Impact of Corona Virus Disease (COVID-19) related lockdown on

Shrimp aquaculture sector In India:

Issues and way forward

ICAR-CIBA, Chennai: 02.05.2020

Background

Fisheries and aquaculture sector contribute around 1% to India's Gross Domestic Product (GDP) and over 5% to the agricultural GDP. Brackishwater aquaculture, the farming of shellfishes and finfishes along the coastal line of the country and in inland saline areas is a vibrant farming sector, under the aquaculture umbrella. Brackishwater aquaculture sector is dominated by the shrimp farming, is the economic engine of Indian aquaculture, when consider the significant contribution of this sector in food production, employment generation and economic benefits. Farmed shrimp production touched 7.0 lakh tonnes in 2019, of which 87% is exported to USA, China, Japan, EU and South East Asia, earning a robust foreign exchange to the tune of Rs.35,000 crores (MPEDA, 2019).

Coronavirus disease (COVID-19) reported for the first time in China during December 2019, later declared as world Pandemic on March 11th 2020 by world health organization (WHO), has so far infected more than 3.22 million people across the globe including India, killing close to 2 lakh people at the time of preparation of this document (27 April 2020). The highly contagious nature of the COVID virus and absence of therapeutics and vaccine, many countries have forced to adopt national lockdown to contain its spread. India has imposed countrywide total lockdown from 25th March to 3rd May 2020 restricting the movement of people, closing down the public transport and all the business activities except the essential commodities and medical emergencies. In this backdrop, it is important to look at the economic impact of the present lockdown and its trickling effect on the Indian shrimp farming, being one of the major brackishwater aquaculture sector, its stake holders including farmers.

While shrimp farming is concentrated mostly in the coastal states from West Bengal to Gujarat, majority of the critical inputs like, seed, feed and other farm inputs are produced in Andhra Pradesh and Tamil Nadu and transported to all the shrimp farming states, including the recently emerging inland saline aquaculture areas in Punjab, Haryana and Rajasthan. The allied processing infrastructure is spread across the maritime states. About 12 lakh families are dependent on this sector directly and indirectly for their employment and income to sustain their livelihoods. Interstate and intrastate movement of seed, feed, inputs and produce for processing and export are of utmost importance for sustaining shrimp aquaculture in India. Therefore, it is important to look at the important components of shrimp aquaculture sector such as hatchery, farming, inputs suppliers, seafood processing and trade including manpower to understand the likely impacts of lockdown and social distancing in the shrimp value chain in the country.

Online survey to gauge the opinion of stakeholders

ICAR-CIBA being a national R&D institute in the fore front of brackishwater aquaculture development in India, conducted an online survey to understand the impact of COVID-19 related lockdown on the shrimp farming sector in April, 2020. A digital questionnaire with 44 questions related seed supply, inputs supply, farming, marketing and social issues was posted through our institute android App '(CIBAShrimpApp)' and other digital platforms. A random sample of 504 stakeholders including farmers, hatchery operators, input dealers, processors, aqua-professionals and academicians across the states (Fig.1&2) responded to the survey and expressed their opinion.

The responses received were processed component wise to evaluate the impact of national lockdown on this dynamic agribusiness sector.

