Social Entrepreneurship in Aquaculture, Pages 325-333
Edited by: V.R.P. Sinha, Gopal Krishna, P. Keshavanath and N.R. Kumar

33

ENTREPRENEURSHIP DEVELOPMENT AMONG COASTAL FISHERS THROUGH BRACKISHWATER AQUACULTURE TECHNOLOGIES

B. Shanthi*, P. Mahalakshmi and V.S. Chandrasekaran

ICAR-Central Institute of Brackishwater Aquaculture,
75, Santhome High Road, Raja Annamalai Puram, Chennai-600 028, Tamil Nadu
**E-Mail: drshanthi@ciba.res.in*

1. Introduction

Aquaculture sector is seeking to identify ways in which the culture of aquatic animals can contribute directly and indirectly to the alleviation of poverty and hunger relief. When the role of aquaculture as a food producing sector is considered in combination with the importance of fish in the diets of many of the worlds' poorest nations, it would seem that aquaculture is assured a central role in efforts to meet the challenge to reduce poverty and hunger. The contribution of aquaculture to food security has been put forward by numerous authors and organisations where the direct provision of food and the indirect benefits of employment and income are cited amongst the benefits arising from aquatic animal production (Sheriff *et al*., 2008). Aquaculture offers one of the best livelihood options for fisher folk, especially in coastal areas and offers plenty of scope for diversification of livelihood for those who live below the poverty line. Aquaculture encompasses a wide range of different aquatic farming practices with regard to species (including seaweeds, molluscs, crustaceans, fish and other aquatic species groups), environments and systems utilized, with very distinct resource use patterns involved, offering a wide range of options for diversification of avenues, for enhanced food production and income generation in many rural and peri-urban areas.

With special reference to women in fisheries and aquaculture in India, women have contributed substantially to the social and economic growth of the economy. Women in coastal areas play an indispensable role in the fishery sector by taking part in various activities both in capture and culture fisheries, such as fish farming, transportation and marketing of fish in the domestic sector, shrimp-peeling in fish processing plants, as workers in shrimp hatcheries, culture and fattening of mud-crabs, aqua feed production, preparation, processing and marketing of value added fish products and so on.

Entrepreneurship, as a concept, started with the development of small scale industries. Small Industry Extension Training Institutes came into existence in India. Entrepreneurship is playing a vital role in the overall multidimensional development of the country. It comprises qualities of an individual for planning, organizing and monitoring one's own venture profitably, while creating self employment and engaging others therein. The inadequacy of entrepreneurial talents is an inhibiting factor to accelerate the process of development in our country. Rural people have poor access to credit, technology, training and other facilities. Now it is high time to bring them into the main stream of economy for the economic development of the country. It can be possible through entrepreneurial development among rural people (Singh and Singh, 2006). In recent years, managerial aspects of entrepreneurship are being emphasized. It connotes innovativeness and an urge to take risk in the face of uncertainties.

In today's context which is primarily determined by Liberalization, Privatization and Globalization (LPG), entrepreneurs will be the backbone of the economy and society. If a sector is not able to attract or groom entrepreneurship it is not going to grow fast. The popular training model on Entrepreneurship Development centres around three stages, namely, identity search, identity formation and identity establishment. In all these, the person using modern equipment devices could be considered an entrepreneur, provided he is innovative, influenced by the urge to take risks, and has been acting on the spur of intuition which proves to be right afterwards. The belief is that even an illiterate or semi-literate person could also play entrepreneurial roles.

The ICAR-Central Institute of Brackishwater Aquaculture (CIBA) has developed the technologies like mud crab (*Scylla serrata*) fattening in pens and ponds, Asian seabass (*Lates calcarifer*) nursery rearing (in hapas) in community ponds, polyculture of the Asian seabass and mud crab farming in community ponds, ornamental fish farming in tanks, farm made aqua feed development and value added fish food products development which are amenable to be tailored to suit the needs of fisher folk, to develop an alternate/ supplementary livelihood for them. The institute has also taken efforts in transferring these technologies and practices to the coastal SHGs and families in the communities. Adoption of these technologies by coastal SHGs and families is an eye-opener in the context of providing opportunities for a socio-economically viable avocation. Owing to the relative ease of the technologies, reasonably good profit margin and familiarity of coastal communities with the adoption of these technologies have proved to be a potential livelihood option.

