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Constraint analysis of shrimp culture in Gujarat, India

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Abstract
Shrimp farming is playing a pivotal role in the socio-economic development of India. The overall export of shrimp during 2015-16 was to the tune of 3, 73,866 MT worth the US $ 3096.68 million in India. Gujarat has the highest productivity of 13.59 MT/ha/year. The four districts of Gujarat namely Valsad, Navsari, Surat, and Bharuch are the major contributors for shrimp production having 95% of state shrimp farmer's population with the potential area of 69,583.91ha. The data was collected from shrimp farmers and intermediaries by personal interviews and exporters by mails and telephonic interview that were selected by two-stage sampling methods. The First stage was purposive sampling method to identify the districts and the second stage was to identify the aquatic cultured farmers by convenience sampling method. Data was also collected from nearby places where trading and marketing activities have taken place. The study has analyzed the various constraints such as production, economic, marketing and miscellaneous constraints faced by the actors involved in the shrimp culture and has suggested some measures for smooth operation and regulation of shrimp culture in South Gujarat. The constraint analysis through garret's ranking is done to analyze the various problems faced by shrimp farmers, exporters, and middlemen during shrimp culture. The data were analyzed using frequency and percentages. Garret's ranking revealed that the storage facility, transportation, and price fluctuations are the major constraint faced by all the marketers. The Government should consider the challenges faced by the marketers of this region encourage shrimp culture by building organized market. The results were reflecting the existing scenario of shrimp culture in the study area. Irrespective of the ranking of the various constraints, the majority of the constraints were the reasons behind the setback of shrimp crop failure.

Keywords: garret's ranking, constraints, shrimp

1. Introduction
India offers a huge potential for aquaculture development. The country has a coastline of 7,517 km and an extensive river and canal system of about 195.210 km, consisting of 14 major rivers, 44 medium rivers and numerous small rivers and streams. In addition, pond and tank resources are estimated at 2.36 million ha (Kumar, 2016) [6] and (FAO, 2014) [3]. India experienced an eleven fold increase of fish production in the past six decades.

Table 1: Brackish water Aquaculture Area in India (Vibrant Gujarat Report, 2017)

State	Estimated brackish water area (ha)	Area under cultivation (ha)
West Bengal	4,05,000	34660
Gujarat	3,76,000	3387
Andhra Pradesh	1,50,000	50000
Maharashtra	80,000	716
Kerala	65,000	14657
Tamil Nadu	56,000	2879
Orissa	31,600	11000
Goa	18,500	650
Karnataka	8,000	3500
Pondicherry	800	37
Total	11,90,900	118983

The table 1 is showing the brackish water area and area under shrimp farming as per the report of Vibrant Gujarat, 2017. West Bengal and Gujarat have the majority of the potential area for brackish water aquaculture owing to the high tidal amplitude. Andhra Pradesh developed almost 57% of area available for shrimp culture whereas Maharashtra and Gujarat utilized only 1.2 to 0.6% of the available area.

In Gujarat, shrimp farming is a fast growing activity.

Currently approximately 15,000 ha are used for brackish water shrimp production and the land available for this industry could be up to 376,000 ha as per the surveyed data. The main districts are Valsad, Navsari, Surat and Bharuch, of which Surat is the foremost brackish aquaculture district. Further opportunities exist in Bhavnagar and Jamnagar region. Since the entire coastal land belongs to the government, actors need to obtain a lease to initiate production. This is a lengthy process. For a farmer only five hectares of land is allowed. Companies need 50 ha however to make the production economically viable however. Companies are therefore engaged in contracting farmers. Leases are given for a period of 20 years after which the lease agreement can be extended for another 20 years. Hence the states heavily support the sector, which makes it interesting for investors to look for foreign expertise and technology. In view of this background, the present study was aimed to analyses various constraints of shrimp aquaculture in Gujarat state and an attempt was made to identify constraints.

