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Constraints analysis of shrimp farming in Saurashtra, Gujarat, India

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Abstract
In India, aquaculture recorded rapid progress since 1980s. India with huge aquatic resources has registered a phenomenal growth in fisheries production with 10.8 mmt in 2015-16 (6.4% of world's total fish) from mere 0.75 mmt in 1950-51, which is 14-fold increase. Since introduction of *Litopenaeus vannamei* in 2009, it has been the candidate species of Indian shrimp farming. Present study was the pioneer work in this area which revealed that lack of experience (86.51%) was the most important socio-personal problem faced by majority of the respondents. 61.86% facing a problem of lack of technical guidance. High rate of chemicals and medicines increases a load on the pocket of 82.33% shrimp farmers. 64.65% respondents demanding for Government support in the form of subsidy. Problem of price fluctuation during harvest (88.84%) was the major economic constraints faced by shrimp farmers followed by self-finance (83.26%) and lack of financial support (79.53). Lack of disease diagnose lab (97.21%) and lack of power (92.09%) was the top most infrastructural constraint. Other major constraints were inadequate drinking water facilities (92.09%), lack of good transport facilities (68.84%) and communication of facilities (53.49%). Non availability of land in near sea shore was the major management constraints (89.30%). Lack of proper extension network and regular training program was the most important extension constraint faced by 60.47% of shrimp famers. Heavy mortality of hatchery seeds due to poor quality constraint faced by 28.84% shrimp farmers. Only 24.65% of farmers facing disease outbreak problem in study area.

Keywords: Constraints, improved shrimp farming, *Litopenaeus vannamei*, Gujarat

1. Introduction
Aquaculture is the fastest growing food production sector in the world. In form of value, aquaculture production was dominated by shrimp. In India, shrimp farming recorded rapid progress since 1990s. India has registered 14 fold increase in fisheries production from 0.75 mmt in 1950-51 to 10.8 mmt in 2015-16 which account 6.4% of world's total fish production. *Litopenaeus vannamei* introduced in 2009 and now it has been the candidate species of Indian shrimp farming [4]. In Gujarat, shrimp farming is a fast growing industry. Currently, approximately 4,552 ha area is used for brackish water shrimp production and the potential area available for this industry is 376,000 ha [1]. Due to the outbreak of WSSV and other associated problems in *Penaeus monodon* farming, an alternate exotic species *Litopenaeus vannamei* (Pacific white legged shrimp) was introduced in 2009. To cope up a problem of food requirement, improved shrimp Farming practices is adopted by shrimp farming community. But to adopt this technologies shrimp farmers facing so many constraints. So the present study was aimed to identify various constraints of shrimp aquaculture in Saurashtra region of Gujarat state and necessary site-specific remedial measures was also identified.

2. Materials and Methods
The present study was conducted in all coastal district Gujarat and union territory Diu during the crop (April-August) of 2018-19. It was selected purposively to establish a database about various existing problems of shrimp farmers. There are eleven districts in Saurashtra region, out of which shrimp farming activity is carried out in seven coastal districts (*viz.* Bhavnagar, Amreli, Gir-Somnath, Junagadh, Porbandar, Devbhumi Dwarka and Jamnagar) and Union Territory (Diu). Total numbers of farmers are comparatively less, hence all the operational shrimp farms selected region by adoption census method (Gawade *et al.*, 2006). Compendium of act, rules, guidelines, regulations and other notifications (2014) by Coastal Aquaculture Authority of India, Chennai was used as a base for compilation of interview schedule (Anon., 2014).

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Interview schedule intends to gather information regarding social, personal, technical, economic, environmental and social constraints. Descriptive statistical tools was employed wherever required [7].

3. Results and Discussion
The results of the present study revealed that 7 major constraint categories and 51 sub-heads which are playing pivotal role in the success of *L. vannamei* culture. These constraints were analyzed using frequency and percentage.

3.1 Socio-personal constraints: Socio-personal status plays an important role in adoption of a technology or practice. It was revealed that lack of experience (86.51%) was the most important problem faced by majority of the respondents followed by lack of co-operation among different institutes (57.67). Lack of information technology affects 37.21% farmers. A similar result was found by Sahu *et al*. (2014). The present study indicated that there was good co-operation among the farmers of Saurashtra. Result of Giri (2016) was contrary with present study. He has reported that lack of co-operation and co-ordination among farmer, extension personnel and scientists were the most common problems faced by majority of respondents. Moreover, lack of labour security, objection of local peoples and lack of regular training program was not an important constraints as indicated by the indents in the study area. Similar results were found by Sahu *et al*. (2014).

