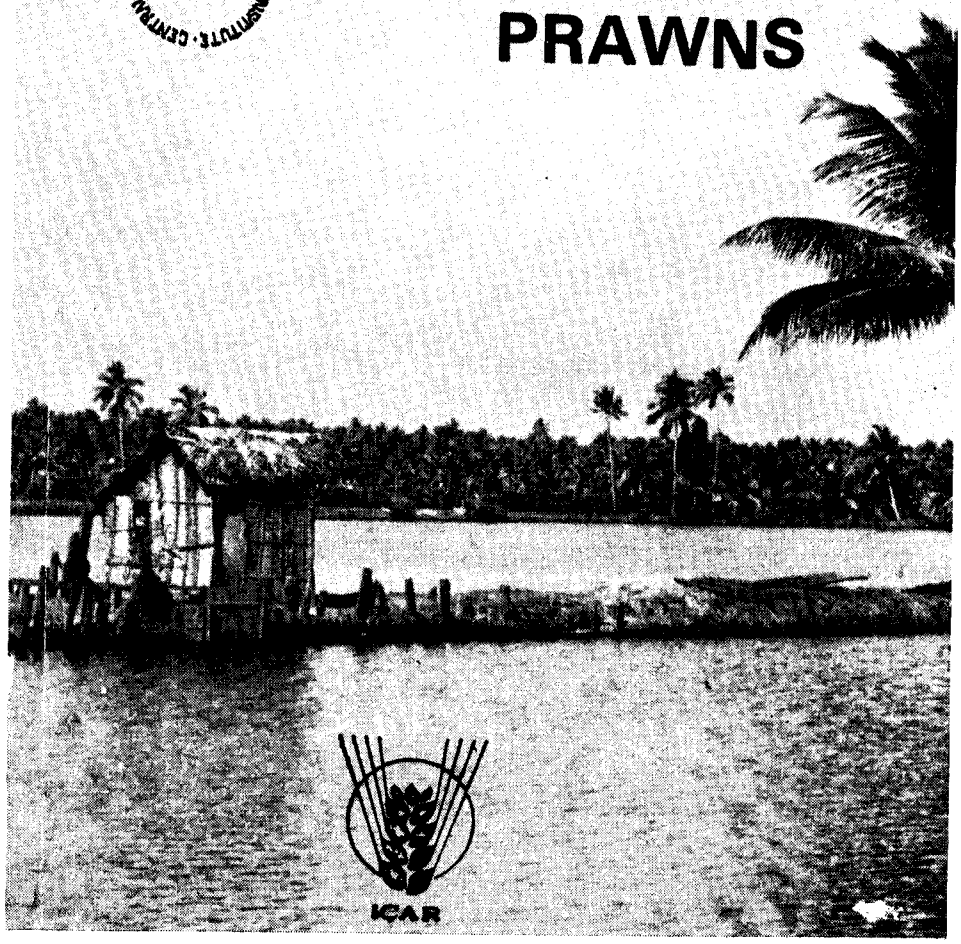
Krishi Vigyan Patrika: Mariculture Series 5(a)

GROW MORE PRAWNS



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Revised Edition : 1986

Published by Dr. M. M. Thomas, Officer in Charge, Krishi Vigyan Kendra Narakkal on behalf of the Director, Central Marine Fisheries Research Institute, Cochin-31

Printed at S. K. Enterprises, Cochin-18

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CONTENTS

INTRODUCTION

Looking at the seas surrounding the Indian sub-continent, one may think that the fishery resources in the huge water mass are limitless and endless exploitation of fish is possible from these waters. But when we examine the trend in the marine fish production, there are indications that the present production cannot satisfy the demand and solve the acute food problem. This and also the great demand for choice seafoods such as prawns, oysters and fin-fishes from the developed countries have given impetus to mariculture, and at present there is a greater awareness on the part of the Indian fishermen on the farming of aquatic animals.

It is a well established fact that the commercially important penaeid prawns enter the backwater system at their early life stages and spend 5 to 6 months in this area before going back to the sea. This habit of the prawns is made use of for impounding and periodically harvesting them in the fields. This type of prawn fishing called 'prawn filtration', is practised in the low-lying areas of the backwaters of Kerala from ancient times. These fields lie on the banks of emband lake and its connecting canals, and estuaries of Periyar and Pamba rivers.

There are two types of fields where traditional prawn filtration is practised. These are seasonal and perennial fields. In the seasonal fields the fishing operation is restricted to post-

monsoon months after the harvest of paddy, where as in the perennial fields it is carried out throughout the year.

Traditional paddy/prawn farming

During the south-west monsoon months, the water in the seasonal fields becomes almost fresh and hence paddy cultivation is practised. The variety of paddy used for this type of cultivation is locally known as "*pokkali*". It is a disease-resistant and to a great extent saline-resistant strain of paddy.

The preparation of the fields for "*pokkali*" cultivation commences by the middle of April. Generally 80 kg. of seeds is required to cultivate a field of one hectare. The paddy is harvested by the end of September. The average production is estimated around 2000 kg per hectare. At the time of harvest, part of the paddy stumps is allowed to remain in the field. In course of time, these stumps decay and help to increase the organic production of the field

Prawn filtration

Immediately after the paddy harvest, the fields are leased out to prawn farmers to carry-out prawn filtration for a period of five months from 15th November to 15th April. The lessee takes a licence for the purpose and a nominal fee of Rs. 15/- per acre is levied by the Department of Fisheries.

The lease amount varies depending upon the location and nearness of the field to the bar mouth and also on the productivity of the field. In Vypeen Island, where the average annual income is the highest among all paddy/prawn fields of Kerala, the average lease amount is around Rs. 7500/- per hectare. The fields of Kadamakkudi and Nedungad in Vypeen block are considered to be relatively more productive and the lease amount prevailed there during 1984-85 was as high as Rs. 12500/- per hectare. In some areas in Alleppey and Kottayam Districts, the lease amount is as low as Rs. 2500/- per hectare.

The type of operation where prawn farming is practised after a single crop of paddy is locally known as *venal kettu* or

season kettu. The seasonal fields are of various sizes ranging from half to about forty hectares.

Preparation

On taking over the field by the lessee, necessary repair work is undertaken. The outer bunds are strengthened as a first step. The earth from the field, just inside the outer bund, is scooped out and deposited on the top of the bund to strengthen the same. Incidentally, the deepened portion forms a natural channel in the inner periphery of the field. All breaches (locally termed as *kallan*)—holes made by crabs or crevices made by roots of mangroves and other plants—are closed so that the water flow to and from the field is possible only through the sluice gate.

