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Many fishing/fish farming communities in Kerala are benefitting from the cage culture technologies introduced by ICAR-Central Marine Fisheries Research Institute (CMFRI). In the current year, members of at least 20 families from Pizhala, in Kadamakudy Panchayat of Ernakulam district have done cage farming and about 40 cages (of 4 x 4 m, 6 x 6 m and 8 x 6 m dimensions) were harvested in December 2016. Similarly farmers at Panampukad, Pooyappilly, Chendamangalam etc. have also harvested cage farmed fishes. Fish cages are simple, cost-effective, environmentally sustainable technology that has been introduced in several villages including Pizhala by ICAR-CMFRI through participatory demonstration programmes that started in 2007. "Traditionally we farm fishes in ponds and catch them by setting nets of different

types, but we're never sure how much we'll catch. However in the fish cage culture, we know exactly how many fish we will harvest, and how much we will earn" explains a farmer involved in the venture. Apart from this, the involvement of women who came forward to start cage culture after awareness classes is noteworthy.

Technology Intervention

Cage aquaculture is nothing but fish production using a relatively new technological system. Thus, many of the issues related to fish biology, pathology, feeding, etc. are similar to other fish production systems. In 2015, after a farmer approached ICAR-CMFRI for inputs in installing a cage in Pizhala, two cages of 4 m x 4 m were installed in September. All physical inputs were met by the farmer, except the

cage nets, which was provided by ICAR-CMFRI. The farmer stocked the cages with Asian sea bass and pearl spot, the most sought after fishes in Ernakulam district. This was the first commercial open water cage culture, in Kadamakudy Panchayat. Earlier the same farmer was using 2 m x 2 m PVC floating cages for fish culture inside shrimp ponds which was not successful. The new cage design created enthusiasm in the farmer and he started cage culture of fish in the open waters in the village where the major activity was fishing and agriculture. This inspired the neighbours and more families residing near the river fabricated cages and stocked fishes. The fish harvest during Easter time was also good and the farmers earned well. The farming is continuing with the village becoming a hub for cage culture. Certain problems identified by farmers during the farming process is given below.

Constraint in seed availability: For 50 cages of dimensions varying from 4 m x 4 m to 8 m x 6 m, they need 100,000 numbers of 30 g size Asian sea bass/or 100,000 numbers of 10-20 g pearl spot/ or 200,000 numbers of tilapia seed for each cycle. Since farming is going on round the year, the seed supply should be continuous and according to the farmer's requirements. The supply of adequate number of indigenous fish seed is the need of the hour.

Lack of cost-effective pellet feed: At present the farmers procure pellet feed at comparatively higher price of ₹ 35 to 110 per kg. By-catch or low value fish are also used as feed for seabass. As for most of the farmed fishes, cost-effective, species specific feeds are not available. This remains a constraint for many farmers.

Lack of alternative feeds for fish: At present a few cage farmers are using different natural resources such as vegetable wastes, food waste, weeds, kitchen left overs etc. for omnivores like pearl spot and tilapia. However, the availability of any item is not as much as to sustain the feeding for total culture period.

Unexpected discharge of industrial pollutants: The cage sites get unexpected inflow of pollutants from various industrial sources in the district, especially during sudden rains. It often results in fish mortality in the cages. However, during the current year this was very rare. The fish farmers constantly look out for such instances and report them to authorities for immediate remedial action. However, they are not aware of the pollutant levels, type or nutrient dynamics of the sites etc. Now, scientists of ICAR-CMFRI are continuously monitoring the water quality of the cage farming sites.

Fish mortality due to attack of parasites / disease: Occasional encounters with diseases or parasites has been observed in cages. However, freshwater dip of infected fish or change of nets was enough to overcome the problem. Farmers are also using probiotics available with local suppliers.

Variation of production in cages: High variation in fish production in the cages was observed by the farmers. According to them, water depth, closeness to other cages and feed are responsible for such variations and these require further standardisation.

Success of cage farming in Pizhala

Popularization of cage farming in the village took hardly a year after its first introduction in 2015. The main reasons for this was the lack of private ponds or other types of fish farming techniques for the villagers. The co-operation of the local panchayat in issuing permission to set up cages, scientific, technology support by ICAR-CMFRI and involvement of Krishi Vigyan Kendra in promoting entrepreneurship and creating awareness among the farmers to new farming methods have paved the way for the success of cage farming in Pizhala. In the long run, for sustainability of the cage farming, the carrying capacity of the system has to be worked out which has been initiated. Diversification of species is also on the cards.

The case study at Pizhala showed that women are more empowered in management of cage farms

like, nursery rearing, feed scheduling, feeding, cage maintenance, marketing etc. Women have been found to be directly involved in fabrication of cages and its maintenance, procuring good quality fish seeds and its stocking. They are also selling the produce directly at farm-gate and in local markets avoiding middlemen. The most significant and positive aspect of involvement of women in cage farming is that since their family income has increased, it is being used for food, health care and

education of the family members. Women's participation can ensure social and economic empowerment in the rural societies with significant societal development. In Pizhala village located close to Ernakulam city, due to the poor financial status of the people development is meagre. However, with popularization of cage farming in the village, opportunities for social upliftment through the development of aquaculture ventures has opened up.