2. Materials and Methods

The present study was conducted in Valsad, Surat, Navsari and Valsad districts of Gujarat during the year of 2016-17. Two stage sampling method was used. First stage was purposively selected four districts namely Valsad, Navsari, Bharuch and Surat because of the highly potential area with cultivation and production. As they have coastline with abundant brackish water area is under shrimp culture and a majority of small –scale growers are prevalent, it was identified as the sampling division for the present study. Only these districts are developed in Gujarat. Why the rest of the coastal districts are not developing and those developed districts also not utilized their potential brackish water area, that's why the present study was undertaken to identify the problems. Second stage was to identify the aquatic cultured farmers by convenience sampling method in each district so as to get hands-on information about diversification of various existing problems. The sample consisted of 105 farmers, 2 exporters and 20 middlemen from South Gujarat region. All farmers have got the licenses from the Coastal Aquaculture Authority, Govt. of India, where majority of the shrimp cultivators are depending on shrimp aquaculture as their main livelihood.

The secondary data about area, production were taken from the Department of Fisheries, MPEDA, CIBA, NAU of Gujarat. The primary data from the respondents were collected in 2016-17 year. Interview schedule with a well-structured questionnaire was used as a tool for the present study. A pilot study was also conducted prior to the present study.

Statistical Tools Used in the Study. The collected data was tabulated, scored, and analyzed using frequency, percentage and Garrett (1969) ranking technique using the following formula. Garrett's ranking technique was used.

Garrett's Ranking Technique

In order to analyze the constraints faced by the producers at the production and marketing stage, and also to analyze any other constraints faced by them, the Garrett's ranking technique will use. Garrett's Ranking Technique gives the change of orders of constraints into numerical scores. The major advantage of this technique as compared to simple frequency distribution is that, constraints are arranged based on their importance from the point of view of the respondents. Hence, the same number of respondents with two or more constraints is given different ranks. Garrett's formula for converting ranks into percent will given by the following equation:

$$\text{Percent Position} = 100 * (R_{ij} - 0.5) / N_j$$

Where,

R_{ij} = rank given for i^{th} factor (constraint) by j^{th} individual;

N_j = number of factors (constraints) ranked by j^{th} individual.

The relative position of each rank will obtain from the above formula will convert into scores for each factor; scores of all individuals will add and then divide by the total number of respondents for the specific factor. Finally, mean scores for all the factors will arrange in descending order and the ranks will give.

3. Results & Discussions

The results (Tab.2) showed that 4 constraints such as production constraints, marketing constraints, economic constraints and miscellaneous constraints are the major constraints which are playing significant role in the success of shrimp culture. All the identified 4 constrains had been influenced by another sub-component of the farming practices. All these constraints were analysed using frequency and percentage and ranking was given accordingly.

Table 2: Constraints of shrimp farming in South Gujarat (n=127)

Constraints	Frequency	Percentage
Production Constraints		
Non availability of quality seeds	43	33.86
High cost of the seed	68	53.54
Inadequate supply of hatchery seeds in the required time	52	40.94
Lack of adequate no. of nearby hatchery units	50	39.37
High cost of feed	86	67.72
Low quality of seed	65	51.18
Knowledge about services of MPEDA/CAA	32	25.20
Less demand for smaller size shrimp	67	52.76
Marketing Constraints		
Lack of storage facilities	83	65.35
Lack of information on prices	75	59.06
Price fluctuations of shrimp	62	48.82

Distance from the market	49	38.58
Lack of Gov. support	55	43.31
Changes in the market trends	74	58.27
Delay-approval of importing countries	45	35.43
Lack of transportation facilities	39	30.71
Economic Constraints		
Lack of funds for expansion	56	44.09
delay in approval of bank loan	49	38.58
High Interest rates	72	56.69
Insurance claims on loss	63	49.61
Financial issues for credit	69	54.33
Miscellaneous Constraints		
Lack of information on technology	68	53.54
Lack of regular training programmes	46	36.22
Absence of skilled labours	71	55.91
Diseases of shrimp	59	46.46
Changes in international quality standards	65	51.18