3.2 Technical constraints: High cost and complex technology limits adoption by the farmers. A good quality feed and good water quality was not an important constraints for the farmers but lack of knowledge (26.05%) and 61.86% facing a problem of lack of technical guidance. The constraint analysis of seed showed that majority (65%) of the respondents facing the constraints of high cost of seed followed by inadequate supply of required number of hatchery seed (60%) within stipulated time [2]. Result of the present study was contrary, it shows that only 4.69% farmers faced seed quality problem. Adequate hatcheries are available in study area but still farmers facing a problem of seed supply in the required time constraint faced by 28.84% shrimp farmers. So quality seed will improve the growth and survival rate and also reduce the cost of production.

3.3 Economic constraints: Economic factor plays crucial role in adoption of improved technologies. High rate of chemicals and medicines increases a load on the pocket of 82.33% shrimp farmers. 64.65% respondents demanding for Government support in the form of subsidy. Constraints faced by Giri (2016) were low price for the fishes in local market, lack of marketing network and transporting of fishes to distant market. In the present study, problem of price fluctuation during harvest (88.84%) was the major constraints faced by shrimp farmers. Chittem and Kunda 2017 revealed that 70% of respondents reported fluctuations of prices.
The shrimp growers should be provided with adequate credit at the time of need to overcome the financial problems in management of shrimp farming practices. Usman *et al*. (2016) reported about 85% of the respondents also revealed that lack of credit was their major constraint to adopting farming technologies. In the present study 66.05% respondents facing problem of credit and 79.53% facing the lack of financial support and 83.26% respondent seeking for self-finance.

Chittem and Kunda 2017 stated that 91.66% of respondents reported high cost of feed and seed. On contrary in the present study only 55.35% respondent facing high rate of supplementary feed and 60% facing high rate of seed. In the present study, 60.47% shrimp growers found scarcity of hired skilled labour but only 28.84% farmers facing a problem of higher wages demanded during peak season. Due to unavailability of skilled labour 41.86% farmers employing unskilled and untrained labour. Chittem and Kunda 2017 facing sever constraint about the availability of skilled manpower (36.66%). Problem of theft and high commission charge was not an important set back in the present study. But high initial investment was one of the major threat for shrimp growers (82.33%).

3.4 Environmental constraints: Chittem and Kunda (2017) reported that to avoid crop failure serious attention requires to prevent of disease outbreak. 40% of the farmers experiencing other than WSSV diseases (33.33%) such as Vibrio sp., white gut, white fecal matter, loose shell etc. In the present study, 24.65% of farmers faced disease outbreak problem. The reasons behind the diseases prevalence other than viral might be high stocking densities and poor water quality management.
During study period it was found that 35.81% of respondent's site was prone to natural disaster. None of the shrimp farming sites in the study area was affected by pollution. In the present study 46.05% farmers facing biosecurity issue whereas Chittem and Kunda (2017) showed 58.33%. To overcome the problem of biosecurity fencing, bird scare, crab fencing, strict control on entry and exit of farm, wearing, inform visitors about restriction & security measures on farm need to be implanted.

3.5 Infrastructure constraints: Infrastructure availability plays crucial role in success of crop. This in turn affects the adoption of technology. Lack of disease diagnose lab (97.21%) was the top most infrastructural constraint. It was also observed that 92.09% respondent facing constraints of lack of power. A similar results showed by Chittem and Kunda (2017) that lack of power (86.66%) facing that constraints.
Other major constraints were inadequate drinking water facilities (92.09%), lack of good transport facilities (68.84%) and communication of facilities (53.49%). The result was contrary with Chittem and Kunda (2017); they found that lack of roads (8.33%), lack of transport (11.66%), lack of adequate drinking water facilities (18.33%) and communication of facilities (3.33%). The intensity and seriousness of these constraints varied from system to system. These constraint analyses emphasize the importance of site selection criteria to be implemented prior to design of shrimp culture system.

