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PRAWN CULTURE AND POLICY OPTIONS
Technology Import and Culture through Fishermen Vis a Vis Industry

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ABSTRACT

Recent developments in aquaculture has created an awareness that prawn culture is a doller spinner, in which industry can step in to earn foreign exchange by producing an expensive food item which has a high market demand abroad.

Till today that major objective of fisheries development were improving socio-economic condition of fishermen and to increase production of protein food to fight malnutrition. Therefore, all government agencies, Fisheries Research and Education Institutes worked for small fishermen, who use cheap technology with government loans and subsidy and inadequate extension services. As a result we have appropriate low input technology for fishermen and now they can produce around 1000 kg. of prawn per hectare per year in a few crops. Their economic condition has improved but the pace of progress is slow and levels of prawn and fish production through aquaculture are low.

Now the industry has confidence that prawn culture is commercially viable and private industry can step in for high production with assured profits and exports. Therefore, it is desirable to import a technology where a production of 10 tons per ha. per year is assured. This also needs organising new programmes for inservice training. training of operatives and managers. This will also require trained manpower.

The Government has to take a policy decision whether the prawn culture should be done through small fishermen to improve their socio-economic condition or through private industry with the high technology input and pre defined objectives of export trade. Perhaps a simultaneous operation of the two could be allowed best in the interest of India. Perhaps in the interest of quick development and adoption of high production technology, through fishermen organization, the development is encouraged through the implementation of welfare and area development schemes. In some selected areas private industry may be encouraged to use high production technology to develop prawns.

PRAWN CULTURE

India has about 5,600 kms. of coast line. It is connected with 8,000 km. of estuaries and about 2.0 million hectares of brackishwaters, mangroves and mudflats. However, more realistic estimates indicate that India has 1.7 million

hectares of brackish-water out of which only 25,000 ha. are under traditional fish and prawn farming in West Bengal and Kerala. Therefore, resources for brackishwater culture with salinity range from 0.5 to 30 ppt. are comparable in magnitude to those of the freshwaters. However, at present these resources are utilized to a very small extent and hence production rate is low. They contribute hardly 1% to the annual fish production of the country. In almost all the maritime states of India, large areas of saline soils, mud flats, swamps and mangroves exist. The reclamation of such areas for agriculture is extremely difficult and is expensive. Therefore, these saline areas in coastal belt which mostly belong to the government can be developed for aquaculture.

The recent progress in the field of brackishwater culture includes breeding of commercially important species of prawns, study of abundance of naturally occuring fish and prawn seed, establishment of Seed Banks, nursery management, development of prawn and fish culture techniques, appropriate crop sequence for east and west coasts and feed formulation for intensive farming. Work on the survey and selection of sites for brackishwater fish farms, development of designs for sluices as well as dykes in relation to topography, tidal amplitude tide flow and soil types development of silt traps to check siltation of ponds, basic designs and layout for brackishwater farms have been developed in the country. Still there is ample scope and need for their improvement and refinement to make them cost effective.

India is amongst the four important countries which export large quantity of prawns in the world and hold an important place in export market. The exploitation of prawn resources during the last 10 years was so intensive that there is an uneasy feeling that prawn catches have now started showing signs of stagnation. In certain pockets along Indian coasts, the exploitation has crossed the level of optimum sustainable yield and it is reported that the production is declining.

It was pointed out that the fear of over exploitation is wide spread therefore fishing industry is looking towards aquaculture as an industrial venture (Dwivedi, 1984). This is a new profitable area of investment and appears to provide good prospects for additional prawn production and export. The organised monospecies prawn culture with high yields is very different from traditional prawn culture where a fisherman without enough financial resources was trying to make a good living. The traditional prawn culture is like a small scale farming which, with the loans, subsidy and extension support can be developed into a cottage industry. Whereas, fishing industry is now desirous of entering prawn culture with the idea that prawn is a dollar spinner. It will be profitable to make large investments, import modern technology, introduce systems management where inputs and outputs and high profitability is assured.

This concept has also been accepted by Govt. of India and now we have important institutions like MPEDA, of the Ministry of Commerce, STC; NABARD, International Banks, Private industries like Tata Oil Mills Co.; Hindustan Levers Ltd., and others who are entering the aquaculture fray in a gay mood.

