

## Interview

## COMMERCIAL SEA CAGE FARMING

*Set to secure its place in Indian Waters: G. Syda Rao*

*CMFRI is soon to bring to a culmination their Sea cage Farming effort, moving focally towards the commercially-oriented field stage of introducing sea cages along the Indian coastline, to be managed by trained hands. Eashwar Dev Anand, Managing Editor, Fishing Chimes had the opportunity to interview Dr. Syda Rao, Director, CMFRI. Excerpts of the Interview.*

**Eashwar Anand:** The sea cage farming is the buzzword in the marine aquafarming sector of India. CMFRI has mounted focal efforts to usher in the technology of sea cage farming. Could you throw light on the project from the stage of its conception to the present status?

**Syda Rao:** Since 30 years the idea of sea cage farming has been there. Based on potential of the idea, in 2005, we at CMFRI tried to adopt the system in India as followed in Norway. Dr. Mohan Joseph Modayil, the then Director of CMFRI, initiated the project. The project was to start on a pilot basis in Ratnagiri, Diu, Mandapam and Visakhapatnam but it was in Visakhapatnam, that the project was started. Later on, after I took over as Director of CMFRI, the project was extended to different zones of the country, based on the experience that was gained in Visakhapatnam. NFDB too has come out in support of the project along with the Union Department of Animal Husbandry, Dairying and Fisheries. We did have initial hurdles which also led to public criticism, although it was unwarranted. However, people have seen now that the project has all the hues of success.

**E.A:** During the past five years there must have been improvements being made in the project from time to time. Could you give a brief account of the work that has been done to take the project forward?

**S.R:** In association with the Coastal State Fisheries Departments, Garware Wall Ropes, Dyenema and others in the cage line, CMFRI has successfully moved up in the development of the Sea Cage Project. In 2006, there was no clear idea on how



Mr.Eashwar Anand (left) interviewing Dr. G.Syda Rao (right).

best to do it, although there were other countries having the technology from one of whom it could be drawn. Unfortunately, these countries were not ready to transfer cage farming technology to us. Further, although technology was initially borrowed from Norway, conditions like that of temperature that showed marked differences between those that prevailed in India and in Norway and hence was not suitable. In this situation, we started to try out the introduction of the cage farming system on our own, but we faced many setbacks in this endeavour. These setbacks however helped us learn. We now have about 25 experimental cages set up in all the sea adjacent to maritime States and the location of each has resulted in unique individual ecosystems, coupled with its own socio-economic issues.

The sixth version of the cage farming system as progressively developed has emerged within 3 years of initiation of the project. To recall, we first started off by using a 15 m diameter cage in Visakhapatnam. The investment on the cage was on the high side at around Rs.4,00,000 and the estimated production level was at 30-40 t (crop/ha). One aspect of this initiative was that we faced the challenge of pooling up sufficient number of early juveniles which were to be collected from the local fishermen. This situation called for efforts aimed at

entrepreneurs who could invest substantially in this direction, but these were not successful. We then shifted our focus towards fishermen and their societies. The result of this approach was encouraging. The outcome has been that they have now designed a 6 m dia cage with an expected production level of 4 – 5 t/6-8 months. This new cage system is suitable for low stocking and is also useful for the fishermen's societies who would however have limitations in respect of quantum of investment which would be on the lower side. The present cost of a cage system has been brought down to Rs.50,000/-.

This new GI cage system (6 m dia cage) has given encouraging results. We have taken into consideration that if the fishermen chose to produce 500 cage-grown fishes in 6 m dia cages, then, after a period of 6 months, the stocked 500 juveniles would grow up into 500 kg of biomass (as against the capacity of 4,000 – 5,000 kg/cage). If we estimate that the present price of sea bass juveniles per kg to be around Rs.200/kg, then that the 500 fishes grown upto one kg would fetch an income of Rs.1,00,000 in a duration of 8 months of farming which will pay for the capital cost of the cage. The lifetime of each cage is pegged at 5 years, and this means that during this period the returns will be substantial. Further, if the fishermen (farmers) managing the cage system can





market their produce based on the prevailing market conditions, they would have comfortable earning. For example, during the recent fishing ban period, each kg of fish fetched Rs. 400/kg, and the minimum price stood at Rs.300/kg. Hence cage farming coupled with innovative marketing practices will benefit the end user very much.

We have invested many heavily in terms of scientific resources. At present, we have around 20 scientists working in the project and these could be the potential consultants for entrepreneurs, venturing into cage farming. Under RKVY the project is being approved in the States of Karnataka, Kerala and Gujarat. NFDB has also given us a massive support and exposure to CMFRI. Initially we had the problem of poaching but since we have a tie-up with the fishermen, we do not foresee much of this problem.

