank-10) marketing constraint (rank-11) and miscellaneous constraint (rank-12). The results pertained to suggestions provided by the *P. monodon* farmers were presented in Tab. 4.25 and ranking was also provided to them based on the number of respondents offered for the same. The results showed that majority (94.5%, rank -1) farmers suggested that full time power supply to the monodon culture farms would fetch better yields. The other suggestions include fixed market price (77.7%, rank- II), insurance from government (69.3%, rank -III), supply of SPF seed (65.1%, rank - IV), technical advice from government (50.4%, rank-V), and awareness programmes and training programmes (37.8%, rank -VI), lab facility (46.2%, rank -VII). The present study conclude that the constraints as well as suggestions expressed by the shrimp growers reflect the current scenario at farm level and these would be considered as bench mark for making policy decisions and helpful for finding out appropriate solutions so as to bring back the past glory of the *Peaneous mondon* farming by adoption of implementation of Better Management Practices (BMP's) as well as HACCP principles throughout the culture chain.

Keywords: *Peaneous mondon*, shrimp, Andhra Pradesh, *Garett* ranking, constraints and suggestions

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Introduction

Fisheries and Aquaculture is an important sector of food production in India. It is increasingly providing nutritional security of the country, with the total production of 10.8 million metric tonnes during 2016-17 and has nearly 65% contribution from the inland sector and almost the same from culture fisheries. Constituting about 6.3% of the global fish production, the sector contributes to 1.1% of the GDP and 5.15% of the agricultural GDP. Paradigm shifts in terms of increasing contributions from inland sector and further from aquaculture are significations over the years (NFDB, 2016). Fish and fish products have presently emerged as the largest group in agricultural exports of India and exported 11, 34,948 MT of seafood worth an all-time high of Rs. 37, 870.90 crores (US $ 5.78 billion) in 2016-17 as against 9, 45,892 MT (US $ 4.69 billion) a year earlier, with USA and South East Asia continuing to be the major importers while the demand from the European Union (EU) grew substantially during the period. The overall export of shrimp during 2016-17 was pegged at 4,34,484 MT worth USD 3,726.36 million. USA was the largest import market for frozen shrimp (1,65,827 MT), followed by the EU (77,178 MT), South East Asia (1,05,763 MT), Japan (31,284 MT), Middle east (19,554 MT), China (7 818 MT), and other countries (27,063 MT). Japan was the major market for Black Tiger shrimp with a share of 43.84 per cent in terms of value, followed by USA (23.44) and South East Asia (11.33). Shrimp farming is a multi-billion-dollar industry contributing a major income to several counties in Asia and South America. India as the second largest country in aquaculture production in the world. The share of the brackish water sector includes culture of shrimp varieties mainly concentrated around the native giant tiger prawn *Peneaus monodon* as a single most important species. Recently the culture of exotic white leg shrimp, *Lito peneaus vannamei* is the most extensively farmed crustacean species in the world (Dr. Laxmappa, India.). India has quickly become a major player in the global shrimp industry since the country initiated culture of tiger shrimp *Peneaus monodon* in 9 maritime states viz. West Bengal, Odessa, Andhra Pradesh, Tamilnadu, Kerala, Karnataka, Goa and Maharashtra, account of 68846 ha area is under culture and producing 81452 MT with an average production of 1.18 MT/ha/year. The state of Gujarat records maximum productivity of 3.12 MT/ha/year followed by Tamil Nadu and Odessa with productivity 2.70 and 2.02 respectively.

Material and Methods

The present study was conducted during first crop of the year 2015-16 in the three districts of Guntur, Krishna and Nellore major districts (inhabited by large number of shrimp farmers) among the 13 districts of Andhra Pradesh State, India. The main focus of the investigation is to perform exhaustive analysis of constraints in shrimp farming and suggestions for combating the constraints of black tiger prawn (*Penaeous monodon*) farmers of small-scale shrimp growers holding 0-2 ha culture area.