The area just inside the main sluice or *thoompumkuzhi* as locally known, is then deepened. It is made in such a way that it has a semicircular shape with maximum depth at the middle. Channels varying in width from 1 to 2 metres and 1 metre in depth are cut through the fields connecting the deepened area to other parts, giving a slope towards the sluice gate. When this work is in progress, some paddy stumps are also removed as their presence in excess would adversely affect the farm.

Unlike paddy cultivation, farming for prawns is a collective affair i e. fields of different ownership are collectively auctioned as a unit and the lease amount divided among the land holders. Therefore the existing bunds on the boundaries of different pieces of fields are also cut opened at various points to function as interconnecting sluices.

Fixing of sluice gate

A wooden sluice gate is then fixed at the pre-determined place in the outer bund. The size and position of the sluice gate depend on the general lay-out and extent of the fields, width of the outer bund and also on the direction of the water flow. The bottom plank or platform is first kept after ascertaining that the bottom earth is in even level and hard enough to hold the platform. Workmen trample on this platform so that

the bottom plank is sunk firmly in the ground. The side planks or *pakkupali* which are provided with foot rest, are then fitted. These foot rest are meant for drawing the coir rope for operating the shutter planks. The top frame or *thoppithati* is then fixed over the sides and the gate is thus made into a single unit. The workmen again trample heavily on the top to drive the sluice gate firmly into the ground. Subsequently strong poles called *kannukutti* locally, are erected very close to the sides of the sluice gate inside and outside the pond. These poles are further jointed together across and length-wise with other wooden supports. The whole structure and the sluice gate are then firmly tied together to avoid further sinking or shifting of the sluice gate. During the first few days after fixing the sluice gate, the top frame is loaded with weights in order to stabilise the gate to the maximum possible in the ground. The outer bunds lying immediately on the sides of the sluice gate are then strengthened. Even after these processes, periodical checking for breaches through the sides or beneath the platform of the gate is absolutely necessary; balls of clay reinforced with dried hay are used to seal off such breaches.

Shutter planks are subsequently introduced into the grooves provided for the purpose. These planks vary from 10 to 20 cm. in width and 2.5 to 3 cm. in thickness. Uniform sizes are always used in a given sluice gate.

Sluice gates are generally made of local timber such as *Kanjiram (Striknose sp.)*. *Irul (Xylia sp.)*, Jackwood, *Thembavu (Terminalia sp)* and Mango. A sluice gate made of *Kanjiram* and having a size of 7' length, 5' height and 2½' width will cost about Rs. 3000/– according to the present market rate (December, 1985). In certain fields. permanent concrete sluice is also constructed so that only shutter planks need be renewed.

A shed is then put up on the outer bund near the sluice gate to house a watchman and also to keep the fishing implements like sluice nets, bamboo / arecanut screens, baskets, hurricane lamp, etc. Sometimes, more sheds are put up depending on the number of sluice gates and also on the extent of the field. As there is a likelihood of a large influx of the

African weed *Salvinia* sp. into the fields, two bamboo poles or arecanut tree trunks are tied together at one end and floated in a triangular pattern inside and outside, while letting-out and letting-in the water.

Prawn trapping

The repair and maintenance work to the fields take about two weeks and by the end of November the fields become ready for operation. During the high tide, the incoming tidal water from the adjoining backwaters is let into the fields by removing the shutter planks of the sluice gate. At night. a hurricane lamp is hung at the side of the sluice gate in order to attract the juvenile prawns towards the sluice mouth. At the time of low tide the impounded water in the field flows out. While letting the water out, a bamboo / arecanut screen locally known as *adichil* is kept vertically inside the sluice mouth. The *adichil* used here is different from the ordinary type, as its purpose is to prevent the impounded tiny prawns from escaping out of the field. It is therefore, made out of thin gauged and finely shaped pieces of bamboo or arecanut poles so closely tied together that only water could pass through its tiny meshes. The designing and fabrication of such an *adichil* is a skilled job and is carefully done, as otherwise a defective one could make the entire operation a complete failure.

The process of letting-in and letting-out of the water at the high and low tides is repeated during the entire lease period.

Harvesting

The fishing out of prawns starts by the middle of December. It is generally carried out for about three to four days before and after every full moon and new moon. The fishing period is called *thakkom*, locally.

During the favourable tides of *thakkom*, a net locally known as *thoombuvala* is fixed in the outer mouth of sluice gate; the shutter planks are removed one by one and the impounded water is allowed to rush out through the net. The sluice net is conical in shape with its mouth tied to a rectangular wooden frame,

The net is made of strong cotton thread with fine meshed cod end. The mesh size gradually increases towards the mouth. The size of the net varies according to the width of the sluice gate. A hurricane lamp is hung at the inner mouth of the sluice gate to attract the prawns. The cod end of the net is tied to form a bag in order to gather the prawns. This end is lifted out of the water periodically and the catch emptied into a canoe.

A float, attached to the cod end, facilitates the periodical lifting out of the catch. When the cod end sinks to the bottom due to the weight of the catch, the net is immediately lifted by pulling out the float. If the net is torn and the cod end drifts, the float helps in locating it.

If there is heavy concentration of floating-weeds in the field, the top-most shutter plank is first removed in order to let the weeds out of the field. The net and the hurricane lamp are tied only after removing the weeds.

The process of fishing continues for a period of 2 to 3 hours. The majority of the prawns are caught during the initial one to one and half hours though the water may continue to flow in the same velocity for some more time. The shutter planks are put back in their position when the flow of water becomes feeble. The entire catch is then sorted out according to species and size.

Crabs and cat-fishes very often enter the net along with the prawns and the net gets damaged quite frequently. The net is therefore, immediately repaired and kept ready for fishing on the following day. During the subsequent high tide, the trapping process is repeated. However, a large meshed conical nylone net *(ettavala)* is fixed inside the sluice gate with its cod end open and directed away from the sluice mouth in order to lead the prawns to the field and at the time to prevent the impounded prawns from escaping out of the field.