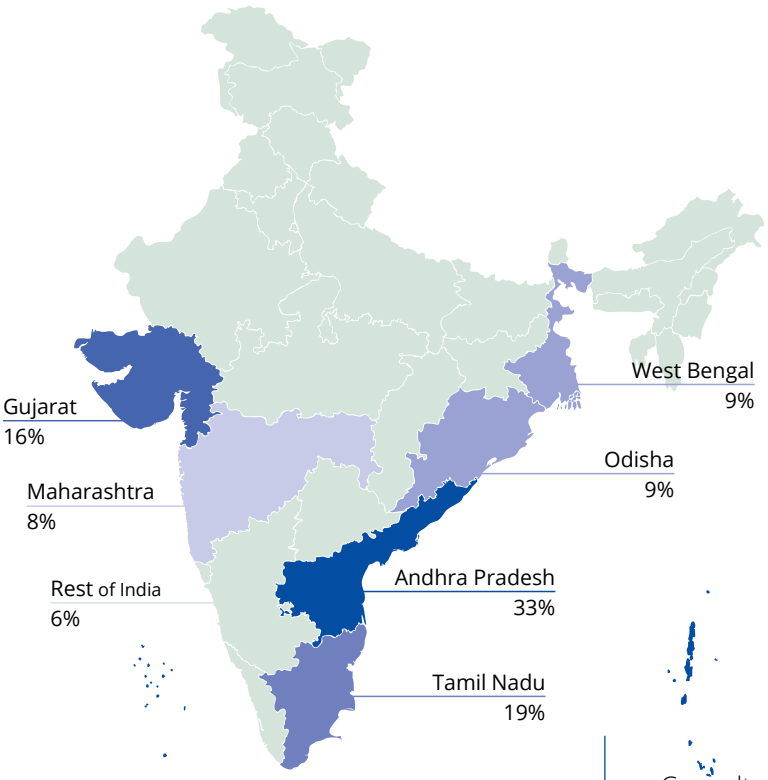

Fig. 1: COVID-19 Impact Survey: State wise responses

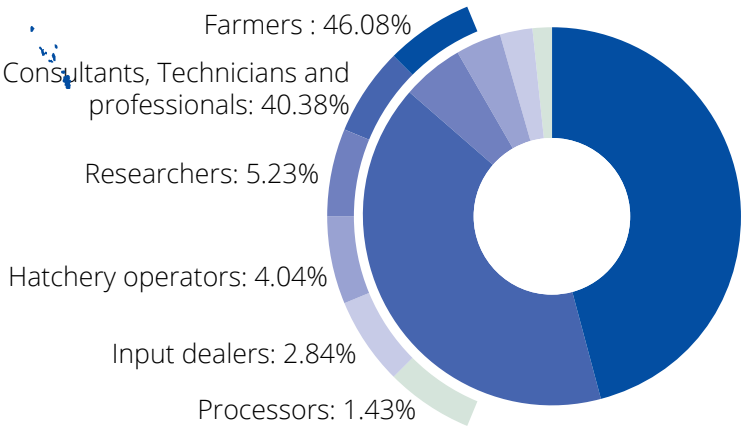

Fig. 2: Stakeholders participated in the survey (N = 504)

Shrimp seed production and supply

Since 2010, exotic Pacific white shrimp (*Penaeus vannamei*) is the candidate species farmed in the country, which accounts for the 90% of the farmed shrimp production. Indian hatcheries imports Specific Pathogen Free (SPF) brood stock mainly from USA, Madagascar, Mexico and Hawaii after due quarantine clearance by Govt. of India through the Aquatic Quarantine Facility (MPEDA-RGCA-AQF) located at Chennai. During 2019-20, 1,24,957 pairs of brood shrimp were imported from the 14 authorized suppliers from abroad to cater the needs of 311 hatcheries and 90 nauplii rearing centers. During the first three months of 2020, the country has imported about 63,430 pairs of vannamei broodstock which was 32% higher compared to the same period in the previous year 2019 (CAA, 2020). This indicates that adequate vannamei brood stock was available for seed production for the first half of the year. In addition to SPF brood shrimp, hatcheries also need import of speciality feeds, live feeds (Artemia cyst and Polychaetes) and several growth promotional products mostly from south East Asian countries and, unavailability of these inputs would affect the hatchery seed production and the seed quality. Further, ban on international air cargo and related disturbances in the functioning of Aquatic Quarantine Facility during April 2020 might affect the vannamei broodstock availability and that would influence the production and supply of shrimp seed. Almost half of the 70 billion annual shrimp seed requirement for stocking is produced during March-April.

Most of the hatchery operators (>90%) participated in the survey were apprehensive about the import of vannamei brood stock and sourcing of polychaete worms the vital fresh feed for shrimp brood stock. Majority (78%) of the respondents reported a drop in the sale of seed to the tune of 30-40%, in addition to the constraints in availability of labour, technical staff and transportation (Fig-3). As reports emerged during the second fortnight of February and early March about the COVID-19 spread in China, EU countries and USA, shrimp farmers scaled down the stocking, leading to a reduction in the farming area in the current cropping season, foreseeing a slump in the demand in the international shrimp markets due to economic slowdown driven by Covid 9 pandemic. It was reported that sizable number of hatcheries destroyed 30-40% of their seed production due to lack of demand. Similarly farmers who had a standing stock resorted to 'panic harvesting' of smaller size shrimp and sold at lower prices to reduce the possible larger financial losses. This interruption in staggered harvesting and stocking might lead to enhanced demand in seeds for the next crop, where hatcheries may not be able to meet the increase demand for shrimp seeds, due to lockdown constraints.