Coastal fishers, including women, as a member of the family or of SHGs, take part in various capture as well as culture fisheries activities. The increasing decrease in the catch obtained through small scale fishing activities in the coastal waters of our country has prompted to take up an alternative or supplementary means of income generation through small scale brackishwater aquaculture in lagoons, estuaries and creeks available in the coastal areas which can be well utilized for brackishwater aquaculture by the marginal and poor fishers. The coastal fishers can earn a significant supplementary income from the brackishwater aquaculture technologies and develop entrepreneurship to increase their family income considerably. This paper discusses the various farming practices and allied means of income generation adopted by the coastal villagers in Tamil Nadu, transferred through demonstrations conducted by ICAR-CIBA under Tribal Sub Plan programme and DBT projects. Brackishwater aquaculture technologies like crab fattening in FRP cages, pens and tide-fed ponds, Asian seabass nursery rearing in hapas, polyculture of mud crab and Asian seabass farming in community ponds, ornamental fish farming, farm made aqua feed development and value added fish products development were transferred. The case studies here portray the different brackishwater farming methods, farm management, marketing details, issues and factors that lead to entrepreneurship development.

2. Mud Crab (*Scylla serrata*) Fattening in Pens and Ponds

The export of live mud crab has gained importance in recent years. Soft shelled crabs collected from the wild are being fattened on a small scale in maritime states of India viz. Andhra Pradesh, Kerala, Karnataka, Orissa, Tamil Nadu and West Bengal. Crab fattening can be carried out in small pens ranging from 100 to 200 m^2 in size, with water depth of 1.5m. Water crabs in the size range of 350 to 1500 g are stocked @ 1 to 3/m^3. Crab fattening cycle takes about 3 to 4 weeks. The price of water crab is Rs. 750/kg. Crabs can be fed with molluscan meat or trash fish daily @ 5 to 10% of body weight. The crabs can also be fed with CIBA feed @ 3% of body weight. Crabs of 350-500 g size will gain 60-80 g weight and the crabs above 1000 g will gain a weight of 100-120g during fattening. Cost of one pen of 100 m^2 is Rs. 1,00,000. Net returns per crab fattening cycle is Rs. 22,000-30,000 (Fig. 1).

3. Seabass Nursery Rearing in Hapas in Community Ponds

Asian seabass, *Lates calcarifer* is an ideal candidate species suitable for brackishwater aquaculture either in ponds or in cages. Seabass can tolerate wide range of salinity from 0 to 40 ppt and can be farmed in marine, brackish and freshwater conditions. The fish can grow above 1.0 kg in 8-10 month period and fetches 250-350 per kg, depending upon the size. Nursery rearing of seabass is an important component of farming practice, where the fry are reared to fingerling size in net hapas, ponds and tanks. Hapa nursery rearing can be done either in open water bodies or in pond system, having a water depth of 1-1.5m. In hapas, sea bass fry of 1-1.5 cm size can be stocked @ 500 numbers/m^2 and reared for 45 to 60 days. The preferred hapa size is 1x1x2m (2 m^2). After 60 days of rearing, seabass fry attain the fingerling size of 6-8 cm, when fed with either trash fish or pellet feed @ 10-15% body weight daily in two rations. In hapa rearing, seabass seed are to be graded twice weekly in order to separate the shooters and to maintain uniform seed size. Regular grading would help in avoiding cannibalism, which results in improved survival rate. After nursery rearing, farmers can get a profit of Rs.6-10/piece and can earn a monthly income of Rs 10,000-20,000 (Fig. 2).

Fig. 1. Mud crab fattening in pens and ponds

Fig. 2. Seabass nursery rearing in hapas in community ponds

3. Polyculture of Asian Seabass and Mud Crab Farming in Community Ponds

Polyculture of mud crab and Asian seabass farming can be carried out in community ponds. A pond of size 2.0 ha with a water depth of 0.5 to 1.2 m, temperature of 28-32°c and salinity of 30- 45 ppt can be used. Regular cleaning and monitoring of the pond will help to remove debris/filamentous algae present in the pond. Beneficiaries guarded the stock in the pond during night hours to prevent poaching as a precautionary measure. Hide-outs made of bamboo baskets should be kept at different places in the pond for the protection of water crabs during molting. Moderate sized thorny bushes and water plants can be planted as hide outs for seabass fingerlings. A total of 2000 seabass fingerlings of 6-9 cm total length and 4-6 g body weight that cost Rs. 15 per fingerling can be stocked in the pond. A total of 1048 of crabs (249.2 kg) ranging from 100-450 g of size that cost Rs. 750/kg can be stocked simultaneously. Locally available low value fish procured from the local market can be cut into small pieces and fed to the stocked crab and seabass (Fig. 3). Feeding can be adjusted based on the standing biomass and fed @ 8-10% of the body weight of the stock. Regular sampling of the seabass and crab can be carried out once in 15 days to assess the growth and to check the health of the stock. After three months of culture period, an amount of Rs. 1,33,908 can be realized out of crab and seabass sales.