The limiting factors, in large scale adoption of prawn culture are the non-availability of prawn seed from natural sources and non-existance of commercial hatcheries. Though traditionally prawn juveniles are collected from nature, but for profitable aquaculture, setting up of organised large hatcheries is essential (Fig. 1). Eventhough, Fisheries Institutes have bred prawns in the laboratory

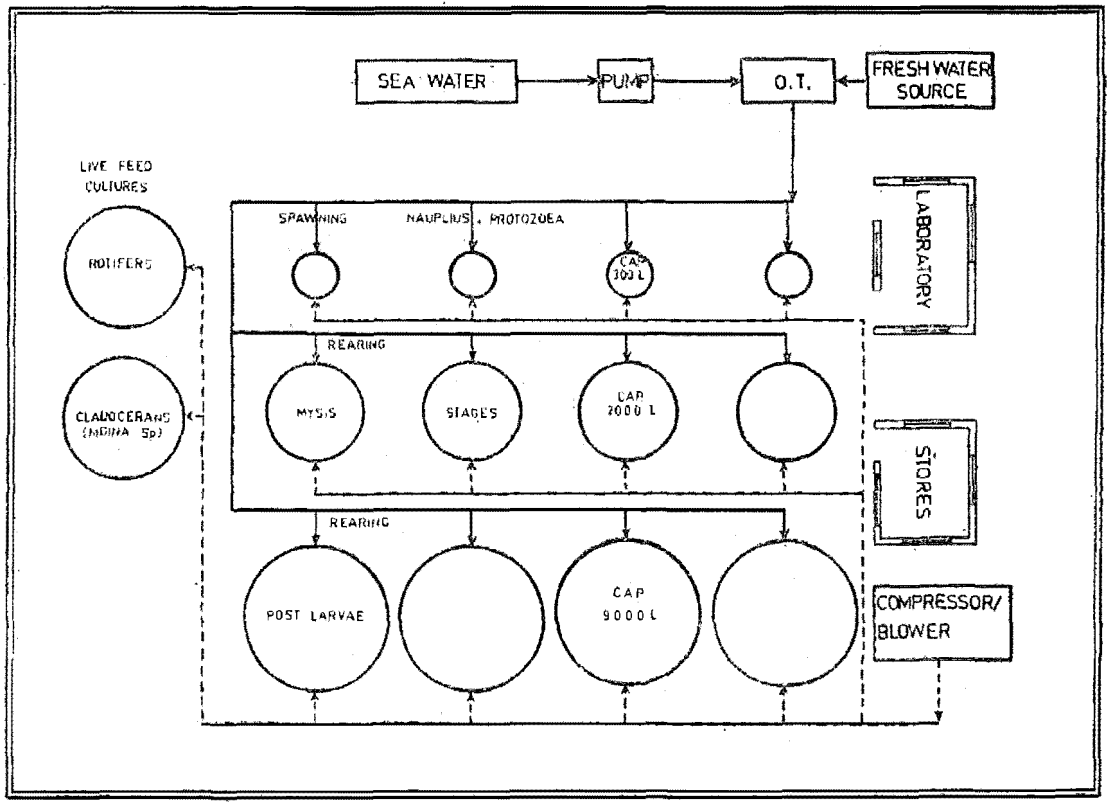

Fig. 1. Prawn Hatchery at CIFE, Bombay.

where they have developed hatchery technology, generally production from these hatcheries is small (Dwivedi *et al.*,1983). At present they do not have infrastructure and large production centres in suitable coastal areas, therefore, they could not start pilot projects and commercial hatcheries. In government and semi-government it also takes long time to obtain funds, procure good quality equipment and develop infrastructural facility through Civil work agencies.

At present, in India setting up of hatcheries require 1) brood prawns from sea, 2)spawning and rearing of eggs to post-larval stages, 3) providing different