Before handing over the field back to the owner by middle of April, the lessee tries to fish out the entire stock of prawns. For this, different methods of fishing are resorted to. The water

is drained out of the field as much as possible and fishing is done by operating cast nets, drag nets and even hand picking of prawns by fisher-women and children. Hand picking, though it may appear to be crude, is a very efficient method of catching all the prawns and fishes that are left in the field. On certain occasions, the sluice gate is kept closed at peak low tide in order to stagnate the pond water and the field is thus left exposed to the sun for a couple of days. It is believed that due to the prolonged heat treatment, the prawns become restless and by sensing this phenomenon, the shutter planks are removed after keeping an *adichil* and fresh tdal water is allowed to flow into the fields. The entire stock of prawns then rushes and gathers at the sluice mouth in search of favourable shelter. They are at this point, caught by filtration technique during the subsequent lowtide.

The entire process of final harvesting is known as *kalakkipi-tutham* or *kettukalakkal.*

In Vypeen Island, the prawn catch from one hectare *Pokkali* field varies from 500 to 1200 kg. About 50-60% of the catch is contributed by *thelly (Metapenaeus dobsoni)* and tiny *naran (Penaeus indicus)*. The bigger *naran* accounts for only 30-35% *Kara or* tiger prawn (*Penaeus monodon*) contributes not more than 3%. The other common species of prawn, *choodan* (*Metapenaeus monoceros*) forms 5 to 8%.

Economics

Tables 1 and 2 give the economics of *pokkali* cultivation and subsequent prawn filtration in a one hectare field These data for 1984-'85 have been collected through personal enquiry with local farmers of Vypeen Island. It will be seen that total annual income from paddy as well as from prawns amounts to Rs. 19,500/- per hectare. The average annual expenditure for maintenance and management of field runs to about Rs. 17,000/- per hectare. The net income from paddy and prawns thus amounts to Rs. 2,500/-per hectare.

Table 1: Economics of pokkali cultivation (One hectare in area)

		Amount Rs. Ps.
I	EXPENDITURE	
A.	*Preporation of the field*	
i.	Draining of the field	540-00
ii.	Labour charges for making channels to drain-out water and repair to the bunds	300-00
iii.	Labour charges for raking the field and heaping into mounts	750-00
B.	*Pokkali cultivation*	
i.	Cost of seed @ Rs. 24/- per kg for 80kg	240-00
ii.	Labour charges for sowing the seed	135-00
iii.	Labour charges for de-weeding	625-00
iv.	Labour charges for transplanting the seedlings	1255-00
C.	*Harvesting*	
i.	Labour charges for harvesting: cost of 1/8 of the total yield of paddy	572-00
	TOTAL	4417-00
II	PRODUCTION AND INCOME	
i.	From 2032 kg of paddy @ Rs. 18/-per 8kg	4572-00
ii.	From hay	200-00
	TOTAL	477-800
III	NET INCOME Rs. 4772-00 — Rs. 4417.00	355-00

Table 2 : Economics of traditional prawn culture (One hectare in area)

I	EXPENDITURE	Amount Rs. Ps.
i.	Lease amount	7500-00
ii.	Maintenance of Sluice gate	180-00
iiii.	Maintenance of bund	280-00
v.	Bamboo/Arecanut screen- 1 number	175-00
v.	Nets:	
	(a) for fishing—*thoombuvala* 1 number	500-00
	(b) for letting in water—*Ettavala* 1 number	225-00
vi.	Temporary shed	500.00
vii.	Wages for watch and ward @ Rs 600/- per month for 5 months	3000-00
viii.	Miscellaneous expenditure	200-00
	TOTAL	12560-00

II PRODUCTION AND INCOME

S. No.	Species	Quantity (Kg)	Rate (Kg) Rs Ps.	Amount Rs. Ps.
1.	*Penaeus indicus* (naran)	254	37.00	9398.00
2.	*P. monodon* (kara)	20	70.00	1400.00
3.	*Metapenaeus dobsoni* (thelly)	396	8.00	3168.00
4.	*M. monoceros* (Choodan)	60	13.00	780.00
	TOTAL	730		14746.00
III	NET INCOME	Rs. 14746 00 — Rs. 12560.00		= 2186/00

N. B. Crabs and fishes are also caught in this process. This is given as remuneration to the net menders.

Perennial fields

In low lying areas where the ponds are deeper, paddy cultivation is difficult and hence prawn filtration is practised throughout the year. Such perennial fields are known as *varsha kettu*. In Vypeen Island such type of fields range in size from 2 to 75 hectare. The mode of trapping and fishing of prawns is similar to that in the seasonal fields. The lease period is generally for one year from 1st November to 31st October. As the prawns are allowed to remain for a longer period, comparatively better growth rate is attained in these fields with the result that the quantity and quality of the prawn catch is relatively better. The lease amount, therefore is also much higher than that of the seasonal fields. For example, a perennial field of 12 hectares at Edavanakad in Vypeen Island has been leased out for Rs. 3,00,000/- during 1984-85. One of the advantages of these fields is that the expenditure for maintenance is comparatively less.

As no wilful stocking is done in the above two types of fields, at any time, the quantity and quality of the prawn catch cannot be predicted. Moreover, the entry of many predatory fishes into the field poses a serious problem.

Prawn farming by selective stocking and better management procedures

Evaluating the advantages and disadvantages of the traditional method of prawn farming, the Central Marine Fisheries Research Institute suggests certain improvements in the system. This entails selection of fast growing and high-priced prawns for culture, preparation of the field by eradicating undesirable organisms, stocking with only the selected species at an appropriate stocking rate, monitoring the water quality and growth of the stocked prawns and culturing the stocked prawns for 3 to 4 months, when they normally attain marketable size. This improved farming method of prawn has been demonstrated by the Institute in certiain prawn fields in and around Cochin area. By following this method, it has been shown that,

three-fold increase in revenue could be obtained, as the entire yield is formed of only quality prawns. This improved system of prawn culture is propagated among the farmers through short term training course by the KVK of Central Marine Fisheries Research Institute, Narakkal.

Krishi Vigyan Kendra (Farm Science Centre)

The Krishi Vigyan Kendra (K V K) for Mariculture was established in late 1976 at Narakkal under the Central Marine Fisheries Research Institute. Transfer of mariculture technologies by the method of 'learning by doing' to farmers and uplifting their socio-economic conditions through such of the means which are likely to give major benefits to them, are the main objectives of this Kendra.

The main functions of the K V K are (1) to train present and prospective fishermen and small farmers of the coastal region in mariculture technologies and their management (2) to develop skills among the small farmers and fishermen in seed production, hatchery techniques, farm operation, simple post-harvest technology, farm management, economics and marketing of products through participating experience (3) to undertake follow-up programmes to develop suitable strategy for training and extension and to assess their impact (4) to disseminate the findings of research and develop the ability to apply mariculture techniques and information to the solution of farming problems through individual or collective farming programmes (5) to assist persons to analyse critically the financial requirements essential for establishing and maintaining efficient farming units and (6) to develop traits such as co-operation, industry, initiative and self-reliance esssntial for successful occupational adjustments and human relations.