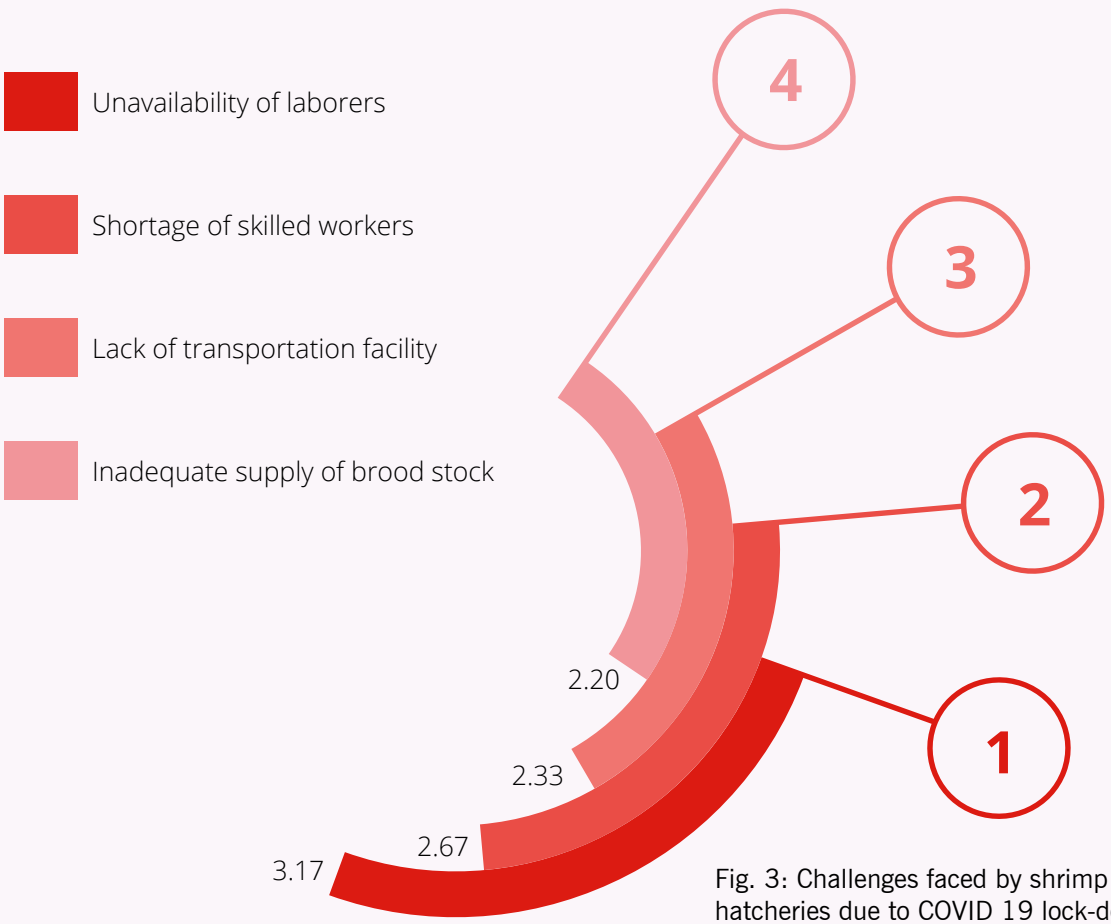

Fig. 3: Challenges faced by shrimp hatcheries due to COVID 19 lock-down: mean score and rank

Farming scenario and farmers

The major stocking season in Indian shrimp farming is during March-April which was disrupted due to its coincidence with the national lockdown brought in by the same period. The present scenario of the farming as expressed by the participants revealed a mixed picture (Fig. 4). About 27% of farmers prepared their ponds but did not stock due to difficulty in accessing the quality seed, uncertainty over the culture and the market. About 25% of the farms were in Phase-I with less than 30 days of culture, 34% were in phase-II with 30 to 80 days of culture, and about 14% were in above 80 days of culture (DOC). The DOC reflects the financial impact on the farmer, where farms in phase I and II may not, realise their investment, while those in phase III, could make break even or small profits.

Constraints in sourcing the seed, increased feed cost by Rs.6-7/kg and accessing the farming requirements (Fig-5) due to COVID19 lockdown caused the reduction in farming area to the tune of 40% in the current season and would increase the cost of production by 15-20% , and that would reduce the profits by 40%. Majority of the farmers surveyed were aware of mobile Shrimpapp developed by CIBA for technical advice and reported its usefulness, especially during the lockdown period. Further, the spare parts for aerators, pumps, generators or other machineries required for farming operations were not classified as essential, hence their availability and movement was affected during the lockdown. Closure of aqua laboratories and professional services affected health management of animals and culture environment.