Fig. 3. Polyculture of Asian seabass and mud crab farming in a community pond

4. Farming of Ornamental Fish Scat in Tanks

Ornamental fish trade is a multi-billion dollar global industry propelled by enormous consumer demand, since the interest among the people for aquarium keeping is increasing over time. ICAR-CIBA has developed the breeding and juvenile production technology for spotted scat, *Scatophagus argus* under controlled conditions. Being an omnivore, scat can consume benthic and filamentous algae, detritus matter and zooplankton. After reaching 1.5 cm size, it can easily accept low protein formulated feed in dough form. Scat can tolerate wide range of salinity from 0-35 ppt; it can be reared in marine, brackish and fresh water aquaria. Juvenile scat (1-2 inch) can fetch Rs. 30-50/piece in the retail market and still higher prices in the international market (Fig. 4). Farmer can stock 1.0 cm size scat fry either in hapas/tanks or in ponds for marketable size production. It can be stocked @ 500 numbers/m^2. Scat fry can be fed with low protein artificial feed @ 8-10% body weight daily in two rations. The fry can attain 1-2 inch size in 45-day culture period, with 70-80% survival rate. Small scale farmer families and women SHGs can take up scat rearing as backyard homestead activity as a source of income generation and can earn Rs. 8000-12000 per month.

Fig. 4. Farming of ornamental fish scat in tanks

5. Farm Made Aqua Feed Development

The common marine protein sources used as raw materials for aqua feed are dry fish, fish waste, Acetes, squid waste, squilla, prawn head waste, snail meal, clam meal and crab meal. In addition to marine raw materials locally available, plant protein sources like groundnut oil cake, gingerly oil cake, cotton seed cake, sun flower oil cake, soybean meal and mustard oil cake can be used based on the availability and cost. The energy sources used are broken rice, broken wheat, maize, tapioca, sorghum and other millets. Wheat bran and rice bran are also important ingredients for farm made feeds (Fig. 5). Fat sources like fish oil or any vegetable oil available locally at cheaper cost can also be used. Based on the availability, cost and nutrient content, raw materials for the specific aqua feed formulations developed by ICAR-CIBA are to be used accurately. Farm made feed produced by women SHGs can be supplied to nearby aqua farms. The product can be stored for 2 months. Farm made feed have been successfully used for fish, shrimp, crab farming and crab fattening by SHGs. The cost of one feed making unit is approximately Rs. 4,00,000.

Fig. 5. Farm made aqua feed processing

6. Value-added Fish Food Products Development

COSTS AND RETURNS

Fish pickle

- Production cost per 2.5 kg (Fish +) = Rs. 520
- Unit of bottles per batch = 12 (Approx)
- Cost of production per bottle = Rs. 43 (200 g fish pickle)
- MRP per bottle = Rs. 60 (Mark up on cost = Rs. 17)
- Returns per fish pickle bottle = Rs. 17
- Returns per batch of 12 bottles of fish pickle = Rs. 17x12 = Rs. 204

Shrimp pickle

- Production cost per 2.5 kg (Shrimp +) = Rs. 620
- Unit of bottles per batch = 12 (Approx)

Fig. 6. Value added fish food products development

- Cost of production per bottle = Rs. 50 (200 g shrimp pickle)
- MRP per bottle = Rs. 75 (Mark up on cost = Rs. 25)
- Returns per shrimp pickle bottle = Rs. 25
- Returns per batch of 12 bottles of shrimp pickle = Rs. 25 x 12 = Rs. 300

Fish samosa

- Production cost per 2.75 kg (Fish +) = Rs. 685
- Unit of fish samosas per hatch = 55 (Approx)
- Cost of production per unit of fish samosa = Rs. 12.50 (50 g each)
- MRP per fish samosa = Rs. 15 (Mark up on cost = Rs. 2.50)
- Returns per fish samosa = Rs. 2.50
- Returns per batch of 55 fish samosas = Rs. 2.50 x 55 = Rs. 137.50
- Cost of one unit of value addition equipment = Rs. 90,000 (demonstration conducted during 2007-2009).

7. Conclusion

The brackishwater aquaculture technologies transferred to the coastal fishers who were suffering in the post tsunami period, proved to be a blessing for their living. These technologies and avocations adopted by fishers were also observed to be a viable means of enterprise for their livelihood and socio-economic improvement. Coastal aquaculture technologies offer the best and the most familiar livelihood options, which could help the fishers to regain their dignity and respectability through increased employment and income.

8. References

Sheriff, N., Little, D.C. and Tantikamton, K.· 2008. Aquaculture and the poor – Is the culture of high-value fish a viable livelihood option for the poor? WorldFish Center, Malaysia. *Marine Policy*, 32(6): 1094-1102.

Singh, R. and Singh, M. 2006. Effectiveness of entrepreneurial development training programmes. *Indian Journal of Extension Education*, 42: 24-26.