**E.A: Who were the partners involved in the cage farming project of CMFRI?**

**S.R:** We had quite a few partners in the project. M/s. Garware, as one of them, came up with the mooring technique. Initially the weight of the mooring was 300 kg and it costed around Rs.60,000. However, M/s. Dynema later came up with optic fibre grade mooring which costed Rs.35,000/- and its weight was less than 20 kg. For this reason, the handling had become very easy. The net design had also come to be evolved. In the beginning the cost of the cage material was at a prohibitive level of Rs. 50,000/-. However, M/s. Garware and Matsyafed came up with a net which costed only Rs. 15,000/- per cage.

**E.A: During the initial phases of the project what were the challenges that you faced?**

**S.R:** We faced a couple of challenges when we began the project. The initial challenge was in respect of the resistance by the local fishermen. They were against the introduction of the system, thinking that it would come in the way of their livelihood. But, after learning that this technique would only enhance their livelihood opportunities, the fishermen evinced greater interest in the project.

The second challenge was one of collecting the seed. Now that the fishers are working with us, we have overcome this problem with their participation. We set up the cage, and asked them to supply the

seed, while we take care of the feed requirements. Thus we have found out a solution to the problem with the co-operation of the fishers.

As an example, in Kanyakumari, there was the problem of meeting the cost of both seed and feed. This was solved by the fishermen as participants in the setting up of the cages. They have been investing in seed supplies, and we have been paying for the feed. Every two months there has been a harvest of lobsters in the cages set up in the area. The price per kg is around Rs. 1,200-1,500, and the average size of lobsters that they have been getting is 200 gm each. The small area in a cage for the lobsters and feed being readily available, there is no loss of energy due to their movement. Hence the lobsters tend to grow faster than when they do in the open sea.

In the beginning we had to address the cage fouling problem. Every two months there would be about one tonne of fouling material on the cage. Now we have adopted a system of net exchange every month. For every 2 cages we have 3 nets. No cleaning is necessary and it has been proven that with smaller cages, less maintenance is required. Previously, it was costing us around Rs. 10,000 for each cleaning. Now, with the net exchange system, we have avoided this additional expenditure.

**E.A: What are the candidate species for cage farming?**

**S.R:** The species that we have worked with are sea bass, pearl spot, mullets, and lobsters. In the cage farming, all these have been successfully grown.

There are some fascinating observations that we have made. The feed and the droppings of the fish have a 30 m radius spillover zone. Into this area, ornamental fish and other types of fishes keep coming. Cages are thus acting like a natural fish aggregation device.

**E.A: What are the preferred dimensions for a cage?**

**S.R:** We should first understand that it is the depth that is more important than the diameter of the cage. Our standard cage design has a depth of 6 m, and by giving an overhead of 2 metres, the preferred depth of the waters where the cage is being located should be around 8 - 10 metres. However, we have also made certain modifications based on the local

requirements. In Karnataka, for example, the depth upto the seabed where we set the cages is around 6 m. Hence the cage was modified to be of a depth of 4 metres.

With regard to diameter, work has been done with cage diameters of 10 metres as well as 6 metres. The diameter depends on the various factors like seed availability for the species being grown and the capital investment. Further, in the open sea, the cage design is always circular.

**E.A: With regard to sea bass, what is the feeding regime being followed? What is the growth period before harvesting? Did you have any disease outbreak during cage farming ?**

**S.R:** The feeding schedule we have designed requires feeding to be done twice a day. The approx quantity of feed used is 5% of body weight. IIT, Kharagpur, are trying to have solar energy-powered automatic feeders. In addition, cages designed by us are sturdy to withstand cyclones, with extra support and adequate mooring.

After 6 months of farming, we have observed that the weight of the fish goes to about 1 kg each. Therefore, six months can be taken as the growth period upto harvesting.

With regard to diseases, we have actually found that calmer seas make the fish more prone to diseases. We have had one case of disease incidence and treatment was given with negligible mortality.

**E.A: Is there any plan to take up cage farming in rivers?**

**S.R:** Problems of setting up cages in rivers are different and need a separate projectisation. Hence, cage farming in rivers has not been taken up. Cages would be round in the sea but they could be rectangular in the rivers. Entrepreneurs would like to have short term investments and get profit in the first crop itself and this aspect could be experimented upon under a separate project but this would not come within the purview of CMFRI.

**E.A: What are the strategies CMFRI plans to follow to transfer cage farming technology to the stakeholders, now that it has, by and large, standardised the cage farming system?**

**S.R:** We conducted a National Training



programme on cage farming. Candidates from most of the States have been trained. Now there is a general awareness that it is only a matter of time before the other States would also be interested to introduce and popularise the system in their respective States.

We are aiming at inducting the traditional fishermen as well as the entrepreneurs into cage farming. The fishermen are more interested in the success of the programme, since it is they that take care of the daily maintenance. Smaller sized cages are easy to maintain and work with. However, larger sized cages are more economical for operation, in the long run. It all depends on the person who would like to establish cages, and their economical status.

**E.A:** Is there any particular place that you would like to focus upon to give the readers an understanding of how cage culture has worked?

