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FARMING THE COASTAL LAND AT TUTICORIN*

Introduction

The need for the utilisation of derelict area for commercial culture of fishes and prawns has been stressed much in recent time as there is vast scope for the development of such high brine water along the southeast coast of India. A number of private farmers have put in efforts to develop culture practices along the ocastal villages of this zone. Among the various priority areas for research and development, the Tuticorin Research Centre of Central Marine Fisheries Research Institute devoted its attention in developing systems for the culture of fin fishes, prawns and crabs by establishing seed resources, identifying suitable water spreads and developing techniques of farming. 6.07 hectare (15 acre)of intertidal swampy flat on the edge of Tuticorin Bay, adjacent to the oyster farm and field laboratory in harbour link road have been converted into productive fish farm. This low land belongs to the Port Trust of Tuticorin and was acquired on terms of lease for 30 years. The outskirts of the site reveal all possibilities for quick development of mariculture practices. The present report describes the environmental features of the culture ground, the construction of coastal ponds, the results and problems and envisages the scope for further development of extensive, unutilized areas into productive farms.

Resources

The existence of seeds of considerable varieties of euryhaline, culturable species in the tidal inlets along the coast of Gulf of Mannar, that too, in different seasons of the year facilitated the start of fish farming experiments at Tuticorin. The seeds of milkfish occur in adequate quantities in the backwaters of Valinokkam, Punnakayal and Tiruchendur during April-May. The grounds and season for the collection of fingerlings of mullets like *Mugil cephalus* and *Liza macrolepis* have been identified. The tidal pools adjoining the creeks of Alangarathittu, Pullavali and Palayakayal are the resourceful beds for the mullet seeds. The seeds of the prawn *Penaeus inducus* are rich in coastal lagoons and estuarine belts and could be collected in 3 different seasons of the year. The young ones of the crab *Scylla serrata* are available in the tidal flats and mangrove swamp areas in Tuticorin, Pullavali and Sahurpuram and the best period for the maximum collection is July-September. All these species possess high reproductive capacity, short larval development, fast rate of growth, unique physiological features to adjust to wide environmental changes and fetch a good market price.

The water characteristics of the culture site are suitable for continuing the experiments, although the monthly average values of surface temperature, dissolved oxygen content and salinity of the ponds are always higher than that of the open sea. The temperature of the pond water varied from 27 to 31.5°C with the maximum noticed in hot sesons of May and October. The dissolved oxygen content is measured in the range 3.5-6.0 ml/L and fluctuates widely in rainy season . The salinity of the culture site varies from 17 to 50 ppm. The maximum is reached due to the poor tidal amplitude and the low exchange of water, particularly in the months May-September. The site does not face any drastic changes in the environment as there is no river or creek nearby.

Site development

The elevation of the site in relation to the tidal amplitude is the advantageous factor for the selection of culture bed in the protected bay. The area is very flat and exposed during low tide. The mangrove swamps are reclaimed by cutting down the plants *Avicinia* and raising the bunds with the mud excavated from the pond area as the soil has good water retention properties (Fig.1). The floor of the pond is levelled after the mangrove roots are pulled out and

Fig. 1. Construction of ponds in swampy land.

stumps eliminated. The ponds are filled and flushed on the tides, even though the tidal range is quite modest here. The area enjoys a diurnal tide with a range upto 120 cm at spring tide and 30 cm or even less during neap tides. The ponds are made in such a

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Fig. 2-3. Views of coastal ponds.

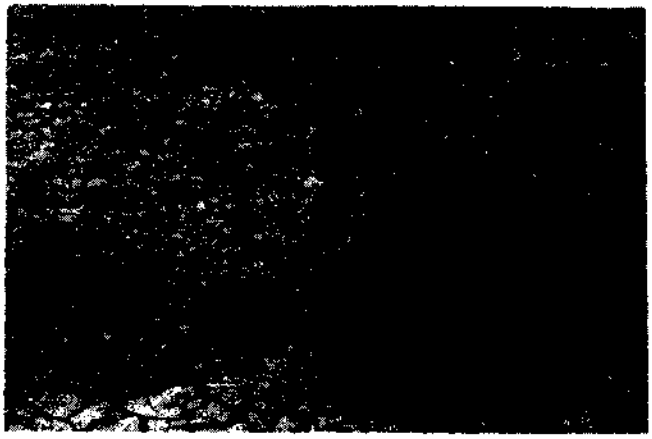

Fig. 4. Preparation of chanos pond by baking.

Fig. 5. Harvested fishes from ponds.

way that their bottom attains a level of 30 cm beneath the mean high-water spring. The sluice pipes are fixed on two sides of the pond at different levels so as to serve as inlets and outlets. The pond bottom slopes gently towards the outlet sluice and traversed by shallow radiating ditches orginating from the harvest basin or catching pit. Maximum exchange of water is possible during spring tide days around fullmoon and newmoon. The bottom consists of soft mud. This hydrophylic mud is biologically active and contains sufficient percentage of humus and large amounts of clay. Such soils provide an excellent environment for the development of algae along with the associated micro-organisms which form the main food of cultivable organisms.