Population and sample

First stage selection – identification of districts

Out of 9 costal districts of Andhra Pradesh state, the districts *viz* Guntur, Krishna and Nellore were selected purposively for the sample collection as the first stage selection.

Second stage selection – selection of mandals

From the identified districts of Guntur, Krishna and Nellore, three mandals were selected purposively in each district; three villages were selected purposively based on the shrimp farming area, number of farmers and production.

Research design

Ex post-facto and exploratory research design was followed for the present study. A pilot study was conducted prior to main investigation to obtain insights and familiarity to the problem. The purpose of exploratory study is to formulate a problem for a more precise investigation or to develop hypothesis. Here the exploratory study was attempted to enhance the understanding of the constraints of shrimp farming in a more scientific way.

Third stage selection – selection of respondents

Table 1. Selection of respondents

Name of the Mandal	Total No of identified respondents	No. of respondents selected	No. of respondents in each selected village	
Total No of respondents selected from Guntur District - 70				
Karla palem	249	24	Ganapavaram	8
			Pedapaluguvari palem	8
			Karlapalem	8
Pittalavani palem	242	24	Alluru	8
			Alakapuram	8
			Khaji palem	8
Repalle	195	22	Lankevanidibba	8
			Rajukalva	8
			Gangadipalem	6
Total No of respondents selected from Krishna District – 70				
Machilipatnam	415	24	Kona	8
			Chinnapuram	8
			Gundupalem	8
Nagayalanka	335	22	Sangameswaram	8
			Ootagundam	8
			Peda kammavani palem	6
Koduru	385	24	Ullipalem	8
			Venugopalapuram	8
			Pittalanka	8
Total No of respondents selected from Nellore District - 70				
Chillakuru	218	22	Eruru	8
			Tippaguntapalem	8
			Kota	6
Indukurpet	305	24	Kuditipalem	8
			Gangapatnam	8
			Naidu palem	8
Bogolu	278	24	Jadagogula	8
			Mungamuru	8
			Yenugulabavi	8

Development of interview schedule

The interview schedule was conducted with the aid of well-structured and pre-tested questionnaire containing 12 items of constraints such as seed constraints, feed constraints, disease constraints, management constraints, input constraints, harvest constraints, post-harvest constraints, labour constraints, extension constraints, infrastructure constraints, marketing constraints, miscellaneous constraints. The farmers were also asked to suggest appropriate remedies/suggestions for improving better yields in shrimp farming.

Data collection

The study involved collection of both primary and secondary data. The primary data was collected from the selected shrimp farmers with the help of duly pre-tested questionnaire. The secondary data as regard to shrimp farming over the years was collected in order to get insights on pesticide usage pattern change over the years in the study area. The secondary data was collected from the reports of state fisheries departments, because of their being authenticity. The questions were asked in local language (Telugu) for easy understanding. A great care was taken to obtain the valid and authentic information for the schedule and after completion of day's work, the questionnaire were checked and edited to obtain objective responses.

Analysis of data and application of statistical techniques

The sample size for the current investigation was 210 and the simple random sampling technique was used for selection of respondents. Garrett's Ranking Technique was used. As per this method, respondents have been asked to assign the rank for all factors and the outcome of such ranking has been converted into score value with the help of the following formula:

$$\text{Percent Position} = \frac{100\,(Rij - 0.5)}{Nj}$$

Where Rij = Rank given for the ith variable by jth respondents; Nj = Number of variables ranked by jth respondents

The percent position of each rank was converted to scores by referring to tables given by Garret and Woodworth (1969). for all the listed constraints and suggestions.

Results and Discussion

The results of the current investigation identified various types of constraints and suggestions for better yield in shrimp farming, were depicted in Tables 1 & 2.