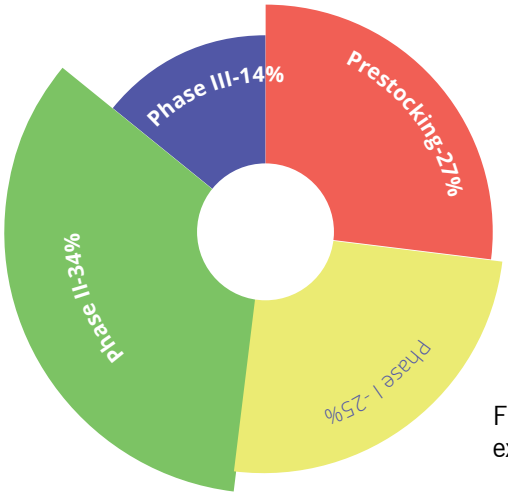

Fig. 4: Scenario of shrimp farming as expressed by the participants

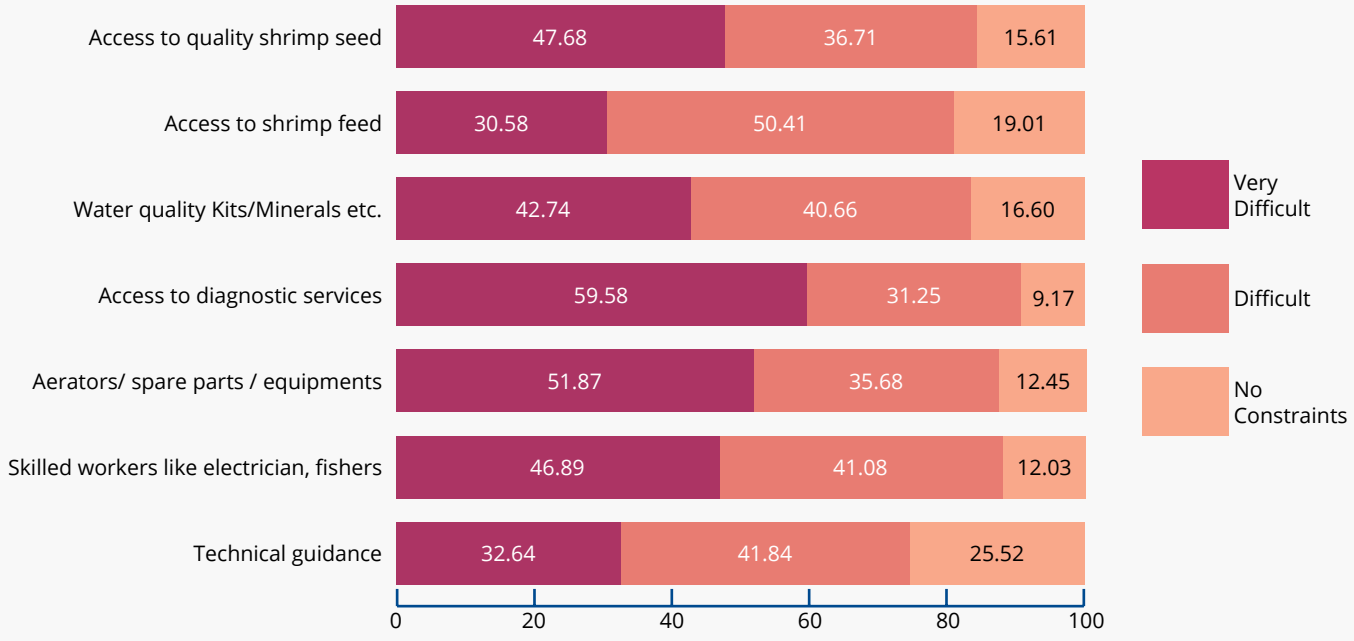

Fig. 5: Constraints faced by the shrimp farmers (%) during COVID-19 lock-down period

Manufacturing and supply of feed and shrimp healthcare products

India's annual shrimp feed requirement is about 12-13 lakh tonnes, most of it is produced by 8-10 major companies located mostly in the state of Andhra Pradesh and Tamil Nadu, and few from Gujarat, Haryana and West Bengal. Barring the minor glitches during the first week of lockdown, feed mills resumed their production to the near normal period except the issues related to labour and transportation which hindered the timely supply. Since feed mills are totally dependent on the demand from farming operations, poor stocking activity, both in terms of farming area and stocking densities in the farms led to the scaling down of feed production. Further, lockdown affected the movement of raw materials such as fish meal, soybean meal and other specialized inputs such as fish oil, krill meal etc., compelling the feed mills to curtail their production capacities. Similarly, shrimp healthcare products including nutritional supplements, probiotics and pond management inputs are crucial for successful shrimp farming. Based on the reports on marketing trends, lockdown is expected to reduce the sale of feed and healthcare products by 40% and loss of employment by 30%. Professional support from the input dealers in the areas of feed, health and pond management to farmers was also interrupted due to restrictions in their movement, under lockdown.

Processing and market dynamics

Majority of farmers (71%) in the survey were constrained especially during early days of lockdown due to closure of domestic markets and the absence of cold storage facilities, where nearly half of the respondents (57%) could not access the refrigerated vehicles for transporting the harvested shrimps to the processing facilities (Fig-6). The non-compliance of processors to honour the government orders for minimum procurement price in state such as Andhra Pradesh further demoralized the already strained farmers. The processors argued that poor handling of shrimps due to lack of skilled labour at farm site had deteriorated the quality of harvest material, hence, expressed their inability to pay the support price fixed by the government. Further, processing units had reservation to procure the harvest material due to shortage of labour and requested the farmers to supply headless shrimp. The labourers who left to their native places during the initial lockdown could not return to the work due to lack of transportation. The problem was compounded by the inadequate quantity of harvested

material to run the processing facility, lack of desired size of shrimp, lack of export orders in addition to lack of storage facility with local dealers and small buyers (Fig-7).

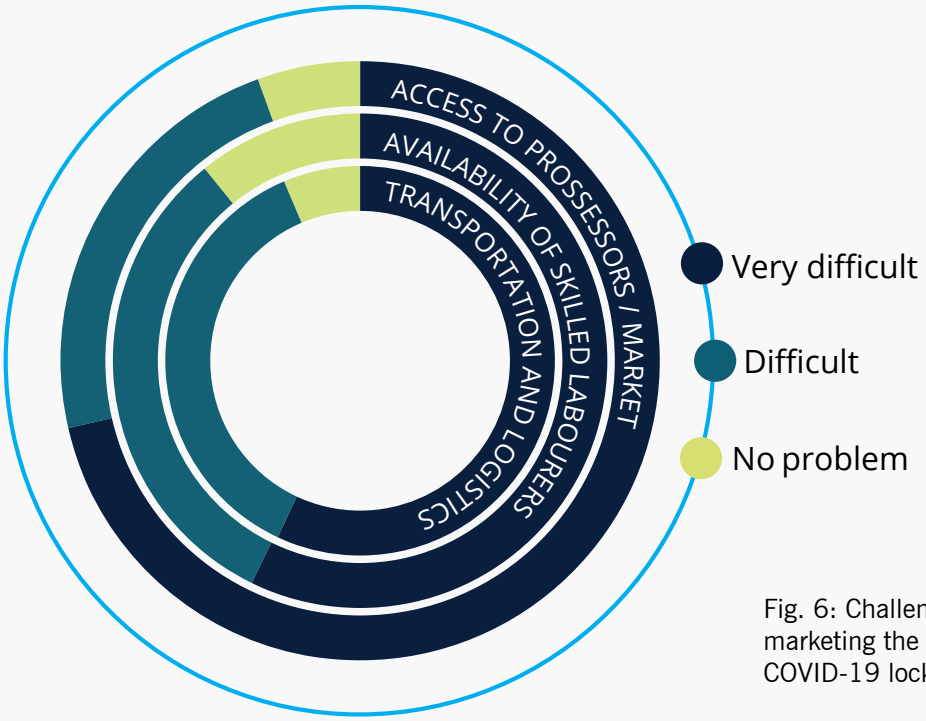

Fig. 6: Challenges encountered in marketing the shrimps during the COVID-19 lock-down