During the nine years of its existence, the K V K has given intensive training on prawn / fish culture to 2500 farmers including 1150 women. The post-training activities of these trainees are being carefully assessed. Many of them have taken up prawn fish culture in their own fields or fields taken on lease or where they find employment to improve the traditional

practice. Some are actively engaged in developing prawn seed industry in Vypeen Island and nearby places.

One of the important points of the training programme of Krishi Vigyan Kendra is intensive off-campus training on collection, sorting and transportation of the seeds from the wild and their stocking. The Kendra has demonstrated the prawn/fish culture techniques in some fields and cannals at Narakkal in order to attract more and more entrepreneurs to this highly profitable farming industry. Hitherto unutilised canals amidst coconut groves are actively under use for '*naran*' farming. It is thus hoped that the knowledge so far obtained and propagated by the Central Marine Fisheries Research Institute and transferred to the farmers through the training programme of Krishi Vigyan Kendra on prawn/fish farming techniques would lead to greater production and exploitation of this important resources.

Details of improved prawn culture system

Prawns can be cultured in the costal waters all along the coast. As the ecological conditions vary from place to place, it is necessary to effect modifications in the technology discussed here to suit the particular conditions prevailing in the location selected for culture so as to obtain the maximum production and income.

Major inputs required for prawn culture

Major inputs required for prawn culture are: 1. suitable water area, 2. seed of the prawn selected for culture, 3. a knowledge of culture operation, and 4. finance.

Water area

Prawns can be farmed in any unpolluted salt water such as protected bays and lagoons on the edge of the sea, in the shallow river mouths, salt pan reservoirs, backwaters, brackish waters and mangrove swamps. For better production, the salt content of the water could be above 10‰. In higher saline waters of over 40‰, the prawns grow slowly.

Selection of farm site

Although prawns can be cultured in different types of waters as mentioned above, the farms having certain features yield better production and help easier management. It is, therefore, essential that farm site is selected carefully. Suitable location for the farm is along the tidal flats and shallow low-lying areas adjoining the estuaries and backwaters. It should be free from the natural hazards like droughts, floods, and erosion. The following criteria would help to select and locate site for farm construction.

1. The farm site should be within the tidal influence, so that adequate exchange between the farm water and fresh tidal water is ensured. Such sites are generally located in the region where the tidal amplitude is between 1 to 2 metres. It is also necessary to ensure that the site is neither very low or too high than the mean low water neap tide level; ideal site in this respect is the one which is a little above the mean low water level so that good exchange of water could be maintained and at the same time, the pond water could be drained off when required. Do not locate a site far away from the river mouth where there is little tidal influence.

2. The site should have a soft bottom soil, either muddy or mixed soil containing clay. sand and silt. The soil should have a good water bearing capacity. The bottom soil rich in organic matter encourages production of natural food organisms on which the prawn could feed and grow. The soil pH may range between 6.5 and 7.5. The pond soil should not be too acidic or alkaline. Hard bottom and sandy soil are not preferred.

3. The salinity range of the pond water could vary from 10-40‰, the ideal salinity for growth of prawns being 25-35‰. The water pH should be between 7 and 9; lower or higher pH than this range affects the health of the prawn. The oxygen content of the pond water should be above 3.5 ml/L. The temperature requirement of the pond water for the normal growth of prawn is between 25 and 35°C. Sudden changes in salinity and temperature, and low oxygen content of pond water are detrimental for prawns.

4. Location of the site in the region where adequate seed of the prawn to be cultivated is available, would facilitate culture operation and reduce the labour and cost on seed procurement.

5. The site should be free from roots or floating plants which hinder the culture operation.

6. The farm site should be free of all pollution from industrial, domestic and agricultural affluents. Agro-industrial wastes pollute pond water and may cause mortality of stocked prawns or render them unacceptable to the consumer.

7. Availability of infrastructure facilities such as roads, electricity and water supply at the farm site would facilitate the culture operations and marketing of the produce.

Construction of culture farm

Bund: The lay-out of the farm is to be carefully considered in relation to the topography of the locality and the estuary or the backwater which supplies the water. The site should be separated by constructing bunds on all the sides. The bund should be sufficiently strong to withstand the tidal force and pressure and also flood waters during the rainy season. It should be sufficiently high (atleast 50 cm) above the high tide water level as well as the highest flood level to prevent overflow. It should be wide enough at the top for the labourers to walk.

The height and width of the bund is determined on the basis of the depth of the water, tidal gradient, soil characteristics and the material used for putting-up bunds. Clay is the ideal earth for putting-up the bund. However, clay mixed with sand and silt can also be used. The side slope varies depending on the height of the bund and the soil used for construction; for clay the slope may be 2:1 and for loose soil, 4:1.

Earthern bunds can be constructed in a simple way. Bamboo poles or arecanut stems or split coconut stems are driven width apart in rows on either side of the bund to be constructed. Bunds in the open coastal waters require sturdy logs than

bunds in the procted waters. Each row is further strengthened by providing horizontal logs at varying distances. Support logs or cable for strengthening the frame work, are subsequently tied across at the top between each stake and the directly opposite one. Each row is then lined with woven palm leaves or bamboo mattings. The earth excavated from the site or brought from out-side is deposited of within this row and rammed well. In course of time, the outer matting decays and the earth consolidates to form the bund.

In order to strengthen the bund and to protect it from erosion, turfing with grass may be provided. The outer side of the bund may also be strengthened by stone pitching.

Bunds should be maintained properly. Redressing of the bund should be carried out periodically. Any leakages caused by the decaying roots or stumps or by the burrowing animals like crabs, eels, etc., should be immediately attended to and plugged with fresh earth.

Do not construct the bunds with loose and non-adhesive soil or with earth containing roots or stumps of plants which later cause leakages.

Sluice gate: Sluice gate or the water gate is provided to facilitate controlled exchange of water in the pond.

For a farm of one hectare area, a simple rectangular sluice gate of about a metre wide is adequate.

Water control devices to be provided in the sluice gates are the vertical wooden plank shutters or drop shutters one above the other, provided in the centre of the sluice gate. In addition to this, two velon screen shutters which slide in the groove, one at the inner mouth and the other at the outer mouth, may also be provided.