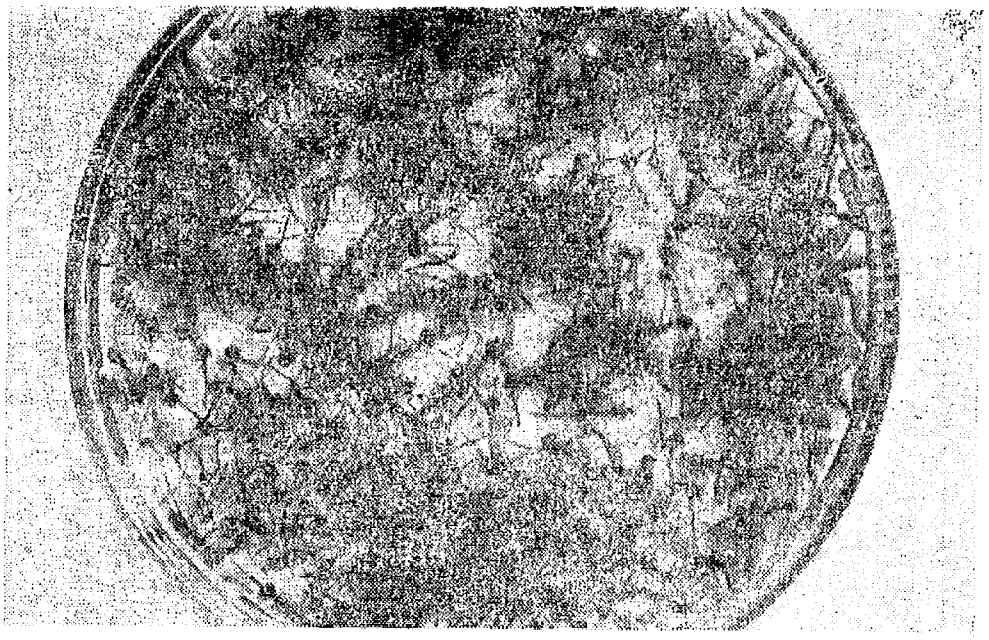

Fig. 2. Live Food Artemia for Prawn Larvae

kinds of food (Fig. 2) for protozoea, mysis and post larval stages of prawns and 4) setting up and managing the controlled systems. At Bombay and Kakinada Centres, the Central Institute of Fisheries Education (CIFE) has developed a simple and inexpensive technology for raising post-larvae (Dwivedi and Reddi, 1977; Dwivedi and Iftekhar, 1979). The same technique with modifications has been adopted for breeding giant freshwater prawn, *Macrobrachium rosenbergii*. Based on the experience gained, two pilot projects have been formulated for Penaeid prawn hatchery and Giant Freshwater Prawn Hatchery. Work on similar lines has been done by CMFRI and CIFRI (Hamid Ali *et al.*, 1982; CMFRI Report, 1985). Hindustan Levers Ltd.; have also developed a hatchery near Madras. Mr. Hamid Ali of Cresent Hatchery and Prawn Farm, Almanar, Kerala has made the beginning of setting up of a small hatcheries in Kerala and a large hatchery is being set up in Maharashtra at Bada Pokhran, near Bombay. Mr. Hamid Ali manages a dynamic consultancy service but this is only one unit and India needs many of them.

Extension of brackishwater aquaculture requires steady supply of young prawn larvae. The estimated seed requirement for different states has been worked out at different levels of stocking (Table 1). At the current rates of stocking of 50,000 post larvae per hectare, India needs about 85.0 billion prawn larvae by the year 2000 A.D. At the rate of 1.5 lacs per hectare India's prawn seed requirement will be around 256.00 billion. These estimates may appear to be on high side but there is no doubt that there is vast scope for hatchery development and private entrepreneurs and industry can make very meaningful contributions.

Table 1 : Estimate of Prawn Seed Demand

State/Union Territories	Potential area in million ha.	Seed requirement with stocking densities		
	(10^6)	50,000	1,00,000 (in billions, 10^9)	1,50,000
Gujarat	0,376	18,80	37,60	56,40
Maharashtra	0,081	4,05	8,10	12,10
Goa	0,019	0,95	1,90	3,80
Karnataka	0,008	0,40	0,80	1,20
Kerala	0,243	11,70	23,40	35,10
Tamil Nadu	0,080	4,00	8,00	12,00
Pondicherry	(840 HA.)	0,04	0,08	0,12
Andhra Pradesh	0,200	10,00	20,00	30,00
Orissa	0,299	14,90	29,80	44,70
West Bengal	0,405	20,20	40,50	60,70
TOTAL	1,711	85,04	170,18	256,12

To solve the paucity of seed which is the major limiting factor in the large scale extension of brackishwater aquaculture, several Institutes in the country are working on setting up of model hatcheries for seed production (Dwivedi *et al.*, 1983; CMFRI 1985). Inspite of these efforts the major part of the seed requirements are met even today from the natural resources. Therefore, it is desirable to establish seed banks and commercial hatcheries for prawn seed in private sector and through fishermen organisations. It will also be desirable to set up Pilot Project hatcheries in different regions through the Fisheries Institutes.