Though the emerging post Covid 19 scenario in terms of economic disruption in shrimp farming sector is very serious, exporters in the industry felt that the present setback is temporary and they are confident that the sector could bounce back. They have recalled that during the April last week Chinese market has opened up and export consignments have started moving, and hopeful that USA and EU markets will revive in the coming months, in less than 6 months period. During 2019 India exported a total of USD 4.88 billion worth shrimp to USA ($2.37 b) and the economic recession in the US due to Covid 19 pandemic would be hurting the Indian shrimp industry the most. Though Chinese market is improving, the earnings in rupees for kg of shrimp exported to China (~ 251.54) was less than 50% than that of USA (~ 575.35). Hence the economic benefits to Indian shrimp farming, in the improved Chinese markets have limited, compared to that of USA. Though small in number, farmers producing black tiger shrimp have the reason to smile as Japan has lifted the inspection orders from India in first week of April 2020 following the satisfactory reports on freedom from antibiotic residues in the consignments. Farming of tiger shrimp and harvest of large size shrimp can be a sustainable income model for farmers. All the participated stakeholders were of the view that over dependence on international markets and lack of domestic market is hurting the sector

the most, as no backup strategy is in place, which make the Indian shrimp farming vulnerable to international market dynamics. Ultimately the impact on Indian shrimp farming will be determined by the sustained interest of the customers and retail business from the importing countries, and the current shrimp farming situation under Covid 19 pandemic in other Asian countries.

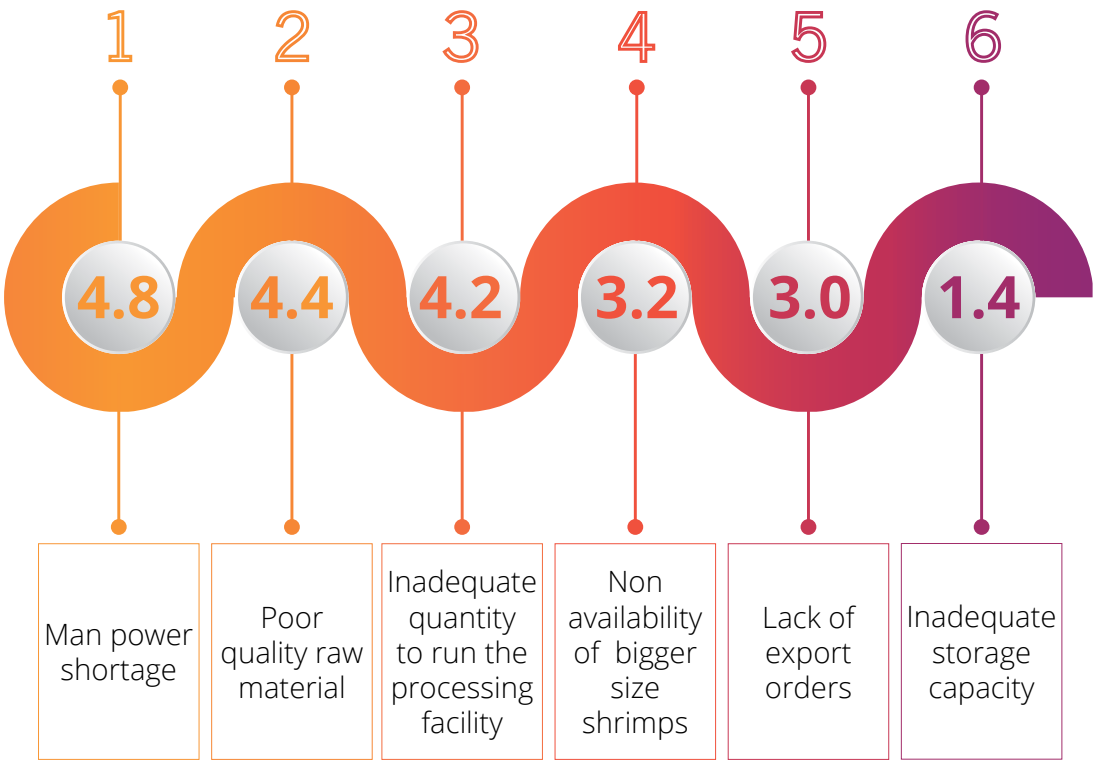

Fig. 7: Challenges faced by the processors during the COVID-19 lock-down: mean score and rank

Loss of employment and other social issues

Shrimp supply chain is heavily dependent on labour and offer wide range of jobs opportunities such as farm labour, technicians at hatcheries, farms and processing units, manufacture and marketing of inputs, whole sale and retail businesses, workers to operators of farm machineries, vehicle operators, civil and plumbing, mechanical and electrical machineries etc. The shrimp aquaculture sector provides more than one million jobs directly and indirectly in production, processing and distribution systems. During the current lockdown period, labour from the local villages could not attend to the work due to movement restrictions and in-house workers left to their native places due to fear of infection, and lack of salary assurance from the employers. The sealing of state and district borders and restrictions on day to day movement of people affecting their access to work place caused loss of employment and income led to social security issues in the entire shrimp farming supply chain.