Pond: The pond bottom should have a gentle slope towards the sluice gate so that the pond water and the silt could be drained off easily. The depth of the pond should be to hold a minimum water column of 0.75m. If the pond is very shallow,

channels may be provided for the prawn to take shelter in day time when the temperature of the water rises, particularly in summer months. Deeper ponds pose difficulties during harvesting and dewatering. A clear marginal land is provided inside the bund to maintain the natural habitats, to locate leakage points and to prevent direct washing from the bund.

Preparation of the farm for culture operation

Before stocking prawn seed in the farm, predatory fishes and other undesirable organisms should be eradicated. This is necessary (i) to prevent predation of the culture species, (ii) to eliminate competetion for the available food and space and (iii) to ensure increased production.

A variety of predatory fishes inhabit the culture ponds of central Kerala. Carnivorous fishes like *Elops* sp., *Megalops* sp., *Ambassis* spp., gobids and *Etroplus maculatus* are found causing partial or complete destruction to the stock. Eels, crabs and even non-poisonous land snakes are sometimes found preying on the culture organisms. When the pond is situated in marshy areas among thick mangrove vegetation, land mammals like otters, cats and rats very often get into the field at night and consume the stock, causing heavy damages to the culture stocks

Eradication of predators could be effected by :

i. Physical removal
ii. Applying organic toxicants
iii. Applying inorganic toxicants

i. **Physical removal :**

a. Draining out the field: This is considered to be the simple method in shallow water ponds having strong embankments and water area around half an hactre. The water in the pond is drained out by pumping or operating a water wheel and the predators removed by hand picking or by operating scoop nets. The entire pond bottom is thus left exposed to the sunlight for a week or so when signs of 'cracks' appear in the bottom soil. The eggs of certain burrowing forms of fishes which lie dormant in

the soil are destroyed by this'heat treatment' and also by the evaporation of the water content of the moist soil. Burrowing fishes like eels and gobids are also killed. To accelerate the decomposition of organic matters and complete destruction of the burrowing forms of life, the exposed bottom could be ploughed. An added advantage of ploughing is that the subsoil gas, which is sometimes detrimental to fish or prawn stock is made to escape out of the soil. Uneven bottom conditions of the pond, very often make it difficult to totally drain out the water. Tiny water pools and ditches may be left out in such ponds. A treatment with high dosage of lime in such water logged pools ensures total destruction of the living organisms. The lime absorbs excess of carbon dioxide and supplies calcium which is required at the time of moulting in prawns.

In order to refill the dried pond, water from the adjoining canals may be let into the field through a fine meshed velon screen provided to the water gate. The free exchange of tidal effects should be ensured before the desired culture animals are stocked in.

b. Fishing out of the field: In deeper ponds where total draining of water is difficult, predators could be removed by repeated fishing. Before operating the nets, it may be ensured that the water level is reduced to the maximum possible. Fine meshed cast nets. drag nets, scoop nets and gill nets could be effectively empolyed for the removal of predatory animals

ii. Applying organic toxicants

Mahua oil cake: In countries like the USA, Canada and the USSR, toxicants of organic origin are used in eradicating weeds/ fishes from inland waters for aquaculture. The organic matter used in Central Kerala for eradicating predators is Mahua oilcake. The cake contains 4-6% saponin along with Nitrogen (2.51%), Phosphorus (P_2O_5—0.8%) and Potassium (K_2O—1.85%) The cake derived after the extraction of mahua (*Bassia latifolia*) seeds when applied in pond water produces lather as it contains saponin. Saponin also known as Mowrin, Is soluble in water and acts like a detergent on fishes, removes the mucous layer of the

body and gill membranes, thereby checking the gliding and respiratory action in the water. It enters the blood stream through gills and buccal tissues and haemolyses the red blood corpuscles resulting in death.

Generally mahua oil cake at the rate of 1 kg per five cubic meter of water is found to kill the predatory organisms of the culture pond. Being an organic agent, fishes effectd by the cake are fit for human consumption. The treatement is done two or three weeks before stocking and the exchange of pond water is ensured for the dispersal of the toxic effect.

The residual portion of the cake deposited at the bottom is decomposed into nitrogenous materials through nitrification promoting a good growth of microbenthic complex of algae and diatoms at the bottom.

iii. Applying inorganic toxicants

a. Treatment with lime : Though lime has been considered as a calcium supplying fertiliser, it is a powerful disinfectant and a fish poison, the toxic and caustic action of which kills the fishes, fish parasites and even soil bacteria. Quick lime is more preferred over several of its other forms since it is less expensive and is almost pure in its calcium oxide content.

The lime may also be applied in ponds of hyperacidity in order to correct the acidity of the soil and water. The quantity of lime, therefore should be decided based on the following factors.

i. Productivity of the pond
ii. Acidity of the soil and water
iii. The depth of the water column
iv. The density of predators

b. Ammonia treatment : Traces of ammonia is produced in the pond through bacterial decomposition of urea and nitrogenous waste and also through excretory process of fishes. When its concentration is further reinforced by direct application, the oxygen content of the blood in fishes decreases. The oxygen-

carbon dioxide exchange system of the blood with outside water is thus effected resulting in the increase of carbon dioxide and decrease of oxygen.

Ammonia at the rate of 10 gm per cubic meter of water (10 ppm) is found to totally destroy the living population of the field. Even planktonic life is destroyed when ammonia is applied.

The fishes treated with ammonia is not hazardous to human consumption as they die largely due to suffocation. The fumes that enter into various systems of the fishes, probably get discharged on cooking. One advantage with ammonia eradication is that the increase of pond fertility is instantaneous due to nitrogen fixation to the bottom soil. Within twenty four hours of treatment, the pond water becomes crystal clear, an indication of total destruction to the biomass. Since the fertility of the pond water is lost with overflow, no exchange of water should be made for a week or so. In the meantime, millions of tiny planktonic organisms are developed to form food for the stocked animals.

The velon netting fixed to a rectangular wooden frame is then fitted in the sluice gate so that tidal water will have a free flow in and out of the field. By fixing the screen, the entry of unwanted animals is also controlled. Clogging of the screen should be removed by frequent brushing. While brushing, care should be taken not to tear the screen. In order to avoid the attacks of crabs, an iron chicken mesh covering to the velon netting is recommended. It is also advisable to have a spare set of velon screen for emergency use. For small farmers, a rectangular wooden frame fitted with velon netting or even a good *adichil* would also serve the purpose; thus reducing the cost of constructing a new sluice gate.