3.6 Management Constraints: A success of shrimp farming often depends on level of management. Non-availability of land near to sea shore was the major management constraints. 89.30% respondent facing this problem. On the contrary Chittem and Kunda (2017) shows only 6.66% respondent facing the same problem. Management constraints showed that 58.33% of respondents faced bio-secure constraints [2]. In the present study, 46.05% respondent facing similar problem. Chittem and Kunda (2017) found that 50% farmers faced problems of harvesting at proper stage. On the contrary only 22.33% of the farmers facing problem of bad count.

Information on export oriented standards and quarantine standards knowledge problem faced by 44.19% of shrimp growers. On the other hand, Chittem and Kunda (2017) found only 13% of respondent facing this problem.

3.7 Extension Constraints: Extension system is very effective in dissemination and adoption of the technology. Lack of proper extension network and regular training program was the most important extension constraint faced by 60.47% of shrimp famers. The result was contrary with Chittem and Kunda (2017); they found only 8.33% respondent facing this problem.

A problem of demonstrations published literature was found by (26.05%) but result was contrary with Chittem and Kunda (2017). Chittem and Kunda (2017) found that 56.66% but present study showed only 6.51% farmers facing this problem. Lack of information on technology was reported by 26.05% respondent. A similar result was found by Chittem and Kunda (2017). To overcome above extension constraints

it is necessary to build extension network which enable farmers to adopt improved shrimp farming practice.

Present study was the pioneer work in this area. It can be concluded that lack of experience (86.51%) and lack of technical guidance (61.86%) and Lack of proper extension network and regular training program (60.47%). These problem might be solved by regular training program by extension, research and teaching agency. Problem of price fluctuation during harvest (88.84%) was the major economic constraints followed by self-finance (83.26%). 64.65% respondents demanding for Government support in the form of subsidy. So in aquaculture sector there should be provision of loan by banks or government for development of this secotr. Lack of disease diagnose lab (97.21%) and lack of power (92.09%) was the top most infrastructural constraint. Non-availability of land near to sea shore was the major management constraints (89.30%) so easy leasing policy should be formed by policy makers.

Table 1: Constraints of *L. vannamei* shrimp farmers in Saurashtra (N=215)

Constraints	Frequency	Percentage
I. Socio- personal constraints		
Lack of experience	186	86.51
Lack of information on technology	80	37.21
Lack of regular training program	71	33.02
Lack of co-operation among farmers	56	26.05
Lack of co-operation among different institutes	124	57.67
Lack of labour security	55	25.58
Objection of local peoples	66	30.70
II. Technical constraints		
Lack of knowledge	56	26.05
Lack of good water quality	1	0.47
Lack of Technical guidance	133	61.86
Non availability of quality seed	10	4.65
Inadequate supply of hatchery seeds in the required time	62	28.84
Heavy mortality of hatchery seeds due to poor quality	62	28.84
Lack of adequate number of nearby hatchery units	0	0.00
Low quality of feed	0	0.00
III. Economic constraints		
Initial high investment	177	82.33
High rate of seed	129	60.00
High rate of supplementary feed	119	55.35
High rate of chemicals and medicine	177	82.33
Lack of financial support	171	79.53
Subsidy	139	64.65
Self-finance	179	83.26
Price fluctuation during the time of harvest	191	88.84
Non availability of credit	142	66.05
High commission charges	43	20.00
Problem of theft	62	28.84
Scarcity of the hired labour	130	60.47
Demand of higher wages during peak season	62	28.84
Employment of unskilled and untrained labour	90	41.86
IV. Environmental constraints		
Pollution	0	0.00
Bio-security	99	46.05
Natural disasters	77	35.81
Disease outbreak	53	24.65
V. Infrastructure constraints		
Lack of road and good transport	148	68.84
Lack of good communication facility	115	53.49
Lack of power	198	92.09
Lack of drinking water and daily needs	198	92.09
Lack of disease diagnosis lab	209	97.21

VI. Management Constraints		
Non-availability of land near to sea shore	192	89.30
Water management	1	0.47
Problem of bad count	48	22.33
Problem of birds	99	46.05
Quarantine standards	95	44.19
Information on export oriented standards	95	44.19
VII. Extension constraints		
Lack of proper extension network	130	60.47
Lack of regular training programmes	130	60.47
Lack of information on technology	56	26.05
Lack of private consultants Approach to extension agency / Distance	56	26.05
Demonstrations Published literature Subsidies (Inputs)	56	26.05
Knowledge about services of MPEDA/CAA	14	6.51

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