Overall impact and economic loss to the sector with scenarios

The results of the survey indicated that COVID-19 related disruptions adversely affected the shrimp aquaculture sector in terms of reduction of farmed area and shrimp production by 40%, seafood export performance, to the tune of 30% or more loss, in the current year (2020-2021) (Fig-8).

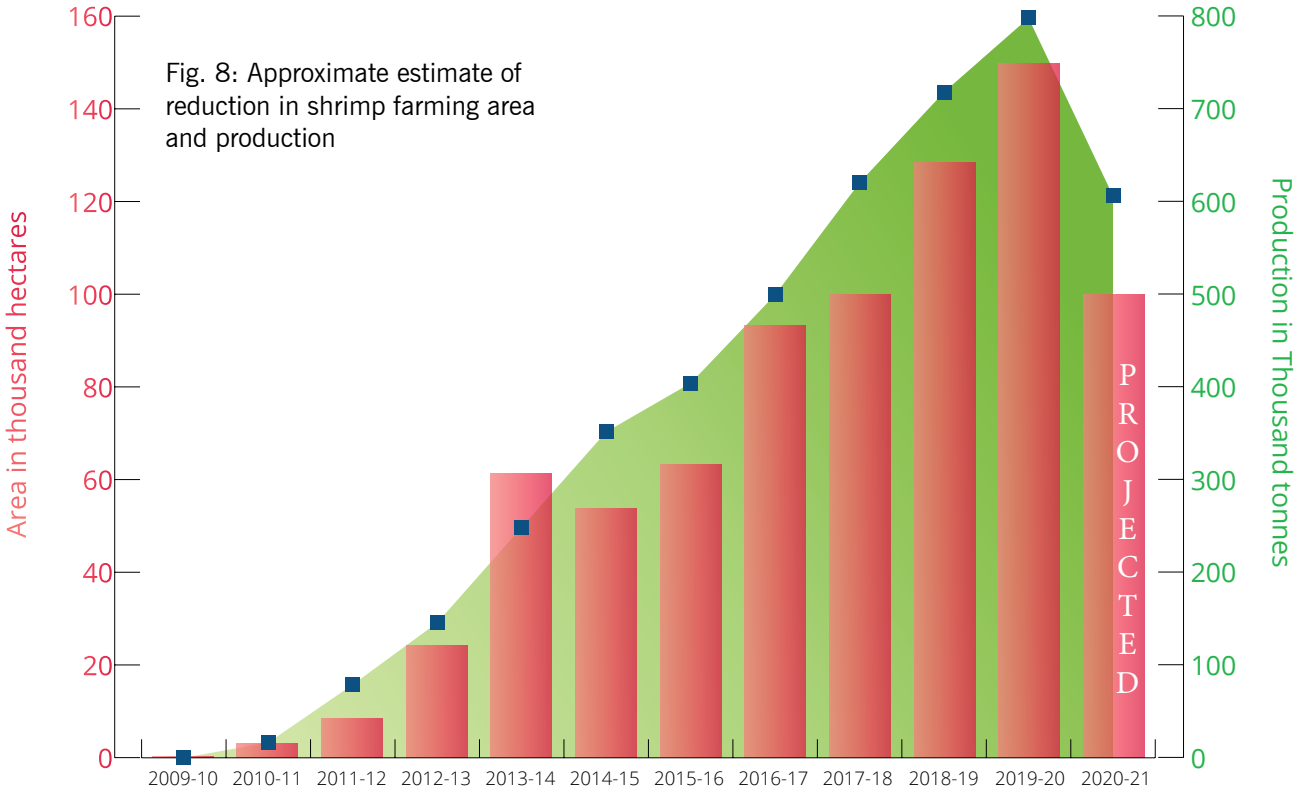

Fig. 8: Approximate estimate of reduction in shrimp farming area and production

The lockdown would drive an increase in seed cost by 15-30%, and timely availability of the seed for the next stocking would also be an issue (Fig-9). The market price for the produced shrimp in the current season was reduced by more than 30%, and they were skeptical about the future market demand, considering the emerging scenario in USA and EU.

The loss of employment for the workers has gone up to 30-40% during the season. Shrimp hatcheries projected an economic loss of 30-40% and further expect a lower seed production in the coming months due to the constraints in the supply of sufficient SPF brood stocks by the international suppliers. Based on the estimates available, probable economic loss to the shrimp aquaculture sector for the current year (2020-2021) is estimated to be around Rs.10,000 crores. However, the impact may change as expressed in the scenarios (Table-1), due to further continuation of lockdown restrictions, non-availability of quality seed and other inputs, bleak marketing prospects in the importing countries coupled with lack of domestic markets.