The Government of India had a definite Policy to the brackishwater aquaculture for poor sections of the society and also for the fishermen who are generally poor and illiterate. Consequently the traditional prawn culture was improved. The traditional aquaculture system is essentially based on cheap inputs available from nature like seed, tidal water, low cost feeds. Therefore, small size bheries and paddy fields received attention of the state governments and research institutions. The prawn culture in bheries and paddy fields was developed through extensive survey of seed resources and creation of prawn seed banks (Fig. 3 & 4), developing better types of sluices for intake of tidal water, low cost farm designs use of natural and inexpensive feeds. As a consequence with research and technology support India developed prawn culture as a cottage industry where the beneficiary is poor fisherman. In this systems the limitations are that, his farm or pond size is small, inputs are limited. Fishermen do not use pumps, filters and aerators to keep the operating costs low. They use part

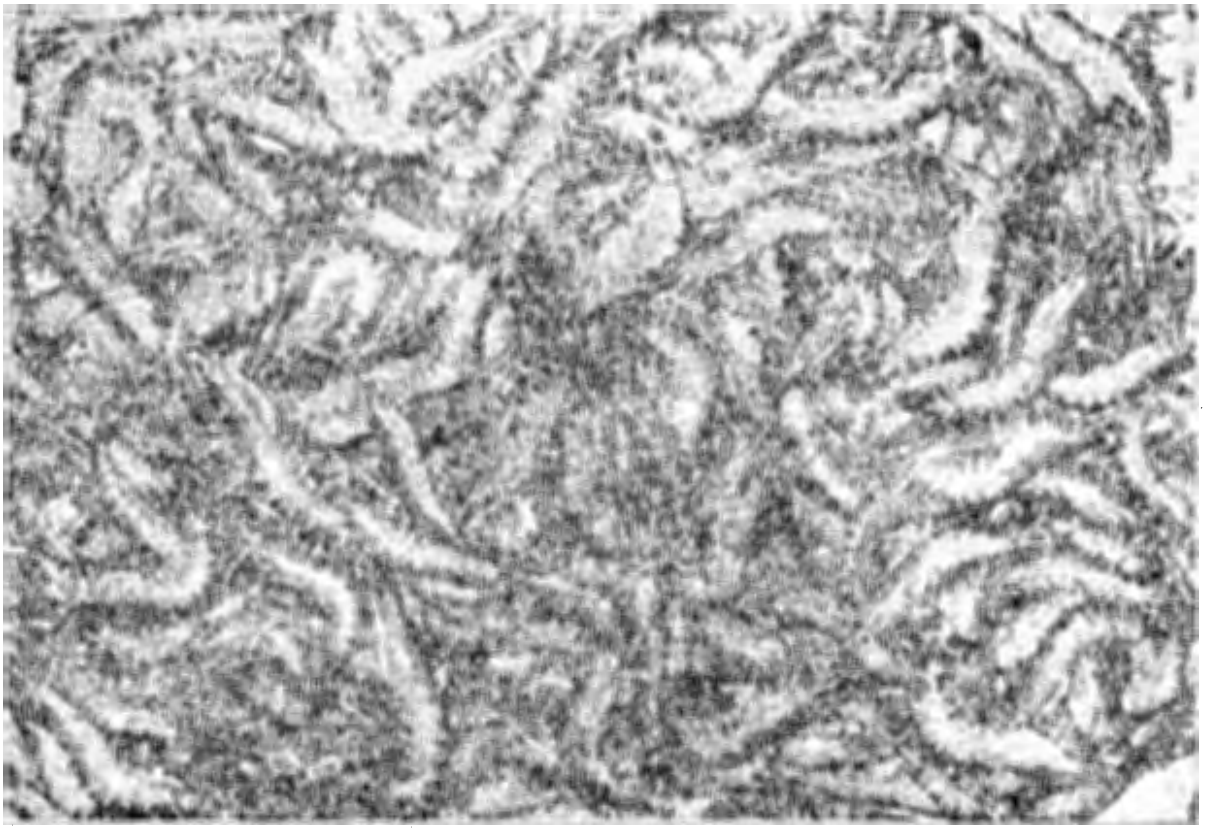

Fig. 3. A crop of *Penaeus monodon*

of the research results which are extended to them through a free or subsidized and inadequate extension services. Many people have been benefitted in West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Kerala and Maharashtra through this practice. The experienced farmers, now produce upto 1000 to 1,500 kg. of prawn per hectare per year in two or three crops. However, the average varies between 500 to 1000 kg. per hectare per year. Now they earn more and live a better life. Their number is small and they generally belong to weaker strata of the society. Therefore, the rate of production is less.