The lay-out of ponds are planned according to the local topographical conditions. 14 ponds, each in the size of quarter hectare with a depth of 1.5 m are constructed. Two main feeder canals with a width of 2 m orginating from the bay on southern side of the site, one in the middle of the farm and the other along the road side, encircle the ponds (Fig.2-3). Radiating canals are arranged at an interval of two ponds. The ponds are provided with cement sluice pipes of 6" diameter which made control of the water level possible. 6-8 pipes are fitted on two side bunds of the pond and most of the ponds are connected with supply channel atleast on two sides. Velon screens tied at both ends of the sluice pipes serve as sieves. The entire farm is protected from open sea by strong embankment which stand one metre above the highest tide level. It is sufficiently broad to withstand the dynamic force of the tides and pressure. The bunds are constructed in stages by laying the excavated mud slabs, free from roots and twigs, in layers which are compacted and allowed to dry in the sun before adding the next layer. Fencing arrangements with special design are made to crab culture ponds. Mounts with mangrove vegetation are retained in these ponds so as to provide ample natural ecosystem.

Milkfish ponds need special preparation immediately after harvesting. The ponds are drained and exposed to air and sun for sufficiently long time to

make the soil surface cracked (Fig.4). Such baking procedure is deemed of paramount importance, since it destroys a variety of unwanted organisms and boosts up the mineralisation process in the top sediment layers and improve the fertility of the pond. Drying out is effective because of the provisions of a good net work of drainage ditches. Ponds which are never dried out gradually lose their value and their exploitation finally ceases to be profitable. This process is also necessary to carry out the essential repair works in ponds.

Culture practices

Experiments on the culture of the mullet *L.macrolepis* and the milk fish *Chanos chanos* were carried out in these ponds during the last three years. *P.indicus* and *S.serrata* were also reared separately in four ponds. The period of culture is normally 10 months and designed from May-February. The rest of the period is devoted towards maintenance and preparation works. The composite culture with compatible species like milkfish and mullet was found to give promising results. Monoculture practices done exclusively with milkfish or mullet in rest of the ponds with different stocking intensities have thrown light in determining the optimum stocking level for better yield. Rice bran and ground nut oil cake at the ratio of 2:1 were supplied to the stocks at 5% of the body weight. The predatory fishes like *Lates calcarifer*, *Terappon* spp., Elops sp., *Polynemus* sp., *Ophiocephalus* sp., *Arius* spp., were eradicated from the ponds periodically by employing the gill net and cast net. The results of the culture experiments were encouraging (Fig.5). Different sets of experiments were completed and the following are the salient features emerging from these preliminary experiments.

1. The growth of milkfish and mullet is slow during the beginning days of stocking due to the prevalence of high salinity in ponds in May-June. The growth is accelerated when a fall in salinity is noticed from July onwards and this is well noticed in milkfish.

2. A maximum overall growth of 30 mm/month and 24 mm/month is observed in *C.chanos* and *L.macrolepis* respectively when stocked at the optimum level of 1 seed/m^2.

3. The milkfish seed released at 28 mm have grown to 335 mm/226 g in a period of 10 months.

4. Better survival and production is noticed with *L.macrolepis*.

5. Poor growth resulted from overstocking besides the other causes like poor depth of water, increased temperature and increase in salinity.

6. The total production encountered in a polyculture experiment is 1644 kg/ha/yr.

7. Harvesting is comparatively easy when single size stocking is practiced.

Development prospects

The facilities for culturing prawns and fishes in coastal lands have been developed using very simple techniques. Farm engineering for marine aquaculture is comparatively a new field and innovative techniques to suit the local conditions need further improvements. Based on the preliminary experiments, several development efforts appear to be warranted for achievement of success. Adequate number of sluices in different dimensions are to be provided for a better exchange of water inside the ponds so that the depth and salinity can be maintained at required levels to promote growth. The shallow outskirts of the culture site are the common fishing ground and to avoid the threat of poaching, fencing arrangements around the fish farm as well as a constant watch and ward set up are the priority requirements for the success of the culture project. Effective system to control the entry of predatory fishes inside the ponds is to be evolved besides the efforts of eradication.

The prevalence of poor tidal amplitude in this region during June-August affects the culture results to a great extent and to solve this problem deepening of the feeder canal and some of the ponds are suggested. This may pose the problem of draining and harvesting. An alternate planning is the careful adjustment of the culture period whereby the adverse period can be avoided or prefixed.

Concerted efforts to tackle some of these problems would hasten the establishment of fish farms on the edge of the sea in these areas, greatly aiding the augmentation of fish production. The present experiments have indicated the possibility of large scale development of farming in the coastal flats.