After about two weeks of applying mahua cake or Ammonia, the water from the outer canal is let into the field by removing the shutter planks. During the subsequent low tide, the pond water is allowed to flow out. This water will never be harmful to the animal population of the outer canal, as the lethal effect of the cake or Ammonia is over. The process of letting-in and

letting-out the water is repeated for a period of 3 to 4 days. The presence of the velon screen in the sluice gate prevents the entry of any predators or other animal populations.

Varieties of prawns suitable for culture

The following 8 species are important from the point of view of culture at present, on the basis of information of the life history, distribution and availability of seed.

Scientific name	*English name*	*Malayalam name*
1. *Penaeus indicus*	Indian white prawn	*Naran*
2. *P. monodon*	Tiger prawn	*Kara*
3. *P. merguiensis*	Banana prawn	
4. *P. semisulcatus*	Green tiger prawn	*Kuzhikara*
5. *Metapenaeus dobsoni*	Flower tail prawn	*Poovalan or Thelly*
6. *M. monoceros*	Indian prawn	*Choodan*
7. *M. affinis*	Indian prawn	*Kazhanthan*
8. *M. brevicornis*	Yellow prawn	

The most suitable species among the above prawns are the '*Kara*' and the '*Naran*' as they grow to large size, attain marketable size within 3-4 months and fetch better price.

Seed resource and availability

Prawn seeds occur throughout the year all along the coastal waters. But their abundance varies from place to place and from season to season. The table given below furnishes the distribution and abundance of seed of different species of prawns in various maritime states.

Table 3: Distribution and abundance of prawn seed in different regions

Region	Species	Season of abundance
Gujarat	*P. indicus*	February-April
	P. merguiensis	February-September
	M. kutchensis	March-April
	M. brevicornis	
Maharashtra	*P. merguiensis*	October-Dceember
	M. monoceros	
	M. affinis	
Goa	*P. monodon*	July-August
	P. indicus	February-May
	P. merguiensis	February-May
	M. dobsoni	February-April-May
	M. monoceros	September-December
Karnataka	*P. merguiensis*	December-March
	P. indicus	December-January
	P. monodon	October-April
	M. dobsoni	
	M. monoceros	
Kerala	*P. indicus*	October-May
	M. dobsoni	October-January-August
	M. monoceros	October-December
	M. affinis	October-December
Tamil Nadu	*P. mondon*	March-May
		September-December
	P. semisulcatus	January-April
		June-October
	P. indicus	February-May
		August-September
	M. monoceros	March-September
Andhra Pradesh	*P. monodon*	September-April
	P. indicus	October-December
Orissa	*P. monodon*	April-May
		November-February
	P. indicus	April-July
		November-January
West Bengal	*P. monodon*	April-May, August-September
	P. indicus	February-April
	M. brevicornis	July, October-December

Seed collection

The prawn seeds congregate in large numbers in the surf region close to the shore and in the shallow edges of the estuaries

and backwaters particularly during the commencement of the high tide. They also occur in large numbers during the spring tides around new moon and full moon.

The seeds are collected from the seed ground by netting with a drag net made of velon screen (2mX1m). Juvenile prawns can also be collected by cast nets. On a good collection day a velon net unit can collect over 1,00,000 prawn seeds. At Vypeen Island there are certain agencies formed by the ex-trainees of the Krishi Vigyan Kendra which collect and deliver the seeds at the stocking site for a nominal fee.

Segregation and identification

The collection containing various species of prawns and juvenile fishes is initially deposited in a *happa*, fixed in the water. The *happa* is a rectangular cage of velon netting with its top open. All debris and fish larvae are removed at collection spot itself. The collection containing only the prawn seeds, is then transferred to plastic bins containing canal water. The bins are brought to the farm site and the collection transferred to a number of plastic basins depending on the concentration of prawn seeds.

"Thelly"(*Metapenaeus dobsoni*),"Choodan" (*M. monoceros*) and "Mottachemmeen" (*Caridina sp.*) also occur along with the seeds of "Naran" (*Penaeus indicus*). The identifying characters of the various stages of penaeid prawns are dealt with in detail in the training programme of the C.M.F.R.I. Thus the trainees of the Krishi Vigyan Kendra would not find it difficult to sort out the various species. However, for the sake of the lay farmer, a few easy-to-practise methods for separating juveniles may be mentioned here.

The water in the basin containing the seeds is rotated with hand. As the circulation of the water slows down, *naran* seeds could be seen assembling along the side of the basin and swimming against the flow. The larger flagellum (antennal flagellum) of the species is light yellowish in colour. The rostrum is serrated on both the upper and lower margins.

Kara could be easily separated by its dark colour; serration of the rostrum is similar to *naran*.

Thelly will have its large flagellum reddish in colour; only the upper margin of the rostrum is serrated.

Choodan has got a habit of sticking to the sides of the basin with its head up. The rostrun is serrated on its upper margin, as in the case of *thelly*. The larger flagellum is greyish and the body is brownish.

The *mottachemmeen*, although resembling *naran* in general appearance, is quite different. Apart from taxonomic differences these non-penaeid prawns have got the habit of sticking to the side of the basin in a cluster with their tail up.

The late post-larvae of the following species generally available in the surf region can be identified from the following characters.

'Naran'	Body transparent, eye stalk stout with prominent eye; rostrum extending beyond eye-stalk; with dorsal and ventral spines; tip of rostrum reddish or brownish; 6th abdominal segment and telson with only a few chromatophores
'Kara'	Appears like a brownish stick; a red streak along the ventral side of the body; eye-stalk thin; 6th abdominal segment and telson with large number of brownish red chromatophores. In the seed measuring above 20 mm, the colour changes to green or pink depending on the surroundings.
'Thelly'	Body transparent, smaller in size than the preceding two

	species; rostrum short, with a basal crest extending to base of eye in younger individuals and to tip of eye in older forms.
'Choodan'	Body more pigmented than *Thelly*, often looks brownish; rosturn reaching tip of eye or beyond it and without basal crest; a distinct 'M'-like patch on mid-dorsal aspect of 4th abdominal segment.

Transportation

Over short distance (2 or 3 miles), the seed (10-14 mm) can be transported in open vessels containing the water collected from the same area of collection of seed at a rate of 75 number per litre without aeration. Over about 3-4 hours duration, the larvae can be transported in open containers with frequent aeration. Over long distance involving 12-14 hours of travel the seed is packed in thick polythene bags containing 100 seed/litre of water, under oxygen packing and these bags are transported in card-board boxes with proper labels and instructions for handling. Cylindrical polythene bags with non-collapsible base is preferred than the rectangular bags with corners. During transporation over long distance, some mortality might occur.