Based on the existing conditions and continuous upgrading of technology, much higher production will be possible. It is expected that by turn of the century, with the system of controlled environment, development of good feeds; genetic engineering, it should be possible to achieve a production of 10 tonnes Ha^{-1} y^{-1} or more. However, some estimates of production are as high as 50 tons $Ha^{-1}y^{-1}$. It is envisaged that the dynamics of production system will change and entrepreneurs will undertake culture in small tanks and then their measure of production will change to per m^3 of water available.

The manpower requirement for the phased development of Brackishwater culture has been estimated (Table 2). By 2000 AD India would be able to employ 17 lacs fishermen, 3 lacs operators, 1 lac graduate and 30 thousand

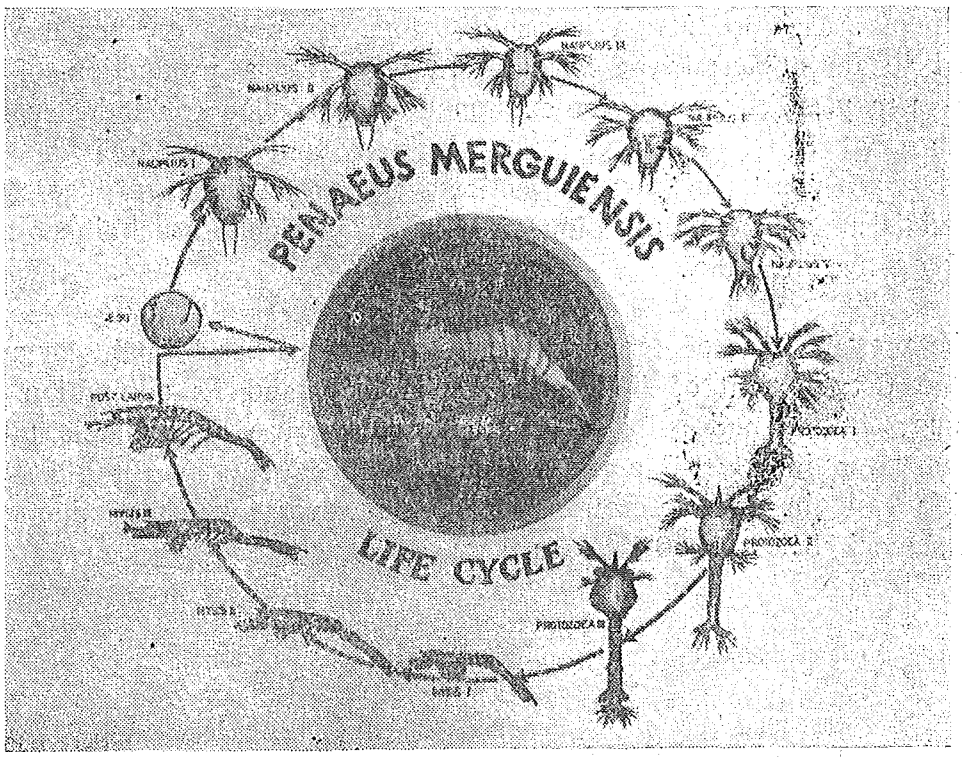

Fig. 4. Life cycle of *Penaeus merguensis*

post-graduate from different disciplines (Dwivedi, 1985). Therefore, manpower training with greater emphasis on field and actual production is needed. The present inservice training facilities and fishing educations has to be improved and developed. However, the adoption of indigenious technology has now been able to make impact at the national level and also in the Parliament, the affects are

Table 2 : Manpower requirement for Brackishwater Aquaculture Development

Year	Category of Personnel			
	Fishermen	Operatives	Graduates	Post-graduates
1985	23,000	40,000	1,400	400
1990	4,50,000	80,000	23,000	2,000
1995	12,00,000	2,00,000	67,000	20,000
2000	17,00,000	3,00,000	1,00,000	30,000

being felt. It is due to this spade work that the government, industry, banks and Indian Institute of Management have developed confidence — that "Prawn Culture is an attractive sector for investments".