**S.R:** Kanyakumari is a classic example to assess how profitable cage farming system is. The fishermen themselves have evinced interest after we set up the first set of cages in Kanyakumari zone. They even offered to bear the cost of transportation of the cages. We now have five cages in Kanyakumari and the fishermen have worked out a buy back system with the exporters, who would give them good quality juvenile lobsters of 20 - 30 grams each. They would get as part of the catches they buy from fishermen. They would then grow these juveniles in cages to marketable size and would sell them back to the exporters. The price as I mentioned earlier is around Rs.1,200/1,500/kg, and the average/each of the weight of lobsters that they would be getting is around 200 gms each, as part of the harvest made from cages, once in every 2 months. This is a classical example, and depending on the local fishes available, enterprising fisheries and individuals could take up cage farming.

**E.A:** What are the others species for which CMFRI is developing cage farming or breeding technologies?

**S.R:** Cobia breeding has been taken up CMFRI in a big way. Other institutions have also tried it, but CMFRI has been the first to achieve successful breeding of the fish. We have used cages for broodstock development. For spawning them we would like to work with hatcheries. RGCA of MPEDA has shown interest. The idea is

that during the first day, the larvae will be transported to any place as decided. They will survive transportation for a period of 2 days. Two hatchery owners are now on the job of raising cobia seed using these larvae.

We propose to have a system where the broodstock would be in the hands of government unit to avoid biosecurity issues. 1 million - 10 million seed can be produced by each hatchery. Some entrepreneurs have shown interest in this production line. For example, a farmer in Kakinada, Andhra Pradesh is interested in raising the seed. The protocols of the hatchery stage are ready, and it has been shown that until 15 ppt salinity, cobia will grow normally, but at 10 ppt salinity 50% mortality has been observed. We are also exploring the possibility of acclimatisation. If taken up on a large scale, it could be an alternative to shrimp farming or could be a part of rotation farming with shrimp. The growth of this fish is robust. In one year we have seen a growth of the fish between 4 and 6 kg and about 2 - 3 kg in 6 months. The cost of feed is expected to be Re1 / day / fish. The price that cobia would fetch is around Rs. 200/kg)

In Tamil Nadu (Kanyakumari), Gujarat, and Maharashtra lobster fishery seems to have potential. Milk fish and mullets are also being tried for seed production and raising them to juvenile size for cage farming. In respect of seerfish, according to a survey, 15,00,000 seed are available (between Visakhapatnam and Kalingapatnam) in the breeding grounds of the fish. We aim to train fishers in seer fish seed collection too.

Molluscs form a good fishery in Kerala and Goa. No feeding is required to grow them and their farming requires less of labour. Green mussel meat extraction technology has been developed by CMFRI. It is intended to establish a plant for the purpose on the west coast. The mussels will be provided by the State governments. The shelf life of the product is about two years and it is very useful for treating arthritis. At present, the price per capsule of mussel extract is Rs 30. However, after we start production, the price is expected to come down to Rs.10 / capsule. Clinical trials have also been conducted on mice to ascertain that the mussel extract is not harmful.

**E.A:** We have heard that CMFRI has developed feed for farm fishes, and also for ornamental fish, exclusively for the aquaculture. Could you shed more

light on this?

**S.R:** Yes, we have worked in these areas too. We have developed an indigenous feed which includes the wastes of tuna processing like the head, gut, etc which are thrown out on to the beach. These wastes are increasingly polluting the sea. Through a process of silo fermentation, we have produced feed that has 30 - 40 % protein and it costs Rs. 40/ kg. It is also devoid of the bad odour of some of the feeds that are used today. We have tried this feed on rainbow trout, and the trials have been successful. A Tuticorin entrepreneur has also got in touch with us regarding the transfer of technology. He would be using silo feed and oil sardine protein, and the estimated cost is put at Rs. 40/kg.

The ornamental fish feed has been the most expensive input with regard to Aquaculture. The imported feed costs around Rs.4,000/kg. We have developed an indigenous feed which has a cost of Rs 400/kg. KAVIL is the biggest buyer for this feed and we are interested in commercialising this feed for large scale production.

**E.A:** What is the potential you visualise with regard to cage farming?

**S.R:** The future potential of cage farming is high. The water in the seas is suitable for the farming and the onus is on the government to come out with a policy concerning leasing issues. The Union Department of Animal Husbandry and Dairying is very much interested in the project. It has given direction to NFDB to work out details. Since cage farming is yet to make a commercial mode of entry on a large scale, the government would have to heavily subsidise the investment on the cost of cages initially so that a larger number of entrepreneurs would venture into it.

We should understand the advantages of such a system. One is that the fish from the sea can be labelled organic. Next is that the pesticides usage will not be there. The third advantage is that the seas with rocky bottom can also be used for this farming.

**E.A:** Cage Culture has now had its successful trials in various parts of the country. The fishermen who are venturing further into the seas for the livelihood now have a suitable alternative. I thank you for your time and for giving us this exhaustive interview.

**S.R:** Thank you.