Pre-stocking treatment

The seed thus collected and transported to the farm site should be sorted out size-wise, and acclematised to pond water before releasing into the farm.

The seed measuring above 25 mm in total length can be stocked in the pond after removing the weaker ones. The seed that measure less than 25 mm are reared further either in large (24' diameterX3') plastic pools or in cement tanks and require constant aeration and artifical feeding.

Stocking size

Seed of above 25 mm size can be stocked in the farm. As far as possible seeds of uniform size may be stocked so that uniform growth rate of the stocked prawns is ensured.

Stocking density

Number of seed to be stocked in the farm depends on the productivity and the depth of the field. In a highly productive field having an average depth of 1 m of water during the low tide, about 50,000 seed of 'naran' (*P. indicus*) of 25-30 mm size per hectare can be stocked and in moderately productive farms about 40,000.

In the case of 'Kara' (*P. monodon*) and 'Thelly' (*M. dobsoni*) the stocking density may be between 20,000-30,000/ha and 1,00,000-1,50,000/ha respectively, depending on the productivity of the field.

Management of the farm during culture operation

For obtaining higher survival rate, better growth and production, monitoring of the water quality and well being of the stocked prawns are essential. In this connection, the following points may be observed:

1. Regular flushing of the farm water with fresh tidal water should be ensured. This would also faciliate replenishment of nutrients expended and keeps the pond water in good condition.

2. Well oxygenated water having dissolved oxygen above 7ml/l, pH between 7.5 and 8.5; salinity 25-35 parts per thousand temperature 25-30°C are ideal for the growth of the prawn.

3. During the first two months of culture, the stocked prawns grow at a rapid rate: average growth rate in the case of *P. indicus* being 30-40 mm per month.

4. Regular sampling (at least once in a week) of the stocked prawns should be carried out to follow the growth of

the prawns. It is better to avoid sampling of prawns during *ashtami* to *ekadasi* This moon phase is considered to be the moulting period of prawns and majority of them, therefore, would be in soft conditon. If the growth rate is found to be unsatisfactory, immediate investigation on the water quality and availability of natural food etc., should be made to take appropriate remedial measures.

5. If the pond water is found to be depleted with oxygen churning of the pond water, which faciliates aeration, should be arranged.

6. Often natural bloom of phytoplankton that is either harmful or depletes the oxygen content of the water, occurs. Whenever such blooms are noticed, the farm water should be flushed out and fresh unpolluted water rich in oxygen should be let into the field.

7. Growing prawns in the field are sometime attacked by parasites If any unhealthy prawns are noticed, further studies should be made to identify the causes for unhealthy conditions and remedial measures are to be taken. In very low saline water the prawns become 'soft' and susceptible to bacterial diseases.

8. As the prawn grows to about 100 mm size they show movement both at the bottom and on surface waters, particularly during dusk and night. At this time, poaching forms a major hazard, and watch and ward should be arranged to prevent human interference.

9. The intestine of the properly fed live prawn can be seen as a dark band on the dorsal aspect. If the stomach is found empty, it is an indication of the scarcity of natural food in the pond. In such case, artificial feeding at a specific rate may be given to the prawns.

Artificial feed

Ground-nut cake, slightly warmed and broken into small particles, could be directly strewn in the pond. Meat of the clam (*Meritrix* sp.) could also be used as an artificial feed.

The prawn waste discarded from peeling sheds, is also a good feed; it could be given after properly drying and making it into powder form. Normally artificial feed equivalent to 10% of the body weight of the stocked prawn is offered. As there i likelihood of the pond water becoming polluted, it would be advisable to consult research instiiutions like the Central Marine Fisheries Research Institute before supplementary feeds are used. As far as Vypeen Island is concerned, the fields are very productive and the question of artificial feed does not generally arise.

Harvesting

Harvesting time: The prawns attain marketable size within 3-4 months after stocking. The size of different species at which they could profitably harvested is given below:

Species	*Harvestable size (mm)*	*Weight (gm)*	*Durations (months) after stocking*
P. monodon	> 150	> 30.0	3-3½
P. indicus	> 120	> 12.0	3-3½
M. dobsoni	> 70	> 2.5	3 4
M. monoceros	> 80	> 4.0	4-5

Number of harvest in an year: It is well established that duration of one culture operation from the time of preparation of the field through stocking and harvesting is about 4 months Thus leaviug the four monsoon months, 2 harvests could easly be taken in an year. By judicious management and providing seed in time, it may even be possible to take 3 harvests in an year

Harvesting methods

The prawns can be harvested by various methods. However, by none of the existing methods, complete harvest at a time or in a day is possible. The cultured prawns could be harvested by seining with drag net or by cast-netting. Before harvest,

the water in the pond is let out as much as possible and the drag net is operated repeatedly. Continuous fishing extending over 3 or 4 days may be necessary to remove all the stocked prawns For total harvest, the water in the pond has to be drained out completely and the prawns which remain burried in the ground are picked out by hand

Marketing:

Since prawns are in great demand, there is always a ready market. After the harvest, the catch is sorted out into different grades in terms of counts per kilogramme or pound and either auctioned or sold at a mutually agreed price. To keep up the quality of the prawns, it is advisable to keep them either whole or tail alone in ice.

Economics

In intensive prawn culture, the operational cost on eradication, seed (*P. indicus*), maintenance of pond, wages (supervising, watch and ward), harvesting and the miscellaneous expenditure works to 17.4, 21.7, 15.2, 20.6, 21.7 and 3.4 per cent respectively of the total expenditure on the basis of current estimate. Construction of new bunds and sluice gates would cost between Rs. 65,000 to 70,000 per hectare at the current rates and the type of ecosystem prevailing around Cochin. With the present knowledge of the technology of prawn culture operation involving the species such as *naran*, a production of 500 kilogrammes could be obtained per harvest to realise an annual yield of about 1000kg of prawn in two harvests.

Polyculture

Polyculture is a concept where different species which do not compete with each other for space and food, are cultured together. This system would then help to utilise the water area judiciously and also to increase production and income.

Fishes like *karimeen* (*Etroplus suratensis*), *poomeen* (*Chanos chanos*), *kanumbu* and *thirutha* (*Mugil* spp) cou be pi cultured

along with prawns. The fry and fingerlings of these fishes are available in appreciable quantity in the backwaters and estuaries of Kerala. They can be collected by operating fine meshed drag net or cast net, and introduced into the pond along with prawns.