Recently Natarajan, (1985) indicated that based on a new feed it is possible to produce two tons of prawn per ha. per month which works out to 24 tons per ha. per year in the year 1985, is an eye opener. Many institutions should

undertake exercises in self-evaluation and examine their rate of progress and achievements. The production levels of 2 tons of prawns per hectare per year achieved so far appear to be insignificant vis a vis a production of 24 tons per ha. per year. However, the million dollar question for industry is, when this technology can be adopted by the Industry and how much time will be required to put this technology in practice even at a few centres. Therefore what is needed is national demonstration of intensive production techniques at a few selected centres in India.

The present stage of aquaculture development has brought an awareness about the development of **indigenous** technology, and its adoptation to local conditions. At the national level by making best use of available technology and manpower, in selected areas, we can produce between 1000-2000 kg. of prawn Ha^{-1} y^{-1} in multiple crops (Fig. 5). However, average production at the present stage is below 1000 kg., Ha^{-1} y^{-1} .

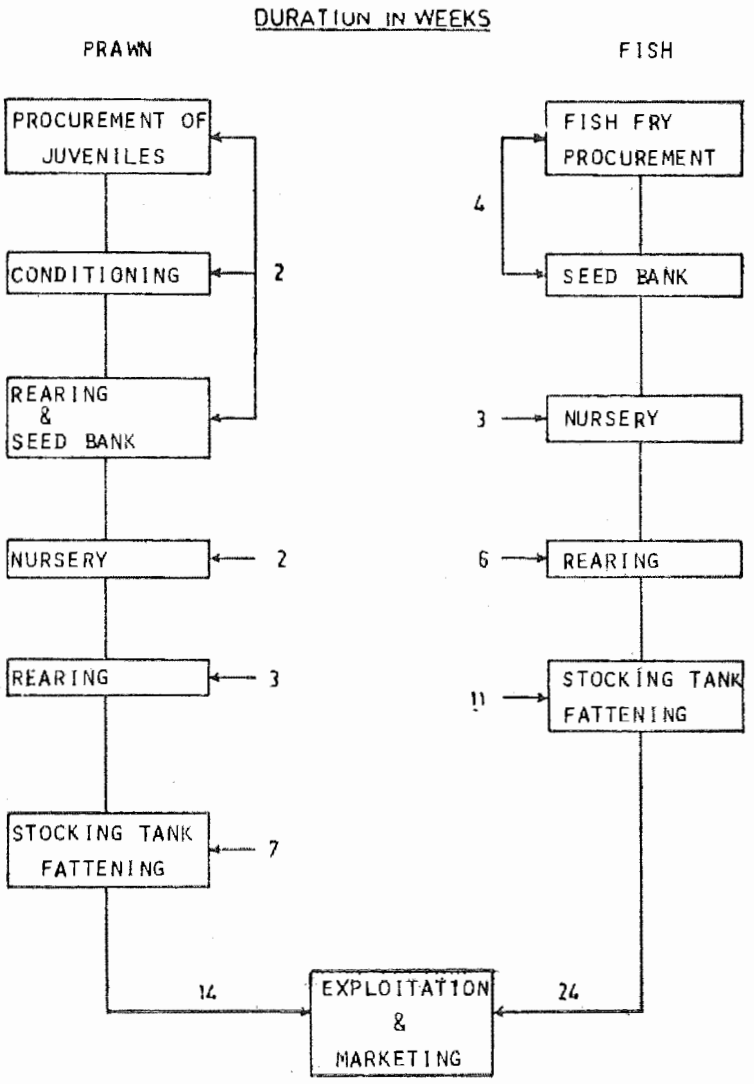

Fig. 5. Fish and Prawn Culture Schedule

Potential of raising four crops in growout ponds in different states in (Table 3) envisages that juveniles upto 60 mm size will be raised in separate rearing ponds. The scheme is intended to assure higher survival at young stages and raise short term crops in grow out ponds. However, at the present stage

through fishermen organisation and government support it will be reasonable to start with two or three crops in a year depending upon the environmental factors and productivity of the areas.