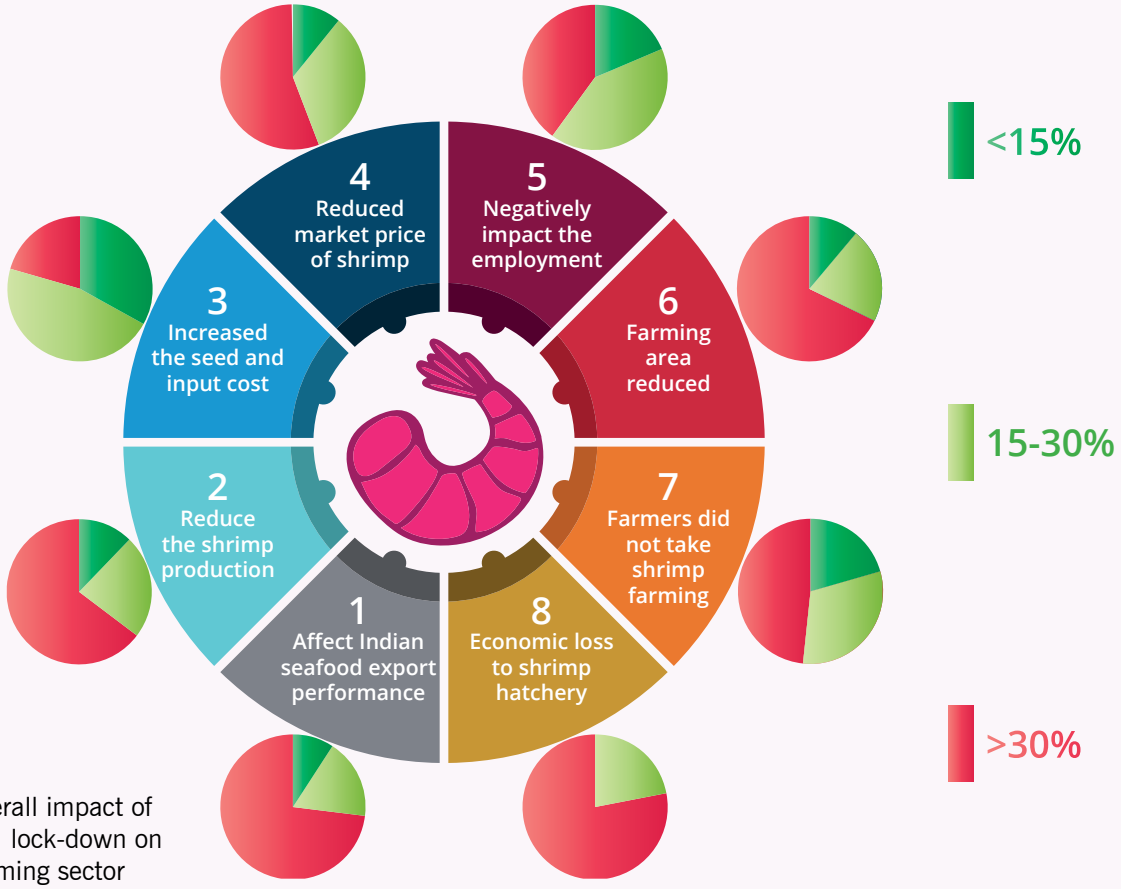

Fig. 9: Overall impact of COVID-19 lock-down on shrimp farming sector

Table 1: An approximate estimate of economic loss to the sector due to COVID 19 lock-down

Components/ subsector	Annual capacity/ resource (A)	Assumed that 60% of (A) is done in this season (B)	Unit cost	Scenario 1 @ 25% loss		Scenario 2 @ 40% loss		Scenario 3 @ 70% loss	
				Loss in Units (billion)	Loss in value (Rs crores)	Loss in Units (billion)	Loss in value (Rs crores)	Loss in Units (billion)	Loss in value (Rs crores)
Seed production	70 billion PL	42.0	40 NP/ PL	10.8	420	16.8	672	29.4	1176
Feed	13 Lakh tonnes	7.8	Rs.80/ Kg	1.95	(1560*) 156	3.12	250	5.46	(4368*) 437
Farming & Production	8 lakh tonnes	4.8	Rs.350/ Kg	1.2	4200	1.92	6720	2.6	11760
Market	6.2 lakh tonnes	3.72	Rs.500/ Kg	0.93	(4650*) 465	1.49	(7440*) 744	2.6	(13020*) 1302
Employment including hatchery, farm, inputs, processing etc.	12 lakh people	12.0	Rs.500/ day	360	1800	576	2880	1008	5040
TOTAL					**7061**		**11265**		**20714**

**(For feed and processor the loss is only loss of business, the monetary loss is taken as 10%)*

Steps taken by government organizations

Initial lockdown restrictions created lots of confusions and disturbance in the shrimp value chain, which were subsequently cleared by government authorities by issuing suitable order, at the request of the stakeholders. Central government issued orders exempting fisheries and aquaculture sector viz, farming activities including feeding, farm maintenance, harvesting, processing, packaging and uninterrupted movement of aquaculture related products and materials across the states. To ensure the imports of required materials for aquaculture, Finance ministry has issued special orders, extending the Sanitary Import Permits (SIPs) & other Agriculture inputs permits expiring between 01-03-2020 to 15-04-2020 by 3 months, delay in arrival of consignments condoned by one month, re-booking of quarantine cubicles in AQF, Chennai without additional booking charges and verification of documents and grant of NOC for quarantine relaxed from 7 days to 3 days. Following the farmers representations, Government of Andhra Pradesh has fixed minimum procurement price for the shrimp and maximum sale price for the shrimp seed in the state and entrusted the department of fisheries to monitor the ground situation. MPEDA has taken measures cautioning the exporters to adhere to ethical practices, and extends help to farmers in carrying out the shrimp farming activities under the lock down situation. Scientists of ICAR-CIBA, Chennai and its regional centres at Kakdwip, West Bengal and Navsari, Gujarat are continuously in touch with brackishwater farmers in the country, through the CIBAShrimpApp and telephonically, coordinating with the respective local administration to ensure the free movement of shrimp/fish seed and feed in the respective states. The Institute is working with CAA and facilitating the supply of quality seed and providing technical advisories to farmers on good aquaculture practices during this lockdown period.