Analysis of Constraints

The data was analyzed using *Garrett* (1969) method of ranking' for all the listed constraints and depicted in Tab. 1. The results followed that out of the total respondents surveyed 50 percent of the respondents NaCSA farmers and remaining 50 percent respondents Non-NaCSA farmers. The results showed that NaCSA farmers rankings such as seed constraint (rank-1) was opted as the major constraint, followed by other constraints such as disease constraint (rank-2), feed constraint (rank-3), labour constraint (rank-4), management constraint (rank- 5), input constraint (rank-6), harvest constraint (rank-7), post-harvest constraint (rank-8), extension constraint (ranking-9), infrastructure constraint (rank-10) marketing constraint (rank-11) and miscellaneous constraint (rank-12). Non- NaCSA farmers rankings such as seed constraint (rank-1), disease constraint (rank-2), management constraint (rank-3), feed constraint (rank-4), input constraint (rank-5), harvest constraint (rank-6), labour constraint (rank-7), post-harvest constraint (rank-8), extension constraint (ranking-9), infrastructure constraint (rank-10) marketing constraint (rank-11) and miscellaneous constraint (rank-12)

The ranking of constraints could be utilized for prioritization of constraints in order to make immediate steps on priority basis to address the specific constraint. Even though 12 ranks were opted for each constraints, but all the constraints were playing equal importance in most of the *P.monodon* farms in the study area as the majority of the farmers were experiencing the either of these constraints irrespective of their rank.

The results clearly indicated that shrimp farmers were still experiencing the problems of diseases which fetched them economic losses. The increase of wages of labor used in the shrimp farming operations and fluctuations of shrimp prices were also the major hurdles perceived by the shrimp growers in the study area. It might be the similar situation prevailed in all the shrimp growing places of rest of the state of Andhra Pradesh.

Table 2. Information about the Constrains in shrimp *monodon* culture compared to NasCSA and Non-NaCSA.

S.No	Constrains/problems	NaCSA		Non-NaCSA	
		Score	Rank	Score	Rank
1	Seed constraints	82.26	I	85.59	I
2	Feed Constraints	60.83	III	60.11	IV
3	Disease Constraints	62.26	II	63.29	II
4	Management Constraints	58.45	V	62.57	III
5	Input constraints	57.65	VI	55.75	V
6	Harvest constraints	54.48	VII	55.19	VI
7	Post-Harvest Constraints	52.73	VIII	51.78	VIII
8	Labour Constraints	60.19	IV	54.72	VII
9	Extension Constraints	49.32	IX	47.42	IX
10	Infrastructure Constraints	29.96	X	32.57	X
11	Marketing Constraints	19.40	XI	19.40	XI
12	Miscellaneous Constraints	9.32	XII	8.29	XII

Analysis of Suggestions

The results pertained to suggestions provided by the *P. monodon* farmers were presented in Tab. 4.25 and ranking was also provided to them based on the number of respondents offered for the same. The results showed that majority (94.5%, rank - 1) farmers suggested that full time power supply to the *monodon*

culture farms would fetch better yields. The other suggestions include fixed market price (77.7%, rank- II), insurance from government (69.3%, rank -III), supply of SPF seed (65.1%, rank - IV), technical advice from government (50.4%, rank-V), and awareness programmes and training programmes (37.8%, rank -VI), lab facility (46.2%, rank -VII).

Table 3. Suggestions provided by *P.monodon* culture farmers (n=210)

Suggestions	Frequency	Percentage	Rank
Awareness programmes and training programmes	22	46.2	VI
Insurance from government	33	69.3	III
Lab facility	18	37.8	VII
Fixed market price	37	77.7	II
Technical advice from government	24	50.4	V
Full time power supply	45	94.5	I
SPF seed supply	31	65.1	IV

The constraints as well as suggestions expressed by the monodon growers reflects the current scenario at farm level and these would be considered as bench mark for making policy decisions and helpful for finding out appropriate solutions so as to sustain glory of the *P. monodon* culture by adopting Better Management Practices (BMP's) throughout the culture chain.