Among the above mentioned fishes, *karimeen* is purely an estuarine form; it would breed and multiply in the culture field. Therefore, if cultured along with prawns in perennial fields, seeding of the species need to the carried out in the initial stage only.

No fixed stocking rate of different component species in polyculture has been evolved. In the experimental polyculture of *P. inaicus* and *Chanos chanos* at a stocking ratio of 10:1, a total production of 1125 kg/ha for 4 to 5 months has been obtained. In other experiments, different stocking ratio such as 6:1 for *P. monodon* and *Chanos chanos*; 100:3:3 for *M. dobsoni*, *Etroplus suratensis* and mullets; 30:31:8:3:1 for *P. indicus* *P. monodon*, *Mugil cephalus*, *Chanos chanos* and *Etroplus suratensis*, have been used.

Finance

Institutional finance for fish culture in inland fisheries sector is provided towards the cost of reclamation of derelict waters, construction of farm, cost of inputs such as fish seed, manure, supplementary feed etc. The agencies which provide credit in Kerala State are:

i. Commercial Banks
ii. Land Mortgage Bank
iii. Fish Farmers Development Agency
iv. National Extension Service Blocks through IRDP

Commerical Banks such as Canara Bank and Union Bank of India provide loan facilities for takiag up prawn farming project, In Trichur District, Canara Bank associates with Fish Farmers Development Agency of the locality for arranging financial assistance to prawn farmers. The Union Bank of India extends the loan facility under the Agricultural finance

scheme. The loan is repayable in five years with an interest of 10%.

As part of developing marshy/low lying/idle lying lands, the Land Mortgage Bank provides loan facility to farmers in pond construction and implementation of prawn farming. Farmers possessing 25 cents to 5 acres of land are eligible for loan @ Rs 17900/- per acre from this bank. It also provides loan @ Rs 19050/-per acre to farmers who own atleast 1 acre of land in augmenting coconut cultivation combined with prawn farming.

The Fish Farmers Development Agency, established for promoting inland fish culture programme, arranges loan @ Rs 1000/- per ha through commercial Banks for construction and establishment of prawn farms. This is an autonomous body functioning under the directions of Department of Fisheries of the Government of Kerala and is operating at present in Trichur District.

Under the Integrated Rural Development Programme of National Extension Service Blocks, a family with an annual income upto Rs 3500/- is eligible for loan based on the input requirement of the project. Under this scheme, a subsidy of 50% limited to a maximum of Rs. 5000/- is eligible in the case of scheduled tribe familles. In other cases, the subsidy is limited to one third of the loan or Rs. 3000/- which ever is less.

Normally, the lending agencies require a viable project report before sanctioning the loan or credit. The project report should therefore, contain the following aspects:

1. Resources available
2. Potential resources
3. Fishing grounds/Farm area
4. Objectives of the proposed project of the scheme
5. Technical feasibility
6. Economic viability
7. Organisation and phased programme of the project

8. Financial requirement
9. Loan/credit requirement
10. Repayment schedule
11. Security/guarantee.

Constraints

Traditional brackish water fish/prawan culture is prevalent at present only in Central Kerala and West Bengal. To a lesser extent, it is also practised in Uttara Kannara district of Karnataka and in Goa. Despite its long history, it has not so far spread to other maritime states, although suitable water area and species are available.

The main constraints in the development of prawn culture are (1) inadequate expertise (2) lack of interest and an awareness of the scope among the fish farmers and entrepreneurs (3) scarce flow of finance (4) difficulties of getting suitable water mass on long lease and (5) inadequate seed. Efforts are now being made to overcome these bottlenecks. Intensive investigations are carried out in the Central Marine Fisheries Research Insititute and simple indigenous techniques are being developed and perfected. As already mentioned, need based training courses are offered in marine prawn culture to fish farmers and entrepreneurs under Krishi Vigyan Kendra at Narakkal and for research/technical, managerial personnel at the Trainers Training Centre of the Institute at Narakkal. Similary, through extension service and demonstration programme, the techno-economic feasibility of intensive prawn culture is demonstrated to fish farmers. With increasing interest and unfolding of the scope in the field, more finance is also now available for prawn culture. To meet the seed requirement of desired species, efforts are being made to develop technique of hatchery production of seed on large scale.

From the foregoing accounts, it is evident that the marine prawn culture is a viable proposition and it has a great scope to augment prawn production.

SCIENTIFIC PRAWN CULTURE

Dos and Don'ts

** Do make up your mind to start prawn culture immediately Consult the Central Marine Fisheries Research Institute, Cochin-31 for technical aspects.

** Select and locate the field in the tidal region and in an unpolluted area. Design and construct the field in consideration of the topography, soil characteristies and utility.

** Outer bunds should be sufficiently strong and atleast 45 cm above high water level. A 3 metre wide outer bund would faciliate coconut planation and extra income in the long run

** All breaches should be thoroughly closed.

** Shallow ponds should be provided with channels of 1 metre depth connected with the sluice mouth.

** Eradicate the pond to the maximum possible by draining out or by operating nets or by using Mahua oil cake or Ammonia.

** Locate the seed collection spot around the culture field. Select the most economical species for culture.

** Do not select or mix with un-economical species of prawns

** For profitable culture, fishes like *karimeen* (pearl spot), *poomeen* (milk fish), *kanambu* (mullet) and *thirutha* (mullet) could be stocked along with prawns. In perennial fields it is more profitable to culture *karimeen* along with prawns as these fishes would breed and multiply in the field.

** Stocking may be done preferably during night time.

** Do not overstock the field.

** Follow the growth rate of prawns periodically and assess the quality of stocked prawns. It is better to avoid sampling during the moon phase *Ashtami* to *Ekadasi*.

** Artifical feeds maybe given, if necessary.

** Periodical brushing of the velon screen in the sluice gate is absolutely necessary.

** Always have one spare set of velon screen.

** Soft prawns with their alimentary tract curved should be fished out then and there.

** Do not allow the pond water to stagnate.

** Observe the pond water for changes to unusual colour and smell. If it adversely affects the behaviour and activity of stocked prawns, remedial measures will have to be taken. Approach the nearest Research Institute for advice/ suggestions

** Harvest the prawn as soon as they attain economical size and do not wait to complete the duration of culture.

** Try to have more than one crop of prawns, than a prolonged culture programme.

** A full time watch and ward is absolutely necessary.

** The Central Marine Fisheries Research Institute, Cochin-31 provides consultancy service and helps the farmers to make the venture successful. Take advantage of this service.

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