During this crisis regional centres of ICAR-CIBA are extending technical advice to shrimp/fish farmers, also involved in the distribution of feed manufactured at its pilot feed mills and coordinating with private shrimp hatcheries for timely supply of seeds to the interested farmers, in their regions of operation. As a social support activity, programs were conducted to create awareness about prevention of Covid-19 and distributed basic necessities to the needy people of the nearby villages. Fishes grown in the institute grow-out farms were sold twice weekly to nearby villagers of Kakadwip and Navsari at reasonable rate to meet their requirement of fish, which is well appreciated.

ICAR-CIBA suggest the following measures, to the Central and State Governments and the stakeholders, as the 'Way Forward' for the shrimp farming sector to tide over the impacts of COVID-19 related lockdown and other restrictions.

Seed production and farming

1. Permission to operate cargo flight to enable shipment of brood stock from overseas suppliers and rapid quarantine at Aquatic Quarantine Facility. Encouraging hatcheries to have nursery facilities to buffer the seed supplies.

2. Compliance of strict biosecurity measures and adoption of better management practices by the farmers.

3. Farmers need to adopt a comprehensive seed selection protocols including PCR screening for the major pathogens such as WSSV and EHP, to ensure the seed quality.

4. Farmers need to adopt diverse farming approaches such as nursery rearing to avoid the loss of survival, shorter duration crops with high stocking densities to produce smaller size shrimps to Chinese markets and local markets, plan longer duration crops with low stocking densities , as low stocking densities always reduce the risk considerably, and get an option for partial harvesting.

5. Staggered stocking of ponds in tune with seed availability and plan harvest as per the market demand.

6. Different polyculture models using native shrimp species (Indian white and tiger) with compatible herbivorous finfishes such as Milkfish, Etroplus etc. Farming of Mud crab in enclosures or in box-farming is also an option to increase the income.

7. In order have a sustainable income, a part of the farm can be used for integrated multitrophic aquaculture (IMTA), with native shrimp such as indicus or monodon, herbivorus finfishes, small poultry units, with vegetable farming on the bunds. This would provide food for consumption for the farmer and farm workers and sustainable income, in these unique situations such as Covid 19 Lock Down.

8. Stress on the availability of exotic vannamei brood stock, necessitates the reintroduction of successful native shrimp species such as Indian white shrimp (*Penaeus indicus*), to have a complimentary option, along with vannamei. A national flagship programme for the reintroduction of indicus in Indian farming is the need of the hour, with a join effort from the Central and state governments, government institutions such as MPEDA, NFDB and CIBA, on public private partnership (PPP) mode. Being the nodal R&D institution for brackishwater aquaculture sector in the country, CIBA has already initiated a nationwide demonstration of indicus farming, and the results showed the economic viability of this native species, which is only comparable to the exotic SPF vannamei.

Domestic and international marketing

In the absence of assured international market, popularizing the domestic market by creating chain of cold storage facilities and public awareness about the benefit of shrimp as healthy food need to be focused. Farmers can harvest in a phased manner considering the local demand. This can be possible by establishing a transparent communication network between all the shrimp farmers in a locality and their regular processors/ buyers/fish selling outlets.

Support from the Govt. authorities

- In addition to seed and feed other farm machineries and the required spare parts also need to be recognized as essential items and allow their movement in farming areas.
- Enabling the movement of workers at hatcheries, farm, feed mills, input manufacturing units, processing and export facilities with appropriate delegation of powers to local officials.
- Regular communication mechanism to provide information on local and international markets and prices to the stakeholders.
- Need to have a minimum support price in place, and mechanism for ensuring compliance by processing units by the government
- Moratorium of three-six months on EMIs, payment of various bills, taxes etc from farmers, hatchery owners and related ancillary stakeholders of aquaculture.
- Provide appropriate social welfare measures to sustain the livelihood of the workers and their families, under lockdown situations.
- Consider aquaculture in par with agriculture and extend all the economic relief measures provided to agriculture sector to aquaculture.
- Joint action group may be created including different developmental, promotional, regulatory, scientific and social departments to provide the authentic information to enable the stakeholders to informed decision minimizing the risk in their aquaculture activities.
- Providing adequate training of staff on prevention of Covid 19 at various levels of shrimp value chain and providing free access to required protection materials.

Conclusion

The study apparently indicated that the COVID-19 lockdown and subsequent restrictions adversely impacted the activities in the shrimp aquaculture sector such as farming including new stocking, availability and access to SPF brood stock from abroad, hatchery seed production and supply to farmers, distribution of feed and other inputs, decrease in the farming area, processing and marketing of shrimps. Further, restrictions forced the skilled and farm workers stay at home, and migratory workers to leave to their homes, which negatively affected all the components of the sector and their livelihoods. The approximate estimate indicates that the sector would incur an economic loss of about Rs.10,000 crores. Therefore, the Central and State governments need to support the sector with a relief package and implement measures to ease disruptions in the supply chain and minimize the negative impact on shrimp aquaculture, and to protect this dynamic food production sector which also earns a foreign exchange to the tune of Rs.35000 crores to the country.

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