Discussion

The findings of the current investigation are agreeing with the earlier researchers. The findings of the present study once again reconfirm that the viral diseases especially WSSV is playing pivotal role in terms of crop losses. A.K Nayak *et al.,* (2001), reported the various problems perceived by the shrimp farmers such as prevalence of white spot disease, lack of support of banks in financing aqua-projects, resolution of legal problems, price fluctuations, poor quality of chemicals and feeds, lack of facilities. It was also opined to seek support from financial institutions to assist shrimp growers, increased subsidy, timely informing price fluctuation, effective extension service, free electricity and use of feed pro-biotics to combat the problems (white spot disease) of shrimp farmers.

The current investigation has categorically proved that the input costs such as labour cost and fluctuations of prices of harvested shrimp are the important constraints which have to be addressed by implementing appropriate Government policies coupled with the strengthening the practices of transfer of scientific technology such as adoption of BMP's at the door steps of shrimp growers. Ramachandra Sahu *et al.,* (2014), reported that selling price of produce was low and increasing price of input materials were indicated as the major constraints by shrimp farmers, lack of credit facilities, lack of guidance on technologies, labour scarcity, lack of electricity and poor quality seed were the other constraints experienced by the shrimp growers. Mohammed E. Megahed *et al.,* (2013), found that the decreasing the cost of seed by decreasing the operating costs, enhance the availability of skilled staff, support investments in the production of shrimp feed and ensure that necessary quality standards, sustainable marine shrimp aquaculture research based on both short and long term vision, encourage private sector to establish local dealer companies to import feed and equipment needed for industry. It was also opined that these major constraints to the shrimp culture could be avoided with the implementation of appropriate policy decisions. Paramita Banerjee-Sawant *et al.,* (2003) reported that there was scope for reducing the yield loss by way of strengthening the transfer of technology mechanism at field level. The training of farmers on management practices related to shrimp culture, establishment of field laboratories for disease diagnosis and remedy, soil and water quality testing, development of small-scale hatcheries to meet the seed requirements, formulation of cost effective, high quality feeds and policy measures to strengthen credit supply, storage and marketing of produce.

Srinivas and Venkatrayalu (2016) reported that a mechanism for seed certification by the state fisheries department has to be developed to ensure supply of healthy and quality shrimp seed. There is need to bring a comprehensive legislation on the practice of BMPs in general and quality of seed in particular in the shrimp farming. Though Shrimp aquaculture has contributed significantly in employment generation and infrastructure development of the coastal community, yet small and marginal farmers are still to be benefited from the shrimp farming. There is a need to bring insurance particularly for small and marginal farmers and the Government should contribute certain percentage of the premium to reduce economic risks involved in the shrimp farming. There is also need to bring the regularization of shrimp farming in non - regularized areas (where shrimp farming is practiced in Government vacant and assigned lands). Government should establish Aquatic Quarantine Facilities (AQF) and Brood Stock Multiplication **Centre's** for sustainability of Shrimp fanning in Andhra Pradesh. Kumaran *et al.,* (2003) reported some of the suggestions identified by the farmers for sustainable shrimp production. Sixty percent of the farmers suggested that quality seed from hatcheries should be ensured through seed certification by SPF. About half of the respondents (53.3%) suggested that dissemination of price information through mass media channel during harvesting would help the farmers to secure good price for their produce. Establishment of disease diagnostic centers at coastal villages, technical assistance by the scientists, and speedy settlement of legal hurdles, institutional credit and insurance and provision of electricity on nominal charges were the other suggestions. From all these, the expected hypothesis "the adoption of BMP's in *P. monodon* culture would improve socio economic status of the farmers due to increase of yield", has been evidently proved to be true.

Conclusion

To conclude from the results of the present study that the constraints as well as suggestions expressed by the shrimp growers reflect the current scenario at farm level and would be considered as bench mark for making policy decisions and helpful for finding out appropriate solutions so as to bring back the past glory of the *Peaneous mondon* farming by adoption of implementation of Better Management Practices (BMP's) as well as HACCP principles throughout the culture chain.

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