Production Constraints

The constraint analysis (Tab.2) of production showed that majority (67.72 %) of the respondents facing the constraints of high cost of feed data followed by high cost of seed (53.54%). The study emphasizes the importance of supply of low priced high quality shrimp feed with long shelf life. It is also necessary to improve the feed storage facilities at shrimp farms such as erecting cold storages at shrimp farms. It is also interesting to note that 52.76 % of respondents reported less demand for smaller size shrimp and (51.18 %) informed that, low quality of seed. It is clear that seed is playing success of any culture and stocking of a quality seed will improve the survival rate and also reduce the cost of shrimp production. It is necessary to establish good number hatchery units to the nearby shrimp farming sites. The lack of availability of quality seed is the major problem for sustainability of the shrimp farming and inadequate supply of required number of hatchery seed (40.94 %) within stipulated time. Disease outbreaks also appeared to be the major threat to shrimp farming. 39.37% respondents are facing the lack of adequate number of nearby hatchery units and 33.86% respondents have the issues of non-availability of quality seeds. 25.20% respondents have knowledge about the services given by the govt. organizations of MPEDA/CAA. Very few of the respondents are using the services that would be much benefitted to shrimp farmers. It is clear evidence that Good Management Practices are important in order to yield more amount of marketable size counts as well good quality final product. The study also found the importance of outreach programmes to enable the shrimp grower informed about the advanced methods of shrimp farming.

Marketing Constraints

Majority of the respondents (65.35%) are facing lack of storage facilities. In South Gujarat area, there are only two working processing units in present which is not fulfilling all the produce of that region. So they need to sell at any cost to buyers in some situations. They are not able to store, also because of the higher storage charges. 59.06% respondents are not aware about the market prices because of illiteracy, lack of information etc. Some of them are dealing with the middlemen or commission agents. 58.27% respondents are thinking like so many changes in market trends like policy, rules of export, demands of shrimp etc. In recent times shrimp culture (48.82% respondents) is facing setback due to fluctuation of market prices even though good market is available for good count at global level. The fluctuations of shrimp prices and supply of adequate information to shrimp growers at regular intervals by the Govt., is the need of the hour so as to minimize the crop losses. The present study also revealed that (43.31%) reported lack of Govt. support, distance from the market (38.58%), delay/approval of importing countries (35.43%) and lack of transportation facilities (30.71%). The results are agreeing with the studies of Mohamed *et al*. (2013) [8], Koteswari *et al*. (2014) [5], (Jagadeesh, 2015) [4] and (Chittem & Kunda, 2017) [1]. Koteswari *et al*., (2014) [5] reported that all farmers were producing tonnes of shrimp but there is price fluctuation in the market for the produce which affects their income.

Economic constraints

Majority of the respondents (56.69%) reported that high interest rates of bank loans. 54.33% respondents have financial issues of credit. Some of the small scales farmers have make some contracts with the middlemen or supplier of seeds and feeds for the credit. They buy seeds/feeds on credit on agreeing that produce should be selling out only with them. 49.61% respondents are having problem about the insurance on crop loss and lack of funds for expansion (44.09%) and delay in approval of bank loan (38.58%). Even majority of the farmers are not able to afford the amount of insurance. The Govt. has to make appropriate crop insurance policies to shrimp culture in the similar lines of agriculture and allied sectors. The results are agreeing with the studies of (Mohamed *et al*. 2013) [3], (Koteswari *et al*. 2014) [5] and (Jagadeesh, 2015) [4]. (Kumaran, Ravichandran, Gupta, & Nagavel, 2003) [7], and (Vadher & Kapila, 2014), shrimp farming was successfully practiced in Andhra Pradesh and Gujarat, although with some constraints.

Miscellaneous Constraints

The shrimp culture in the present study area had been facing sever constraint about the non-availability of skilled labour (55.91%) during important operations such as stocking, harvesting, Mannering etc. These hired labours generally come from Bihar, Jharkhand and Orissa during culture period.