Table 3 : Raising of short duration crops of different prawns based on natural seed availability in different states — an indicative chart

States/months	Jan-Mar	Apr-June	July-Sept	Oct-Dec
Gujarat	*P. merguiensis*	*P. merguiensis*	*P. merguiensis*	*P. merguiensis*
	P. indicus	*P. indicus*	—	—
Maharashtra	*P. merguiensis*	*P. merguiensis*	*P. merguiensis*	*P. merguiensis*
Goa	*P. merguiensis*	*P. merguiensis*	*P. monodon*	*P. monodon*
Karnataka	*P. indicus*	*P. indicus*	—	*P. monodon*
	P. monodon	—	—	—
Kerala	*P. indicus*	*P. indicus*	—	*P. monodon*
	—	—	—	*P. indicus*
Tamil Nadu	*P. monodon*	*P. monodon*	*P. monodon*	*P. monodon*
	P. indicus	*P. indicus*	*P. indicus*	*P. indicus*
Andhra Pradesh	*P. monodon*	*P. indicus*	*P. monodon*	*P. monodon*
	P. indicus	*P. indicus*	—	*P. indicus*
Orissa	*P. monodon*	*P. monodon*	*P. monodon*	*P. monodon*
	P. indicus	*P. indicus*	*P. indicus*	*P. indicus*
West Bengal	*P. monodon*	*P. monodon*	*P. monodon*	*P. monodon*
	P. indicus	*P. indicus*		

Note : (Species other than *Penaeus* have not been included in the Table)

However, if we look at the technology in other countries, much higher production has been achieved and many entrepreneurs desire to import foreign technology, perhaps at a very high cost. Indian Institute of Management is also examining the question of import of technology and levels of technology available in India, and the kind of technology and financial assistance, India can ask from the International Agencies.

In the present situation India has the technology but due to difficulties in land leasing systems, lack of finance and absence of technological services for farm construction, hatchery management and feeds, we are not able to adopt quickly modern prawn culture systems. Also we do not have private firms, who on a regular basis can assure a prawn production of 2000 kg per ha. or more. Therefore, we need turn key projects in which prawn production of more than 4000 kg. Ha^{-1} y^{-1} is assured in multiple crops. These technologies are available in other countries. However, selection of appropriate technologies should be

based on formulated feeds, which can be obtained in India and whose conversion ratio is very high. We envisage a technological development like poultry, where standard practices are available. They have revolutionised availability of eggs and chicken in India. We have the same possibility but what we need is a culture system which can be operated on turn key basis in which water quality, seed supply, feed, hygiene, disease prevention and control are properly managed. We will also neel better breeds of prawn which grow fast, and are resistant to disease and can utilise inexpensive feeds. This should be supported by trained manpower at operatives and managerial levels.

POLICY OPTIONS

However, before entering into large commercial ventures and deciding about import of new technologies, Government will have to ensure that prawn culture development does not take place at the cost of a small fishermen.. The Government should evolve a policy and systems so that fishermen will have a better future. The entry of large houses and import of technology can accelerate the pace of development, it will also increase prawn production and prawn exports. However, the principal question is the development of a new system in which socio-economic condition of fishermen is improved, he becomes the main beneficiary and at the same time prawn culture is boosted as a commercially viable industry in which private sector plays an appropriate role. The greater participation of fishemen and private enterpreneurs can bring about a blue revolution and prosperity in coastal areas of Inlia. It will also help in recycling of organic waste and keep on coastal line free from pollution.

CONCLUSION

New opportunities exist both for fishermen organisations and private enterpreneurs; there appears to be two approaches. The first is the development of prawn culture through fishermen and their cooperatives with production levels around 2 tons per ha. per year. This helps in slowly increasing the production but the main beneficiary are fishermen and poor people. This can be done by development of Brackishwater Fishery Estates through fishermen Cooperatives with government assistance. The second approach is option of high production imported technology through private enterprise where size of the farms will be around 50 to 100 ha. and the production levels around 10 tons Ha^{-1} or more. This will lead to quick adoption of technology to meet export demands and earn foreign exchange. Perhaps, taking into consideration overall national priorities allowing both the systems to function simultaneously may be most practical.

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