The existing shrimp growers were also suffering from inadequacy of the family labour for their day to day activities. The present study had reconfirmed the earlier studies of demand of higher wages and non-availability of skilled man power. These problems have to be checked by fixing standard prices to the skilled workers/certified workers and appropriate policy has to be prepared by the Govt. Agencies for hiring and wage fixation for the labour in order utilize their services in the shrimp culture facilities. 53.54% respondents are not aware about the updated scientific information on technology and 51.18% changes in international quality standards. 46.46% respondents reported disease of shrimps. Prevalence of disease outbreaks in shrimp culture is receiving serious attention in recent times and resulting in crop failures. Majority of the respondents of the surveyed experiencing other than WSSV diseases such as Vibrio sp., white gut, white fecal matter, loose shell etc. The reasons behind the prevalence of diseases other than viral might be poor water quality management, high stocking densities and poor maintenance at Shrimp farming facilities. The results are agreeing with the studies of Mohamed *et al*. (2013) [3], Koteswari *et al*. (2014) [5] and (Jagadeesh, 2015) [4]. Disease is the major limiting factor faced by the shrimp farmers and it has become the most burning and threatening issue for shrimp farming communities. 36.22% respondents are feeling lack of regular training programmes. Shrimp aquaculture has contributed significantly in employment generation and infrastructure development of the coastal community and overall development of coastal areas.

Ranking of Constraints in Shrimp Culture

The data were analyzed using 'Garrett (1969) method of ranking' for all the listed constraints and depicted in Table 2 and depicted in Table 3. The results showed that out of the total farmer's, exporters and middlemen surveyed High cost of feed (rank-1) was opted as the major constraint, followed by other constraints such as lack of storage facilities (rank-2), High Interest rates (rank-3), Absence of skilled labours constraint (rank-4), Lack of information on prices (rank-5), High cost of the seed (rank-6), Changes in the market trends (rank-7), Financial issues for credit (rank-8), Lack of information on technology (ranking-9), Less demand for smaller size shrimp (rank-10), Low quality of feed (rank-11) and Price fluctuations of shrimp (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 shrimp farms in the study area as the majority of the farmers were experiencing the either of these constraints irrespective of their rank. The increase of wages of labour 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 area.

Table 3: Garret's ranks and scores on Constraints encountered by shrimp farmers

Sr. No.	Constraints	Score	Rank
1	High cost of feed	55.528	I
2	Lack of storage facilities	53.591	II
3	High Interest rates	46.488	III
4	Absence of skilled labours	45.843	IV
5	Lack of information on prices	40.157	V
6	High cost of the seed	36.409	VI
7	Changes in the market trends	34.961	VII
8	Financial issues for credit	32.598	VIII
9	Lack of information on technology	32.126	IX
10	Less demand for smaller size shrimp	31.654	X
11	Low quality of feed	27.126	XI
12	Price fluctuations of shrimp	25.874	XII

4. Conclusion & Suggestions

The present study conclude that shrimp culture even though it was stated with high expectations but in recent time it is also receiving severe setbacks due to several constraints and fetching heavier economic losses. The constraints such as non-availability of quality seed and feed, high cost of seed and feed, very low support price fixed by the Govt., lack of market facilities, lack of labour, high cost of labor, & higher input cost are to be addressed with appropriate existing measures at shrimp culture facilities in order to produce zero defect shrimp products.

Like other states of India, the seafood markets of South Gujarat have been found lacking in marketing infrastructure. Some suggestions are given below, which may help policy makers for improvement in shrimp marketing in the state. In order to build the efficient and skilled human resources for the effective shrimp marketing in South Gujarat the following suggestions can be useful for fisheries department and other private organizations to develop fisheries in South Gujarat. (Also include suggestions taken from various respondents involved in the marketing)

The cold storage facilities are requiring, in order to storing the shrimp in good quality for longer time. It also reduces the post harvest loss during marketing. The government organizations like NABARD, MPEDA can help in providing these facilities in the market by their various schemes to develop the shrimp marketing in various states including Gujarat. There should be at least one ice factory at each block. Most of the shrimp farmers and intermediaries reported the transportation is the major constraint in shrimp marketing. The increase fuel cost and transportation cost affects the marketing of shrimp. The intermediaries does not use proper weighing machine to weigh the shrimps. It may leads to loss to the shrimp farmers. The electronic weighing balance should be used to weigh the shrimp properly.

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